G05B  CONTROL OR REGULATING SYSTEMS IN GENERAL; FUNCTIONAL ELEMENTS OF SUCH SYSTEMS; MONITORING OR TESTING ARRANGEMENTS FOR SUCH SYSTEMS OR ELEMENTS (fluid-pressure actuators or systems acting by means of fluids in general F15B; valves per se F16K; characterised by mechanical features only G05G; sensitive elements, see the appropriate subclass, e.g. G12B, subclass of G01, H01; correcting units, see the appropriate subclass, e.g. H02K)

NOTES
1. This subclass covers features of control systems or elements for regulating specific variables, which are clearly more generally applicable.
2. This subclass does not cover:
   a. systems for controlling or regulating non-electric variables in general, which are covered by subclass G05D;
   b. systems for regulating electric or magnetic variables in general, which are covered by subclass G05F;
   c. systems specially adapted for the control of particular machines or apparatus provided for in a single other subclass, which are classified in the relevant subclass for such machines or apparatus, provided that there is specific provision for control or regulation relevant to the special adaptation. Otherwise, classification is made in the most appropriate place in this subclass.
3. In this subclass, the following terms or expressions are used with the meanings indicated:
   • “automatic controller” means a system, circuit, or device in which a signal from the detecting element is compared with a signal representing the desired value and which operates in such a way as to reduce the deviation. The automatic controller generally does not include the sensitive element, i.e. that element which measures the value of the condition to be corrected, or the correcting element, i.e. that element which adjusts the condition to be corrected;
   • “electric” includes “electromechanical”, “electrohydraulic” or “electropneumatic”.
4. In this subclass, details or specific control systems are classified in the group relevant to that system, if not otherwise provided for.

WARNING
In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00 Comparing elements, i.e. elements for effecting comparison directly or indirectly between a desired value and existing or anticipated values (comparing phase or frequency of two electric signals H03D 13/00)
   1/01 . electric
   1/02 . . for comparing analogue signals
   1/022 . . . {using discharge tubes}
   1/025 . . . {using inductance means}
   1/027 . . . {using impedance bridges}
   1/03 . . . for comparing digital signals
   1/04 . . . with sensing of the position of the pointer of a measuring instrument
   1/06 . . . continuous sensing
   1/08 . . . stepwise sensing
   1/11 . . . fluidic
   5/00 Anti-hunting arrangements
   5/01 . electric

   5/04 . fluidic
   6/00 Internal feedback arrangements for obtaining particular characteristics, e.g. proportional, integral, differential (in automatic controllers G05B 11/00)
   6/02 . electric
   6/05 . fluidic
   7/00 Arrangements for obtaining smooth engagement or disengagement of automatic control
   7/02 . electric
   7/04 . fluidic
   9/00 Safety arrangements (G05B 7/00 takes precedence; safety arrangements in programme-control systems G05B 19/048, G05B 19/406; safety valves F16K 17/00; emergency protective circuit arrangements in general H02H)
   9/02 . electric
Automatic controllers (G05B 13/00 takes precedence)

11/00

11/01 . . . electric
11/011 . . . [details of the correcting means]
11/012 . . . [details of the transmission means]
11/013 . . . [using discharge tubes]
11/015 . . . [using rotating amplifiers]
11/016 . . . [using inductance means]
11/017 . . . [using photo-electric means]
11/018 . . . [using thermal amplifiers]
11/06 . . . in which the output signal represents a continuous function of the deviation from the desired value, i.e. continuous controllers (G05B 11/26 takes precedence)
11/10 . . . the signal transmitted being dc
11/12 . . . the signal transmitted being modulated on an ac carrier
11/14 . . . in which the output signal represents a discontinuous function of the deviation from the desired value, i.e. discontinuous controllers (G05B 11/26 takes precedence)
11/16 . . . Two-step controllers, e.g. with on-off action
11/18 . . . Multi-step controllers
11/26 . . . in which the output signal is a pulse-train
11/28 . . . using pulse-height modulation; using pulse-width modulation
11/30 . . . using pulse-frequency modulation
11/32 . . . with inputs from more than one sensing element; with outputs to more than one correcting element
11/36 . . . with provision for obtaining particular characteristics, e.g. proportional, integral, differential
11/38 . . . for obtaining a proportional characteristic
11/40 . . . for obtaining an integral characteristic
11/42 . . . for obtaining a characteristic which is both proportional and time-dependent, e.g. P.I., P.I.D.
11/44 . . . pneumatic only
11/46 . . . without auxiliary power
11/48 . . . with auxiliary power
11/50 . . . in which the output signal represents a continuous function of the deviation from the desired value, i.e. continuous controllers
11/52 . . . in which the output signal represents a discontinuous function of the deviation from the desired value, i.e. discontinuous controllers
11/54 . . . Two-step controllers, e.g. with on-off action
11/56 . . . Multi-step controllers
11/58 . . . with inputs from more than one sensing element; with outputs to more than one correcting element
11/60 . . . hydraulic only

Adaptive control systems, i.e. systems automatically adjusting themselves to have a performance which is optimum according to some preassigned criterion (G05B 19/00 takes precedence; machine learning G06N 20/00)

13/00

13/02 . . . electric
13/0205 . . . [not using a model or a simulator of the controlled system]
19/05 . . . Programmable logic controllers, e.g. simulating logic interconnections of signals according to ladder diagrams or function charts

19/06 . . . using cams, discs, rods, drums, or the like (mechanical programme-control apparatus G05G 21/00)

19/08 . . . using plugboards, cross-bar distributors, matrix switches, or the like

19/10 . . . using selector switches

19/12 . . . using record carriers

19/122 . . . [using cards, tapes or discs having conductive paths (G05B 19/128 takes precedence)]

19/124 . . . [using tapes, cards or discs with optically sensed marks or codes (G05B 19/128, G05B 19/14 take precedence)]
Go5B

19/256 . . . . . . [with force or acceleration feedback only]
19/258 . . . . . . [with a combination of feedback covered by Go5B 19/253 - Go5B 19/256]
19/27 . . . . using an absolute digital measuring device
19/29 . . . . for point-to-point control
19/291 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/293 . . . . [with speed feedback only]
19/295 . . . . [with current or torque feedback only]
19/296 . . . . [with force or acceleration feedback only]
19/298 . . . . [with a combination of feedback covered by Go5B 19/293 - Go5B 19/296]
19/31 . . . . for continuous-path control
19/311 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/313 . . . . [with speed feedback only]
19/315 . . . . [with current or torque feedback only]
19/316 . . . . [with force or acceleration feedback only]
19/318 . . . . [with a combination of feedback covered by Go5B 19/313 - Go5B 19/316]
19/33 . . . . using an analogue measuring device
19/35 . . . . for point-to-point control
19/351 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/353 . . . . [with speed feedback only]
19/355 . . . . [with current or torque feedback only]
19/356 . . . . [with force or acceleration feedback only]
19/358 . . . . [with a combination of feedback covered by Go5B 19/353 - Go5B 19/356]
19/37 . . . . for continuous-path control
19/371 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/373 . . . . [with speed feedback only]
19/375 . . . . [with current or torque feedback only]
19/376 . . . . [with force or acceleration feedback only]
19/378 . . . . [with a combination of feedback covered by Go5B 19/373 - Go5B 19/376]
19/39 . . . . using a combination of the means covered by at least two of the preceding sub-groups Go5B 19/21, Go5B 19/27, and Go5B 19/33
19/40 . . . . Open loop systems, e.g. using stepping motor
19/401 . . . . characterised by control arrangements for measuring, e.g. calibration and initialisation, measuring workpiece for machining purposes (Go5B 19/19 takes precedence)
19/4015 . . . . [going to a reference at the beginning of machine cycle, e.g. for calibration]
19/402 . . . . characterised by control arrangements for positioning, e.g. centring a tool relative to a hole in the workpiece, additional detection means to correct position (Go5B 19/19 takes precedence)
19/404 . . . . characterised by control arrangements for compensation, e.g. for backlash, overshoot, tool offset, tool wear, temperature, machine construction errors, load, inertia (Go5B 19/19, Go5B 19/41 takes precedence)
19/406 . . . . characterised by monitoring or safety (Go5B 19/19 takes precedence)
19/4061 . . . . Avoiding collision or forbidden zones
19/4062 . . . . Monitoring servoloop, e.g. overload of servomotor, loss of feedback or reference
19/4063 . . . . Monitoring general control system (Go5B 19/4062 takes precedence)
19/4065 . . . . Monitoring tool breakage, life or condition
19/4067 . . . . Restoring data or position after power failure or other interruption
19/4068 . . . . Verifying part programme on screen, by drawing or other means
19/4069 . . . . Simulating machining process on screen (Go5B 19/4068 takes precedence)
19/408 . . . . characterised by data handling or data format, e.g. reading, buffering or conversion of data
19/4083 . . . . [Adapting programme, configuration]
19/4086 . . . . [Coordinate conversions; Other special calculations]
19/409 . . . . characterised by using manual input [MDI] or by using control panel, e.g. controlling functions with the panel; characterised by control panel details, by setting parameters (Go5B 19/408, Go5B 19/4093 takes precedence)
19/4093 . . . . characterised by part programming, e.g. entry of geometrical information as taken from a technical drawing, combining this with machining and material information to obtain control information, named part programme, for the NC machine
19/40931 . . . . [concerning programming of geometry]
19/40932 . . . . [Shape input]
19/40933 . . . . . . [Selecting figure elements from a menu table]
19/40935 . . . . [Selection of predetermined shapes and defining the dimensions with parameter input]
19/40936 . . . . [Defining geometry with a high level language]
19/40937 . . . . [concerning programming of machining or material parameters, pocket machining]
19/40938 . . . . [Tool management]
19/4097 . . . . characterised by using design data to control NC machines, e.g. CAD/CAM (Go5B 19/4093 takes precedence; CAD in general Go6F 30/00)
19/4099 . . . . Surface or curve machining, making 3D objects, e.g. desktop manufacturing
19/41 . . . . characterised by interpolation, e.g. the computation of intermediate points between programmed end points to define the path to be followed and the rate of travel along that path (Go5B 19/25, Go5B 19/31, Go5B 19/37, Go5B 19/39, Go5B 19/40 take precedence)
19/4103 . . . Digital interpolation
19/4105 . . . Analog interpolation
19/414 . . . Structure of the control system, e.g. common controller or multiprocessor systems, interface to servo, programmable interface controller
19/4141 . . . [characterised by a controller or microprocessor per axis]
19/4142 . . . [characterised by the use of a microprocessor (G05B 19/4141 takes precedence)]
19/4144 . . . [characterised by using multiplexing for control system]
19/4145 . . . [characterised by using same processor to execute programmable controller and numerical controller function [CNC] and PC controlled NC [PCNC]]
19/4147 . . . [characterised by using a programmable interface controller [PIC]]
19/4148 . . . [characterised by using several processors for different functions, distributed (real-time) systems (G05B 19/4141 takes precedence)]
19/4155 . . . [characterised by programme execution, i.e. part programme or machine function execution, e.g. selection of a programme]
19/416 . . . [characterised by control of velocity, acceleration or deceleration (G05B 19/19 takes precedence)]
19/4163 . . . (Adaptive control of feed or cutting velocity (without NC B23Q 15/12))
19/4166 . . . (Controlling feed or in-feed (G05B 19/4163 takes precedence))
19/418 . . . Total factory control, i.e. centrally controlling a plurality of machines, e.g. direct or distributed numerical control [DNC], flexible manufacturing systems [FMS], integrated manufacturing systems [IMS], computer integrated manufacturing [CIM]
19/41805 . . . [characterised by assembly]
19/4181 . . . [characterised by direct numerical control [DNC]]
19/41815 . . . [characterised by the cooperation between machine tools, manipulators and conveyor or other workpiece supply system, workcell]
19/4182 . . . [manipulators and conveyor only]
19/41825 . . . [machine tools and manipulators only, machining centre]
19/4183 . . . [characterised by data acquisition, e.g. workpiece identification]
19/41835 . . . [characterised by programme execution]
19/4184 . . . [characterised by fault tolerance, reliability of production system]
19/41845 . . . [characterised by system universality, reconfigurability, modularity]
19/4185 . . . [characterised by the network communication]
19/41855 . . . [by local area network [LAN], network structure]
19/4186 . . . [by protocol, e.g. MAP, TOP]
19/41865 . . . [characterised by job scheduling, process planning, material flow]
19/4187 . . . [by tool management]
19/41875 . . . [characterised by quality surveillance of production]
19/4188 . . . [characterised by CIM planning or realisation]
19/41885 . . . [characterised by modeling, simulation of the manufacturing system]
19/4189 . . . [characterised by the transport system]
WARNING

Groups G05B 23/0205 - G05B 23/0297 are incomplete pending reclassification of documents from group G05B 23/0202. Groups G05B 23/0202 and G05B 23/0205 - G05B 23/0297 should be considered in order to perform a complete search.

23/0205 . . . {by means of a monitoring system capable of detecting and responding to faults}

23/0208 . . . {characterized by the configuration of the monitoring system}

23/021 . . . . {adopting a different treatment of each operating region or a different mode of the monitored system, e.g. transient modes; different operating configurations of monitored system}

23/0213 . . . . {Modular or universal configuration of the monitoring system, e.g. monitoring system having modules that may be combined to build monitoring program; monitoring system that can be applied to legacy systems; adaptable monitoring system; using different communication protocols}

23/0216 . . . . {Human interface functionality, e.g. monitoring system providing help to the user in the selection of tests or in its configuration}

23/0218 . . . . {characterised by the fault detection method dealing with either existing or incipient faults}

23/0221 . . . . {Preprocessing measurements, e.g. data collection rate adjustment; Standardization of measurements; Time series or signal analysis, e.g. frequency analysis or wavelets; Trustworthiness of measurements; Indexes therefor; Measurements using easily measured parameters to estimate parameters difficult to measure; Virtual sensor creation; De-noising; Sensor fusion; Unconventional preprocessing inherently present in specific fault detection methods like PCA-based methods}

23/0224 . . . . {Process history based detection method, e.g. whereby history implies the availability of large amounts of data}

23/0227 . . . . . {Qualitative history assessment, whereby the type of data acted upon, e.g. waveforms, images or patterns, is not relevant, e.g. rule based assessment; if-then decisions}

23/0229 . . . . . {knowledge based, e.g. expert systems; genetic algorithms}

23/0232 . . . . . {based on qualitative trend analysis, e.g. system evolution}

23/0235 . . . . {based on a comparison with predetermined threshold or range, e.g. "classical methods", carried out during normal operation; threshold adaptation or choice; when or how to compare with the threshold}

23/0237 . . . . {based on parallel systems, e.g. comparing signals produced at the same time by same type systems and detect faulty ones by noticing differences among their responses}

23/024 . . . . . {Quantitative history assessment, e.g. mathematical relationships between available data; Functions therefor; Principal component analysis [PCA]; Partial least square [PLS]; Statistical classifiers, e.g. Bayesian networks, linear regression or correlation analysis; Neural networks}

23/0243 . . . . {model based detection method, e.g. first-principles knowledge model}

23/0245 . . . . {based on a qualitative model, e.g. rule based; if-then decisions}

23/0248 . . . . {Causal models, e.g. fault tree; digraphs; qualitative physics}

23/0251 . . . . {Abstraction hierarchy, e.g. "complex systems", i.e. system is divided in subsystems, subsystems are monitored and results are combined to decide on status of whole system}

23/0254 . . . . {based on a quantitative model, e.g. mathematical relationships between inputs and outputs; functions: observer, Kalman filter, residual calculation, Neural Networks}

23/0256 . . . . {injecting test signals and analyzing monitored process response, e.g. injecting the test signal while interrupting the normal operation of the monitored system; superimposing the test signal onto a control signal during normal operation of the monitored system}

23/0259 . . . . {characterized by the response to fault detection}

23/0262 . . . . {Confirmation of fault detection, e.g. extra checks to confirm that a failure has indeed occurred}

23/0264 . . . . {Control of logging system, e.g. decision on which data to store; time-stamping measurements}

23/0267 . . . . {Fault communication, e.g. human machine interface [HMI]}

23/027 . . . . . {Alarm generation, e.g. communication protocol; Forms of alarm}

23/0272 . . . . . {Presentation of monitored results, e.g. selection of status reports to be displayed; Filtering information to the user}

23/0275 . . . . {Fault isolation and identification, e.g. classify fault; estimate cause or root of failure}

23/0278 . . . . . {Qualitative, e.g. if-then rules; Fuzzy logic; Lookup tables; Symptomatic search; FMEA}

23/0281 . . . . . {Quantitative, e.g. mathematical distance; Clustering; Neural networks; Statistical analysis}

23/0283 . . . . . {Predictive maintenance, e.g. involving the monitoring of a system and, based on the monitoring results, taking decisions on the maintenance schedule of the monitored system; Estimating remaining useful life [RUL] [preventive maintenance, i.e. planning maintenance according to the available resources without monitoring the system G06Q 10/06]}
23/0286 . . . . [Modifications to the monitored process, e.g. stopping operation or adapting control]
23/0289 . . . . [Reconfiguration to prevent failure, e.g. usually as a reaction to incipient failure detection]
23/0291 . . . . [Switching into safety or degraded mode, e.g. protection and supervision after failure]
23/0294 . . . . [Optimizing process, e.g. process efficiency, product quality]
23/0297 . . . . [Reconfiguration of monitoring system, e.g. use of virtual sensors; change monitoring method as a response to monitoring results]

24/00 Open-loop automatic control systems not otherwise provided for
24/02 electric
24/04 fluidic

99/00 Subject matter not provided for in other groups of this subclass

2219/00 Program-control systems
2219/10 . Plc systems
2219/11 . Plc I-O input output
2219/1101 . Remote I-O
2219/1102 . Speed up I-O manipulation
2219/1103 . Special, intelligent I-O processor, also plc can only access via processor
2219/1104 . Display state of connection of I-O
2219/1105 . I-O
2219/1106 . Pneumatic, hydraulic output module connected to plc module
2219/1107 . Hardware expansion of function of plc, programmable, connected in output line
2219/1108 . Relay module
2219/1109 . Expansion, extension of I-O
2219/11101 . Verifying ram data correct, validity, reload faulty data with correct data
2219/1111 . I-O grouped on one board
2219/1112 . Bit addressing, handling
2219/1113 . Address setting
2219/1114 . Address by module name
2219/1115 . Avoid to give two different addresses to same I-O, no duplicate
2219/1116 . Position of module in loop, ring determines address of module
2219/1117 . Parallel input addressed as memory
2219/1118 . Peripherals have a key to determine kind of peripheral
2219/1119 . Key is 8-resistors connected to either 0-or-1 to form a byte key
2219/1121 . Read key multiplexed, 16-bit wide, connect some resistors to reversed potential
2219/1122 . Program address module after installation, connect programmer into module
2219/1123 . Poll and detect connected I-O addresses, not connected means high address
2219/1124 . Transfer address to module, decrement, send this as address for next module
2219/1125 . I-O addressing
2219/1126 . Conversion table between original defined module address and actual physical address
2219/1127 . Selector for I-O, multiplex for I-O

2219/1128 . . . . Several networks linked to host computer
2219/1129 . . . . Serial addressed modules on bus
2219/1131 . . . . I-O connected to a bus
2219/1132 . . . . High speed bus between plc and plc or programming device
2219/1133 . . . . Sensor actuator, asi, bus, network
2219/1134 . . . . Fieldbus
2219/1135 . . . . Profibus
2219/1136 . . . . Canbus
2219/1137 . . . . Peer to peer communication
2219/1138 . . . . Configuration of I-O
2219/1139 . . . . By using software configurable circuit, integrated, pga between cpu and I-O
2219/1141 . . . . Modify manually, using keyboard configuration of module
2219/1142 . . . . Load in replacement I-O stored configuration
2219/1143 . . . . Base configuration contains all I-O modules, deselect not present modules
2219/1144 . . . . Program, program I-O module
2219/1145 . . . . Normal scan of I-O and direct acces of some I-O independent from normal scan
2219/1146 . . . . Scanning sequence as function of previous logic expression
2219/1147 . . . . Variable rate of scan
2219/1148 . . . . If I-O module cannot be scanned in time, report to controller
2219/1149 . . . . I-O in groups, serviced according to critical inputs, tasks matched to I-O
2219/1151 . . . . Fast scanning of I-O to put I-O status in image table
2219/1152 . . . . I-O module delivers interrupt on event, store port and 10ms timestamp in buffer
2219/1153 . . . . Scan only some I-O registers, use flags
2219/1154 . . . . Reading repeatedly input state, try again
2219/1155 . . . . Switching over from one input to another one
2219/1156 . . . . Special latches release all simultaneously
2219/1157 . . . . I-O used either as input or as output
2219/1158 . . . . Control of output current
2219/1159 . . . . Image table, memory
2219/1161 . . . . Signal processing, detect or deliver analog signals
2219/1162 . . . . Forcing I-O
2219/1163 . . . . Multiplexer for analog signals
2219/1164 . . . . Latch for output or input
2219/1165 . . . . Disable I-O card by preventing current flow
2219/1166 . . . . Create optimum data blocks for transmission
2219/1167 . . . . Pulse wave output
2219/1168 . . . . Peak amplitude for input, nul amplitude for activating output
2219/1169 . . . . Activating output if input changes, transition input and output not yet on
2219/1171 . . . . Detect only input variation, changing, transition state of variable
2219/1172 . . . . Direct negation, inversion of inputsignal
2219/1173 . . . . Activating output only if powersupply is sufficient
2219/1174 . . . . Input activates directly output and vice versa
2219/1175 . . . . Activating output repeatedly for guaranteed turning on of output
2219/1176 . . . . I-O signal processing, adaption, conditioning, conversion of signal levels
2219/1177 . . . . Insertion mistake
2219/1178 . . . . Display states of I-O in time
2219/1179 . . . Safety, on error, fault, block, inhibit output
2219/1181 . . . Detection of I-O faults, shut down of I-O
2219/1182 . . . I-O isolation, optical
2219/1183 . . . On error shut off output by independent system, not normal I-O
2219/1184 . . . Test ability of input for on, off capability
2219/1185 . . . Feedback of output status to input module and compare with command
2219/1186 . . . Redundant inputs parallel, outputs series, load safe switch off, AND condition
2219/1187 . . . Test input value with stored limits, permissible range, plausibility
2219/1188 . . . Detection of inserted boards, inserting extra memory, availability of boards
2219/1189 . . . Duplicated I-O also triple
2219/1191 . . . I-O voter
2219/1192 . . . Output of interfaces parallel, for safe load switch on, OR condition
2219/1193 . . . I-O ram as buffer for signals and self test for I-O bus
2219/1194 . . . Send dummy, check data to I-O to check correct I-O connection
2219/1195 . . . Critical I-O monitored by safety module connected to plc, other I-Os by plc self
2219/1196 . . . Intelligent, smart I-O can function independently, monitoring limit values
2219/1197 . . . Each interface, module has simulation module which takes over control
2219/1198 . . . Activate output only if power of the output signal is sufficient
2219/1199 . . . Inserting or taking out of boards during power on, hot plug in
2219/12 . . . Plc mp multi processor system
2219/1201 . . . Each plc can act as master, flying master
2219/1202 . . . Modules with same hardware and software
2219/1203 . . . Expand logical expression over multiple controllers
2219/1204 . . . Multiprocessing, several plc’s, distributed logic control
2219/1205 . . . Memory access for different processors, memory arbitration, mailbox
2219/1206 . . . All processors are loaded with same program, only part of program is loaded
2219/1207 . . . Download programcode to node, I-O and execute programcode
2219/1208 . . . Communication, exchange of control, I-O data between different plc
2219/1209 . . . Exchange control, I-O data to other plc, individually, without host
2219/1211 . . . Exchange control, I-O data to other plc, using separate synchronizing,
2219/1212 . . . Exchange control data between plc’s only when other plc’s are inactive
2219/1213 . . . All plc send their input to a common image memory, output directly send out
2219/1214 . . . Real-time communication between plc, Ethernet for configuration, monitor
2219/1215 . . . Master slave system
2219/1216 . . . Interlock problem, avoid sending data to slave when slave processes data
2219/13 . . . Plc programming
2219/13001 . . . Interrupt handling
2219/13002 . . . Transfer rom content to ram, load ram from non volatile memory
2219/13003 . . . Initial program load, host to controller
2219/13004 . . . Programming the plc
2219/13005 . . . Subroutine
2219/13006 . . . Prom burning
2219/13007 . . . Program hardwired logic, pld, fpga when out of machine, or inactive
2219/13008 . . . Quicker execution of jumps when repeating same kind of operation
2219/13009 . . . State machine instructions
2219/13011 . . . Batch control
2219/13012 . . . Using other programs, adapting program to machine, exchanging or rom
2219/13013 . . . Transferring ram to eprom see also prom burning
2219/13014 . . . Expanding functions of display by modular hardware
2219/13015 . . . Semi automatic, manual automatic
2219/13016 . . . Jump while output is disabled, or disabling output when running test instruction
2219/13017 . . . Macro instructions
2219/13018 . . . Conversion ladder diagram to decision system, machine code, language
2219/13019 . . . Translate program in order to be used on different plc
2219/13021 . . . Convert Petri net to ladder diagram
2219/13022 . . . Convert source program to intermediate program
2219/13023 . . . Convert natural language, graphic to coded states, input
2219/13024 . . . Convert digital logic of hardware circuit into plc software
2219/13025 . . . Convert batch recipe into plc program
2219/13026 . . . Convert ladder to event chaining, internal state for fpga or similar
2219/13027 . . . Convert time chart to relation vector to calculate plc I-O state as function of time
2219/13028 . . . Convert plc type program in pc type program for running in pc environment
2219/13029 . . . Enter values with incremental keys
2219/13031 . . . Use of touch screen
2219/13032 . . . Different menus on screen, softkeys
2219/13033 . . . Code wheel to enter data, push button to accept
2219/13034 . . . Operator interface derived from comment label in program
2219/13035 . . . Name, address duplication detection for program components, symbols
2219/13036 . . . Tracing, use of dummy ladder to collect signals together in one
2219/13037 . . . Tracing
2219/13038 . . . Comment, message data displayed with program instructions
2219/13039 . . . Print out of program, printer for program
2219/13041 . . . Display ladder or logic diagram, mnemonics, switch between two display
2219/13042 . . . Display logic diagram, LOP
2219/13043 . . . Display statement, instruction list, IL, BL, AWL
2219/13044 . . . Display as flow chart, SFC, FUP
2219/13045 . . . Additional data to restore ladder diagram from machine instructions
2219/13046 . . . Display status of edited program segments: inserted, deleted, replaced
2219/13047 . . . Display data on chart with comment, message about type of data
2219/13048 . . . Display of ladder, RLD, RLL, KOP
2219/13049 . . . Display progress of program, state, highlight, colour
2219/13051 . . . Display status of I-O in intelligible, easy to understand language
2219/13052 . . . Display of ladder diagram
2219/13053 . . . Edit by use of a ladder mask, raster, enter a symbol and select place in mask
2219/13054 . . . Enter a symbol and number of times symbol to be used in ladder diagram
2219/13055 . . . Place cursor, enter symbol, move cursor
2219/13056 . . . Edit conversion, jump table interactively
2219/13057 . . . Automatic search for unused, available address; assign to symbol
2219/13058 . . . One instruction of plc generates a whole independent sequence, relay
2219/13059 . . . If not able to execute instruction block, skip and execute next
2219/13061 . . . Selection between sequential and conditional program
2219/13062 . . . Booting
2219/13063 . . . Synchronization between modules
2219/13064 . . . Execute reverse sequence
2219/13065 . . . Tasks for executing several programs asynchronously
2219/13066 . . . Execute next step if state, control zone changes
2219/13067 . . . Use of variables, symbols in instructions, to indicate mechanisms, interfaces
2219/13068 . . . Program divided in operation blocks, groups, tasks each executed
2219/13069 . . . Execute bit operation during instruction fetch cycle for word operation
2219/13071 . . . Non time critical program by processor, time critical program by hardware
2219/13072 . . . Super scalar computing
2219/13073 . . . Several interacting programs, each for a separate machine, exchange of start, stop
2219/13074 . . . Result of bit operation can modify or stop instruction execution
2219/13075 . . . User program, then interlock program to override certain conditions
2219/13076 . . . Interprette in pc a ladder diagram, use of sequence engine
2219/13077 . . . Interlock conditions stored in tables
2219/13078 . . . Sequence operation and interlock set programs are separated
2219/13079 . . . Solving stored logic function if value is equal target value
2219/13081 . . . Select between initialisation and normal control instructions sequence plc
2219/13082 . . . Parallel execution of bit operations
2219/13083 . . . Jumps
2219/13084 . . . Rom or eprom with conditional instructions
2219/13085 . . . Plc controls several machines in sequence
2219/13086 . . . Priority interrupt
2219/13087 . . . Separate interrupt controller for modules
2219/13088 . . . Analyzing only relevant rows of ladder diagram

2219/13089 . . . Skip part of expression evaluation if no influence on end result
2219/13091 . . . Use of precalculated and stored values to speed up calculations
2219/13092 . . . Speed up, evaluation of expressions between brackets
2219/13093 . . . Using functions like arithmetic timers in program
2219/13094 . . . Using a-d convertor as function
2219/13095 . . . Pid regulator
2219/13096 . . . Fuzzy control function
2219/13097 . . . Function is true macro program, not subroutine, conversion to machine
2219/13098 . . . Nc function to control axis, written in C or not
2219/13099 . . . Function block, OOP, various functions grouped, called by name as servo
2219/13101 . . . Function block instance, only one function block exists, several instances
2219/13102 . . . Function is a user written program, separate from rest
2219/13103 . . . Adaptive selftuning regulator
2219/13104 . . . Assembly, machine code, instruction list, AWL, IL, BL
2219/13105 . . . Two or more languages, ladder diagram or progression, basic program
2219/13106 . . . Natural language, use simple words like move, rotate,
2219/13107 . . . Logic symbols, plan LOP, functional block symbols PBS, functional programming FUP
2219/13108 . . . Flow diagram, sequential function chart with transitions and states SFC Grafacet
2219/13109 . . . Pld programmable logic device software for plc
2219/13110 . . . Expert system
2219/13111 . . . Petri net
2219/13113 . . . Read image of sequence ladder diagram, flow chart drawing, translate into code
2219/13114 . . . Use of relative addresses for program
2219/13115 . . . Optimize ladder diagram block by rearrangement of serial and parallel
2219/13116 . . . Machine code, instruction for processor
2219/13117 . . . Two languages, ladder diagram and machine code for processor
2219/13118 . . . Decompiler, translate machine code to hll, reverse processing, easy modification
2219/13119 . . . Compiler
2219/13121 . . . DDE direct data exchange, DLL dynamic library linking
2219/13122 . . . Flow chart program activates several ladder diagrams, each controls one machine
2219/13123 . . . C language
2219/13124 . . . Step language
2219/13125 . . . Use of virtual, logical connections
2219/13126 . . . Csl computer simulation language
2219/13127 . . . Hybrid sfc for description of sequence, ladder diagram for conditions, interlock
2219/13128 . . . Relay ladder diagram, RLL RLD KOP
2219/13129 . . . Automatic documentation of program
2219/13131 . . . Select out several languages: FBD, SFC, RLL or RLD
2219/13132 . . . Select out several languages: FBD and SFC
2219/13133 . . . Select control languages out of FB RLL or RLD, SFC, ST
Two or more languages mixed, RLD, SFC, FBD, IL, ST, relay ladder, function block, sequential function, instruction list, structured text mixed to form logic control program

Using audio and/or video playback

Translate spreadsheet into code

Interpreter considers hierarchy of plc in system structure for programming it

High level language HLL, structured text ST, resembles pascal

CAD, design plc system by inputting desired failure, fault behaviour

Derive sequence program from design, cad data of machine

Debugging, tracing

Manual testing

GUI graphical user interface, icon, function bloc editor, OI operator interface

Graphical input of network of symbols, simulation on screen, translate to machine

Process image blocks have a relation to software function blocks

Program using time charts

Object oriented programming

Encapsulated actuator model with standardized interface: state, action, interlock

Correction of program using grammatical error detection

Modification of program

Modification, change of program in real time

Patching rom to correct program

Inserting instructions in program

IC-memory card

Tape

Non volatile memory, no battery

Cassette

Easily exchangeable rom, eprom cassette, earom

Core memory

Light pen

Remote and local programming unit, control panel

Program plc by independent build in processor

Program intelligent I-O separate from main plc

Personal computer pc

With contact pins

Voice, oral, vocal, speech announcement

Portable, detachable programming unit

Remote programming from computer

Selection out of all possible programs with switch

Pc, computer connected to plc to simulate machine

For each input corresponding delay time for output response

Functionality of a complex controlled systems, composed of sub-systems

Select next stimuli as function of input state of previous step, so useless stimuli skipped

Reiterate simulation till minimum delay stimuli, original contact start

Reiterate simulation for different conditions or subsystems

Selection of limited stimuli, inputs for simulation

With petri nets

Connect simulation card with overlay into control system, to learn programming

Pc, computer connected to plc to simulate only part of machine

Software function module for simulation

Simulation, also of test inputs

Checking validity of data

Checking program data, parity, key

On error, look in table for alternative allowed next instruction

Inhibit next step if signature fails, response different from stored response

Eeprom and software interlock, user cannot change ram data

Examine needed I-O, detect connected I-O, execute program only if proper I-O

Build in measurement processing time and input time, input time must be smaller

Protected programs, running these programs

Check if instruction for special module is valid for that module

Host and remote version of ladder program, avoid different versions

Safety, forbid dangerous instruction, instruction order while programming

On error choose another program

Pc safety

Detect direction, sign of change of signal

Independent processor, coprocessor monitors plc

Pc, personal computer monitors contact data of several plc's

On error I-O control state is substituted by actual state to continue

Alarm

Safety, monitoring in general

Plc as standalone for safety control of machine

Pc monitors plc

Manual override control, digital or analog, between plc and machine

Explosion free control, intrinsically safe

Safety integrity level, safety integrated systems, SIL, SIS

IN, dual plc worker coworker, switch, OUT persistency

Redundant processors and I-O

Dual plc's, processors and dual I-O

Triple plc's, processors and dual I-O, triple modular redundant

Triple plc's, processors and triple I-O

IN, plc and comparator, error detector, backup, standby plc, switch, update OUT

Dual IN, crosscoupled relay, dual AND, dual OUT

IN, direct link parallel to plc, AND, OUT

Dual IN, dual plc with dual OUT comparator, dual AND, dual OUT

IN, three plc and 2-out-of-3 processor voter, 2-out-of-3 output voter, OUT
Test of I-O scanner

block, group with stored Compare operation time of each independent Log, history of key, input information before Look up table to determine particular fault each scan Checking step, diagnostic routine at end of Portable diagnostic unit, offline Diagnostic of degrading performance function anymore Diagnostic, using expert, knowledge based system Self test Make log, journal, history file of state changes Monitor only particular devices which are required for execution of process Compare response time, time interval with reference response time, interval Diagnostic of dead state, machine does not function anymore Diagnostic of degrading performance Portable diagnostic unit, offline Checking step, diagnostic routine at end of each scan Look up table to determine particular fault conditions Log, history of key, input information before last fault occurred Compare operation time of each independent block, group with stored Dual watch dog, one for operating system, other for user program Test of equipment, system without using actual system Test of I-O scanner

Real time modeling of plc behaviour, display pictogram of system Signature analysis, recorded states, zones are compared to actual Test of interface Test of sensor Detect difference in signal between identical channels, if plausible If fault in next cycle persists, declare channel faulty If signal out of range, use for next cycle previous detected signal Take average, mean of two valid signals of same input Sample input signal again to verify if signal is correct Derive diagnostic program from model needed for sequence program Remote diagnostic Memory testing Watch dog Selecting parameters or states to be displayed on panel, displaying states Display result of computation, calculation Display of control states on cards, by leds Message generation, composer from variables and states, zones Display menu and its code, sense code, compare with registered code Display matrix of relay, contact symbols, select and show time Display instruction with corresponding states, markers Library of pictures to display process, pictogram Voice, vocal, speech alarm Display of error messages Displaying instructions for monitoring state of machine What kind of fault, first fault latch indication Indication of status in a ready, off, running of fault state Fault stages, confinement, logical segregation of I-O, separate modules Detection on or off-line, latency from failure occurrence to fault recognition Fault masking, redundant module is selected, fault will not propagate Retry, reacquire input data and start fault sequence again Reconfiguration of components or graceful degradation, degrade Recovery, after detection or reconfiguration, effect an error eliminati Restart of processing Repair on or off-line Reintegration, after correction of fault, failed module reinserted Diagnostic, troubleshooting Fault tolerant objectives for equipment, controller Integrity, error detector, switch off controller, fail safe
Plc structure of the system partial cells, modules
Assign functions to group of complete or
Configure priorities of different tasks from fixed non volatile
Set configuration, address of connected module of plant
Object oriented configuring, graphical display table
Identify connected I-O and store in address setting, configuration automatically set
On reinsertion board, power up, program identity kind of module, control unit connected
Local remote switch control
Serial feedback of several states of output
Galvanic isolation
Synchronus serial datatransmission
Redundancy, masking redundancy, avoid failure but no fault detection
Restart, power up of processor, outputs are off, disabled or hold last state
Each independent operation block, group has own restart, home position
On the fly software replacement in case of error
Low impedance bus
Process, low pass filter, debouncing input, output driver with ramp
Serial feedback of several states of output
Plc structure of the system
Local remote switch control
Image table in I-O expansion module
Interbus-s
Identity kind of module, control unit connected
Set switches defining control function
Set configuration from master control station
On reinsertion board, power up, program setting, configuration automatically set
Identify connected I-O and store in address table
Object oriented configuring, graphical display of plant
Configuration of operating system
Configuration software for networks
Set configuration, address of connected module from fixed non volatile
Configure priorities of different tasks
Assign functions to group of complete or partial cells, modules
Initialize amount of memory space needed in module

Optical fiber
Communication, serial data transmission, modem
RS232 serial
Convertor between plc and pc built into serial communication line
Synchronous serial datatransmission
Data packet, each module reads input stream and replaces with output
RS422, balanced lines, xor, only one transmitter, receiver, RS485
Before starting communication between modules, initialize modules
Detection of data transmission faults
RS485, MPI multipoint interface, multiple transmitters, receivers connected
Controller and device have several formats and protocols, select common one
I-O communicates with local bus at one end and with fieldbus at other end
RS485 for service connection to module
Exchange objects having I-O, configuration, status, parameters, functions attributes
Exchange objects between cpu and intelligent I-O, stored in their memory
Serial transmission using one line for data and one line for clock
Select between simplex, only reading I-O data or duplex, also writing to interface
Fail safe communication
Control words for interface itself and for connected I-O
Internet, tcp-ip, web server see under
Fail safe communication
Sense area of screen, compare if corresponds with correct area
Synoptic display of process, mimic diagram
Lcd, 7-segment displays ten different states
Multiple lcd, alphanumerical display
Portable display unit
Low-high intensity display, flashing
Colour display
Microprocessor
Timer, counter, clock-calendar, flip-flop as peripheral
Dual port memory
Communication processor, link interface
Microcontroller
LIFO for storing intermediate results
FIFO
DMA
FPGA field programmable gate array
Tristate interface
Floating point coprocessor
RISC processor for plc
Battery backup
Real time clock
MMU, memory management unit
Optimize program memory space
Use of external memory
Using a mixture of memories
Two cpu control plc, select cpu, video switch, with special key
Adapter bus connected to centronics

2219/21022 . . . Telephone ring interface, detect ring sequence to control devices
2219/21023 . . . Midi interface
2219/21024 . . . Analog output
2219/21025 . . . To address single module, assign a group with only that single module
2219/21026 . . . Indirect addressing of I-O through a control register
2219/21027 . . . Address extension, module with several I-O, command has subaddress for each I-O
2219/21028 . . . Address of module determined by position
2219/21029 . . . Address of module determined by function of module
2219/21031 . . . Address of module determined by signature: type, value of measured, controlled data of module
2219/21032 . . . Controlled module in a ring, each module detects its own address
2219/21033 . . . Serial transfer address to each module, decrement, if zero module found
2219/21034 . . . Address I-O
2219/21035 . . . Identification with serial header
2219/21036 . . . Each connected module has own address and address of originator of message
2219/21037 . . . Serial time multiplex bus, programming each module with one delayed line TDM
2219/21038 . . . Special clock line, module counts clock until equal to its address
2219/21039 . . . Slaves, modules in daisy chain, each handles control data, transmits to next
2219/21041 . . . Detect length of packet of pulses to recognize address
2219/21042 . . . Address a group, a zone
2219/21043 . . . Device address and subdevice address and function address
2219/21044 . . . Modules with same address are each selected by different transmission speed
2219/21045 . . . Modules with same address are each selected by different modulation
2219/21046 . . . Address a single module out of a group
2219/21047 . . . Select module if address of module equals required address, compare addresses
2219/21048 . . . Compare fixed address of module to required address
2219/21049 . . . Poll and detect connected I-O modules, address terminator, address line high
2219/21051 . . . Modules able to communicate to other modules are connected to aritiber
2219/21052 . . . Modules having a common function are allocated ascending number to address
2219/21053 . . . Each unit, module has unique identification code, set during manufacturing, IMAC address
2219/21054 . . . Connector on bus has two rows of contacts, if one contact is connected, other not
2219/21055 . . . Number of halfwaves equals number of I-O, send block of halfwaves, synchro gap
2219/21056 . . . Decoding on module, module can be inserted anywhere, fixed address in bus connector
2219/21057 . . . Buslines connecting modules are offset by one line from module to module
2219/21058 . . . Find address by activating power and detect which address gives feedback
2219/21059 . . . I-O in address space
2219/21061 . . . Adapter bus connected to centronics

G05B . . .

2219/21062 . . . Pc and I-O bus manager and network nodes linked to I-O clusters
2219/21063 . . . Bus, I-O connected to a bus
2219/21064 . . . Calibration: automatic of a-d convertor, store null and maximum in eeprom
2219/21065 . . . Module calibrates connected sensor
2219/21066 . . . Disconnect data line from module before, reconnect after configuration
2219/21067 . . . Set group of module by hardware for each module, no program protocol
2219/21068 . . . Configure input signals either as interrupt or status signals
2219/21069 . . . At start up check I-O and store addresses in secure device
2219/21071 . . . Configuration, each module has a settable address, code wheel, encoder
2219/21072 . . . Write, modify address into module by optical means, laser
2219/21073 . . . Each module has push button, trigger circuit to initialise address setting
2219/21074 . . . Master has keyboard to enter address of called slave
2219/21075 . . . Initialise each module random, count down, if zero master sets address
2219/21076 . . . Plug, connector with build in decoding, encoding for module
2219/21077 . . . Module address fixed, defined by fixed identification lines on motherboard
2219/21078 . . . Fixed address of slot on motherboard changed, using address convertor, decoder
2219/21079 . . . Allocate at start up also to each controlled device a code for the master
2219/21081 . . . At start up, check I-O configuration and store addresses in ram
2219/21082 . . . At start, send first address to all modules, manually trigger first module and so on
2219/21083 . . . At start up detect if connected devices are input or output devices
2219/21084 . . . Actuate module, seek response by counting up address, store address on response
2219/21085 . . . Define type of I-O, analog, digital, pulse
2219/21086 . . . Configuration menu program for I-O
2219/21087 . . . Define sensor type, resistance, thermocouple, thermistor, voltage, current
2219/21088 . . . Define name and address of I-O
2219/21089 . . . Detect configuration of I-O regular
2219/21091 . . . First module initializes its address, then signals next to do same, serial
2219/21092 . . . At start up, autoconfigure module for proper I-O execution, bootstrap
2219/21093 . . . Module has a configuration part for own logic and one for application logic
2219/21094 . . . Different connectors for serial transmission as function of machine or connected sensor
2219/21095 . . . Screen, display connected directed to control system via optical fibre
2219/21096 . . . Connection of machine to pc via centronics, parallel port
2219/21097 . . . DMA
2219/21098 . . . Connect pc to machine, controller, module via serial port
2219/21099 . . . Two independent interfaces, one for pc, other for remote monitoring
2219/21101 . . . Connect I-O interface to joystick port
Pc control of device over normal remote control connected between them

Connect pc to machine, controller, module via PCMCIA

Wire pc connector to output of controlled module, for printer, modem, other module

Read in data only if value changes, transition to save processor time

If specific I-O not updated in memory, priority access of I-O, data directly to microprocessor

Change sensitivity of detection if input value is very low

Module, I-O module consisting of counters and comparators

Field programmable gate array, fpga as I-O module

Each module has a push button to bypass control and switch module on

Each module has push button to turn module off

Bus interface has multiplexer, control register, data shift register

Universal input, AC or DC

Same connector can represent either input or output

Universal cabling; control interface between processor and devices

Universal I-O, same pin is input or output, bidirectional

Two sensors on same line, superpose pulsed digital on analog signal

Circuit for signal adaption, voltage level shift, filter noise

Output only enabled during a short period of positive going power supply

Programmable signal discrimination, input can be used for several functions

Impedance matching

A-d conversion if input signal is analog, no a-d conversion if input signal is digital

Digital value of analog signals depends on range between signal and threshold

Signal processing, filter input

Signal adaption I-O

Change control signal, first max or min signal, then normal desired signal

Low pass filter for input

Sample two input values, one in positive wave, other in negative wave, average

Window for signal

Module to adapt connection of signals to general connector

Signal adaption circuit build into connector

On closing contact, clean contact with large current, then normal signal current

Detection of zero crossing for command and maximum for reading value

Analog to digital conversion, ADC, DAC

Variable filtering as function of kind of sensor signal

Input activates directly output and vice versa

Latched I-O

Read input signal when switching power supply is not switched

Sample analog signal between superposed digital signal

Link between input and output, output only activated if corresponding input on

Fuse in case of overcurrent

If real status is different from controlled status stop motor

Time critical I-O shut off by I-O module, otherwise by processor

Over current protection on clock line

If read write error, keep last I-O status for next cycle

Activate output only if power sufficient

If output defect, switch it off

In order to follow higher data input rate, shut off non essential peripherals

Activate I-O only after system stabilises from start up

If I-O defect, warning light, operator pushes button, cpu disconnects I-O

Send dummy, check data to I-O to check correct I-O connection

Detect short circuit of cable

Test I-O if functional or safe value

Resistors between transmitter and receiver, against disturbances

Zenerdiodes for protection of output of transmitter, input of receiver

Output state, over resistance, coupled back to input to monitor output

Intelligent I-O monitors also local load, controlled object

Couple, feedback each output to corresponding input to verify output

Low voltage protection

Pc multi processor system

Controller calculates a control parameter from values sent by other controllers

Grid, array of controllers

Use default values if communication with other controllers not available

Multi core

Microprocessor for display and parameter input, link to control microprocessor

Microcontroller combined with state sequencer

Each processor controls a different function of the machine

Only one processor is permitted to execute a common function at a time

Active controllers are allocated more time if request rate is low

All processors are loaded with same program, only part of program is used

Local processor uses data from own local store and data from other stations

Multicontrollers, multimicrocomputers, multiprocessing
Process directly process signals without interrupt or polling
Define module independent and module specific element, interconnection, capability
First cluster runs normal program, second cluster runs different program
Join two clusters of processors together
Processor starts application program only if it receives predetermined data
Only common memory in host, master, no local memory in slave, local controller
Use of priority levels for gaining access to resources
Use a different frequency to address each processor
Processor sends data to next, downstream processor
Communication, CPU accesses own I-O and next CPU over dual port memory
Processor accesses own I-O and I-O of all processors connected on his right
Common memory as well as local memory
Master detects and configures slaves
Multiprocessing, change over from master slave to peer to peer, no master
Master slave
Master executes modified program on slave demand
Each slave can control several other slaves
Each slave can function in stand alone if master fails
Each slave has library of states during which operation is permitted to start
Master determines critical time when each of slaves must be controlled
Selection of master or slave
Several masters at same time
Reallocate, reschedule execution of controlled functions if one processor fails
Real time database, each processor stores in local memory used variables
Program references to variable by absolute address, update of absolute address
Detect incompatibilities between control devices
Pc programming
Expansion of control words, code of standard language to increase functionality
Petrinet
Bumpless control transfer, map corresponding operation states to operation tables
Build up program so that safety conditions are met, select most stable states
Expert design system, uses modeling, simulation, to control design process
Finite state modeling
CAD to develop sequential control system, use data also to test
Computer aided software engineering, program generation, case tools, CASE
Automatic documentation of program
Sequence control design using pc, cad of control system CADCS
Derive sequence program from design, cad data of machine CADCS
Build up program by selecting function modules as function of amount paid for it, charging, payment
Conversion of ASCII scripting language to machine code
Convert input signals to universal machine control signals represented by music
Accelerate input, exponent as function of pressure, time, turning speed, keys for 10-to-1 Page, scroll key
Enter parameters by combinations of keys and duration of actuation of keys
Joystick delivers reference function as function of speed of its movement, except about null
Gesture programming, camera sees hand, displays it on screen, grasp buttons
Production design metaphor, tool, operation like input system
Control knobs, levers integrated into display, display parameters near knobs
Delivers reference when in neutral position, otherwise delivers desired value
Overlay, template for keys with different meaning
Recognise user input pattern and present possible intended program
Database with information on how to control or test different appliances
Switch function of panel, detect this and execute other orders
Up down, increment decrement keys, jog, sequentially show functions or values
Simulate control panel to give remote instructions
Input of data from second control unit if first fails
Variable pressure on key gives input value
Press once on key to raise signal, twice to lower signal
Same knob, different functions, turn for pulses, push to enter value
Same knob, different function, normal for parameter, value, pushed to enter value
Touch key integrated in display
Select function by amplitude of analog value, potentiometer, resistor taps
Remote programmer
Enter analog value
Only increment key
Remote and local control panel, programming unit, switch
Transparent overlay with touch sensors, put over display panel, select function
Function key changes function as function of program, associated pictogram
Selection out of menu by function keys
Operating, repair manual stored in memory
Knob to select program serves also as indicator for progress of program
Control panel serial, RS232 connected to controller
Remote control, enter program remote, detachable programmer

Matrix, plugboard like control panel with modules for display, switches

Knob with tactile feedback, representing clicks, detents programmed

Simulate response on entered parameters and display, quicker response

Cursor keys to select cells of a spreadsheet with control parameter, enter value

Foot pedal, control, operated

Position of knob, pedal detected by encoder, addresses memory for functions

Knob, pedal selects ranges, functions and controls in each range as function of position

Configuration of pedal, knob with code card, adapt pedal to person

Variable range of knob, pedal for each function, adapt to person

Position of knob, pedal detected by bundle of optical fibres

Double, two foot pedal

Entry of function or parameter during manipulation of tool, operation

Manual override of program

Same knob starts two different functions

Control, human or man machine interface, interactive, HMI, MMI

Give instructions, messages to operator

Illuminated, lighting up keys, build in led, display, show sequence data entry

If up, down key is selected, linear display of values appears, pops up

Telephone, dial as control panel

Keyboard decoding by microprocessor

Each control unit can control own associated load or as central control

Control unit can switch load on off or can also go into program mode

Pushbuttons to manually up or down control of motor also for entry of program

Reconfigurable remote programmer, learn control signals for different devices

Input a code representing a sequence of operations

Local programmer can switch to remote to use same capabilities as remote

MMI design, operator workplace design

Enter parameters with two hands, dead man knob, switch, pedal

Joystick with buttons for menu and function selection, scrolling, +sign and -sign

Synoptic display of available, selectable control modules with their functions

Several users can enter data simultaneously to same processor

Menu is sequentially selected and read from cd disk and guides operator

Programmable selector switch, can be programmed by connected apparatus

Same switch to power control and to set references of several devices

Key cap label rewritten, changed to indicate changed or alternate functions

Multiple consoles, panels to issue concurrent commands to different groups I-O

Soft up down keys, simulated on screen

Input a code representing a device function

Debounce key

If knob pushed during power up, knob can be used afterwards as data input

Use single button, knob to enter code number, equals number of pushes

Messages to operator in mother tongue, selection out of different languages

Manual control, via microprocessor instead of direct connection to actuators

Switches on panel, connected to serial port

Enter quality parameters to select control parameters

Quality parameter is low energy consumption of machine

Quality parameter is high production rate

Change display of window to another as function of settable active display time of window

Window, drop down menus

Cockpit metaphore, condensed representation, urgent things better shown

Push on flashing alarm indicator, corresponding window pops up on whole screen

Floorplan, room metaphore, dedicated windows, unchangeable but can be selectable

Configuration of display device, operator panel

Adapt control signal logarithmic

Ramp, slope connection between two reference values

Reread, retransmit several times data for valid data, redundant command

Maintain parameter setting for a while to avoid changes due to noise

Buffer

Input signal can be sent simultaneously to several processors

Lookup table, interpolation between points

Column and line select in memory to access address data in second memory, tree

Display state, variable only when needed, energy saving

Display graphics with corresponding text

Display on off time chart for different events

Production report

Notepad, message from other operator

Switch display to show different things, test or normal state

Display tree structure of whole system or relevant info after function selection

Switch from one kind of display to other, selected by duration discrimination

Switch from one kind of display to other when parameter is changed

Animated display, changes as function of parameters

Select on large display part of pictogram to show on display of used workstation

Multifunction display
Animated, rotating fan indicates speed, flashing bulb for intensity
Display history of used, selected programs, their frequency
Display to console, panel which sends parameters, commands
Display all subsystems, select one and display screen corresponding to subsystem
Display program step, instruction number
Linear, bar display of variables
Segment display
Flat panel, thin film electro luminescent
colour display
Adjustable display
Kind of display, matrix like display, large surface
Blinking, flickering display
Programmable, reconfigurable via microprocessor or coding switches
LCD liquid crystal display
Helmet display, mounted on head of operator
Dual, two displays
Highlight
Large and several smaller displays for each workstation, each own cursor on large display
Controlled load, lightbulb, roller blind itself acts as display to acknowledge command
Line of light diodes LED
Display on screen reference value and sequence steps
Show upper, lower value, position with upper, lower segment of 7-segment display
Display process, synoptic, legend, pictogram, mimic
Display of evaluated and selectable program
Display plurality of parameters simultaneously
Hand held terminal PDA displays machine control program when user is near that machine
Display real time or time already elapsed or rest time for program
Display enlarged, zoomed detail and small overall schematic, plan
Display data on a scrolling line, ticker display
Display of parameter plus permissible, allowable range
Display program in fast, quick, speed mode
Display of selected sequence, permissible sequence
Display progress of program
Operation field together with control parameters
Display dynamic change of process, animation
Different states with one LED, blinking, on and off or different colours
Display modified program together with original program to see differences
Display of parameter and several suggested values for that parameter
What to display: program channels, running of program
Display entered data for each controlled station
Display status of currently selected controlled devices
Warning display if heavy energy consuming programsteps are selected
Use of sound, acoustic, voice
3D display of controlled system
Display effects of high level commands
Display different states by using two leds, first blinks, then second, then both
Setting of internal dipswitches, jumpers
Visual display of workpiece with actions to execute on
Display number of each program
Software independent and dependent of hardware
Information is code
Command to control simultaneously several machines
A limited number of programs to be used by plurality of machines, multiplex
Memory stores lifetime, different settings, configurations of controlled device
Check validity data by writing in sector control data and check data
Memory stores available, allowable, possible options, variations, alternatives of program or modules
From lookup table and real time clock, select actual daylight period
Curve entered with pen on touchscreen
Disk with segments connected to separate input of microprocessor, represents different values
Reference value, setpoint for regulator
Value is analog signal
Curve, surface represents analog value, line, surface follower
Curve represents analog value, tv scan
Reference in coded form
Reference together with sequence commands
Set reference as function of position, for compensations
Capacitive detection of line
Potentiometer
Linear potentiometers with multiple sliders
Limit value to tolerances, ranges, plausibility
Store entered data, program status, reread regularly, against data loss
Check validity of entered data
Checksum CRC
Check data validity in ram, keep correct validity, compare rom ram
Extend processing time by extending enable signal with special output signal
Parallel processing
Interrupt queued requests only at the end of each segment of each of requests
Different tasks in different memory, called as function of priority of tasks
Each event can have two sub events, device can be activated twice in cycle
On off time tables, as function of angle, each linked to groups for device selection, pointer
During each cycle, different on off sequences can be used
Offset on off signals for different sections
Program system from more than one source
Table with data on how to execute the same function in different modules
Environment conditions affect execution of program
Program execution, if external programs exist, execute them instead of internal
Execute first current program, then select new program
Mark objects, execute sequence according to mark
Execute program from added, expansion rom, memory
Input state executes immediately corresponding block program
In real time loop do one of the control modules and a safety module program
Set address code in register to switch between program in ram and in eprom, flash
Table lookup driven system
Program execution by message passing
TV microprocessor executes also home control, monitoring of appliances
Execute other program during idle time of main program, or between interrupts
Idle, during idle time of main program, a game can be played
Synthesize time logic circuits
Specification language
Ascii script: one line is read each time, each letter controls a device
Block, buffer the inputs when executing critical process, read them when finished, for a finite state machine
Create control program by demonstrating behaviours using widget and inferencing them
Widget have states, properties, events associated, demonstrate control behaviour
Integrate function blocks from different machines; CORBA, RMI protocols
Using audio and or video playback
Use two or more different programming languages in same program
High level language HLL, basic, control language
Expert system
Interactive programming, sentence on screen filled in by operator
Object oriented programming, OOP
Hybrid programming, part sequence, part continuous
Grafacet
GUI graphical user interface, icon, function bloc editor, labview
Synchronous language
Use control template library
DDE direct data exchange, DLL dynamic library linking
C++
Assembly language, pass parameters by registers instead of stack
Select device driver for actuator, sensor
Compiler
Program derived from sequence time diagram and stored in table
Forth
Program provides for communication protocol with device, equipment
Decompiler, translate machine code to HLL, reverse processing, easy modification
Natural language, use simple words like move, rotate
Select, associate the real hardware to be used in the program
Link graphical data for display automatically into program
Use of parser
Use of virtual, logical connections
Use of separate interface software, main program calls functions from it
Program by data flow
Enter simple words: start motor, pc translates boolean equations into orders
PEARL process experimental automation real time language
Detect erroneous instructions in asic systems
Debugging, breakpoint
Eliminate redundant states in finite state machine
Enable, disable hardware logic to implement finite state machines
Graphical representation of finite machine states to help operator
Executing sequential program concurrently with state machine instructions
Adaptive states; learning transitions
State logic control, finite state, tasks, machine, fsm
Process, graphic programming of a process, text and images
Use of model of process, divided in part models with IN, OUT and actuator
Automated assembly of machine control software, reusable software components
Whole program to first processor, transfer to next processor if not for 1st
Load program and data for multiple processors
Load, update new program without test program, save memory space
Remote load of program with cellular, wireless, satellite connection
Remote load of program, through internet
Remote load of program, through fieldbus
Load program from file system of a controller
Load program in data blocks
Load program, optical connection between programmer and eprom
Download program from host
Transfer program into prom with passwords
Load program from host, remote load, non volatile card to volatile, ram
Initial program loader, ipl, bootstrap loader
Transfer program from ram to eprom, flash, card
System boot only allowed after inputting user identification, password
Load new program together with test program
Load program from attached device to control that device
Load program to initial configure machine, then erase and install userprogram
Switch between initialization, program, test, end of programming, erase mode
Normal and emulated, pass through for disabled persons modes
Standby, inactive, sleep or active, operation mode
Safe mode, secure program, environment in case of error, intrusion
Mode, two mode, directly from console or download from host
Microprocessor control or manual control
Switch between manual, automatic, inching or step by step mode, select mode
Hand, manual or automatic
Select between entry and execution of program
Separate update program onboard
Transfer modified data from ram to eprom, flash after system have run several cycles
Clone, duplicate hardware functions of another device
Modification of program in real time
Modification program
Modification, correction entered values
Patch program during non execution, tables to load modified program
Override stored parameters
Modify program and store it
Use of table with addresses for different modules, write new table if modified
History, log of program modifications
Identification of program, application, device to be controlled
Modify if history of program coincides with history of modifying data
Transfer modified program from ram to eprom, flash
Update diskette, cassette initiates bootstrap program to load eprom, flash
Only new module in high level language, combine with existing modules
Pluggable rom, smart card
Earom, alterable eprom, erasable
Changeable memory, program
Memory is eprom
Permeability of pin sets frequency of oscillator, record carrier
Eeprom
Programmed parameter values in memory, rom, function selection and entry, no cpu
Pluggable pin module, fits in corresponding female receptacle, coded plug
Film
Ram rom memory
Endless tape, loop
Hard disk
Magnetic card
Programmable, pluggable module, logic set up on front of module
Grammophone record, disk
Program card with integrated control panel, flexible circuit
Screw like form of record carrier
Ram card with write protection switch
Floppy diskette
Barcode
Bubble memory
Ferrite memory
Temperature induced on tape, sensors read temperature as program data
Card with picture of work to be done, together with selectable codes
VRAM videoram
Memory in controlled device is ram, rom
Fixed and variable memory for parameters or user program
XY matrix, switching controlled by pc
Interactive guidance by voice message
Set potentiometer automatically
Function switch, knob with piezo, strain gauge
Template for program, set values to template
Touch screen, with representation of buttons, machine on screen
Touch sensitive key
Knob, delivering pulses, digipot, electronic potentiometer
Balls with different properties circulate and form the sequence
Knobs with build in illumination, legend
Lightpen
Tape, card with magnetic, luminescent, iron particles for sequence
Programming pencil, touch probe
Voice, vocal command or message
Trackball
Mixture of different means, joystick, keys, pedals, fader, potentiometer
Modular program, each process has corresponding program module
Each module can transfer data to I-O or other module and has parameter memory
Change execution time ratio of several programs
Set finish, end time and total program time to calculate, derive begin, start time
Set time constant
Set value of limit switches, high low value
Enter start and end of selected program
Set day, week
Set start time and duration
Adapt set parameter as function of measured conditions
Programmer has connection with pc to enter parameters into system directly by pc
Edit reference value on screen by lightpen
Store edited program also in detachable programmer, can be used elsewhere
2219/23404 . . . If data error detected, switch automatically to program mode
2219/23405 . . . Change settings of events for a whole group of related events
2219/23406 . . . Programmer device, portable, handheld detachable programmer
2219/23407 . . . Program machine during execution of other program in real time
2219/23408 . . . Handheld programmer has cover to protect operator from environment
2219/23409 . . . Portable, detachable programmer has emulation for fixed control panel
2219/23411 . . . Voltage supply or allow, not inhibit signal to memory on connection of programmer
2219/23412 . . . Discriminate with id code the module to be programmed
2219/23413 . . . Remote programmer can only program a device if nearby, narrow beam communication
2219/23414 . . . Pc as detachable program, debug, monitor device for control system
2219/23415 . . . Program each station with specific data, all, global with general, common data
2219/23416 . . . Enter application program into I-O module, like motion program, servo program
2219/23417 . . . Read program from pluggable memory card
2219/23418 . . . Read tape, card forward, backward, in two directions
2219/23419 . . . Automatic passage of tape to reader
2219/23421 . . . Record program on tape, disk, memory
2219/23422 . . . Learn parameters by producing a small number of objects
2219/23423 . . . Record playback
2219/23424 . . . Select construction element from function library
2219/23425 . . . Selection of program, adaptive to process
2219/23426 . . . Layout of program choice around knob according to used intensity
2219/23427 . . . Selection out of several programs, parameters
2219/23428 . . . Select program from look up tables as function of detector states, pointer, index to program
2219/23429 . . . Selection as function of connected machine
2219/23431 . . . Change program on detection of deviations
2219/23432 . . . Select as function of different connected tools, each tool has its parameters
2219/23433 . . . Selection of program as function of connected keyboard, panel
2219/23434 . . . Select automatically preferred program data, ordered to most used program
2219/23435 . . . Select a program per zone to be controlled
2219/23436 . . . Select by dipswitches on power on
2219/23437 . . . Each operator can select his own program, data entry
2219/23438 . . . Select application program as well as connected control device
2219/23439 . . . Select additional programfunctions by pushing two different keys
2219/23441 . . . Select between user program selection or service program selection
2219/23442 . . . As function of colour or number code on object to be treated
2219/23443 . . . Upon detected function changes of remote device, activate proper local program
2219/23444 . . . Select as function of surface property, characteristic of object handled by machine

2219/23445 . . . Real time simulation
2219/23446 . . . HIL hardware in the loop, simulates equipment to which a control module is fixed
2219/23447 . . . Uses process simulator to develop, simulate faults, fault tree
2219/23448 . . . Find optimum solution by simulating process with constraints on inputs
2219/23449 . . . Use of an additional dedicated processor for emulating sensor output
2219/23451 . . . Software in the loop, bypass function, execute new program parts on external device
2219/23452 . . . Simulate sequence on display to control program, test functions
2219/23453 . . . Pc simulates equipment and is connected to sequencer to test program
2219/23454 . . . Execute program in fast mode, real system has no time to respond
2219/23455 . . . Determine capability of machine by simulating model of capability of its parts
2219/23456 . . . Model machine for simulation
2219/23457 . . . Programmer magnetically attachable to machine
2219/23458 . . . Remote controller pluggable, attachable to pc
2219/23459 . . . Keyboard attachable, pluggable into household apparatus
2219/23461 . . . Module has coded cams darking optical detectors
2219/23462 . . . No local entry panel, only central remote programmer for all appliances
2219/23463 . . . Before controlling module execute monitoring of module and its resources
2219/23464 . . . Use signatures to know module is not corrupt, cfc, control flow checking
2219/23465 . . . Master processor blocks input of data to slaves
2219/23466 . . . Block, latch entry keys once program launched
2219/23467 . . . Code and program on two objects to be assembled, compared for compatibility
2219/23468 . . . Before switch to execution of second, non failsafe program, inhibit I-O for it
2219/23469 . . . Execute alternatively a failsafe, proven program and a non failsafe program
2219/23471 . . . Interrupt after set time non failsafe program, switch to failsafe program
2219/23472 . . . Confirmation of user for the selection of a program setting
2219/23473 . . . Program stopped if consumed current to high
2219/23474 . . . Pc safety
2219/24001 . . . Maintenance, repair
2219/24002 . . . Clock failing, adaptive to clock
2219/24003 . . . Emergency stop
2219/24004 . . . If control lever, joystick, handle is released, spring return to neutral
2219/24005 . . . Inhibit update control program if default values has been changed by program during processing
2219/24006 . . . Code coverage memory: contains data about addressed addresses during program run
2219/24007 . . . Backup data if microprocessor not responding
2219/24008 . . . Safety integrity level, safety integrated systems S1L. S1S
2219/24009 . . . If board, card is retrieved, then disconnect first power, then block machine
2219/24011 . . . Transmit warning, error message to all devices in a list
Remote testing, monitoring independent from normal control by pc

Diagnostic programmed in state logic

Simulator, generates input signals, shows output signals of logic

During simulation, test inhibit output to actuators

Select signals as function of priority, importance for diagnostic

Sample rate variable as function of importance of alarm signals

Real time diagnostics

Monitor only devices essential to current process

Processor stores variables, events and date in eeprom, for external monitor

Find intermittent errors

Diagnostic

Online service documentation

Detect faulty circuit, display on screen and replace it

Avoid propagation of fault

Probability of defect, severity of defect, fault

Predict control element state changes, event changes

Markov model for safety analysis

Module detects wear, changes of controlled device, statistical evaluation

Debounce, correct periodicity of command

Detect correct command wave form

Detect valid sequence of commands

Detect if driver, actuation circuit is correct

Detect if actuators are correct, react

Remote and local monitoring, local result to remote, remote takes action

Analyze, trace fault signals according to tree, table

Expert system, guidance operator, locate fault and indicate how to repair

After correct repair, update fault tree

Simulate process graphically using feedback from real, to prevent or repair

Change colour of message after reading message

Display indication out of order, alarm indication

Warning display lights, lamps, leds on module

Display, show place of error, fault

Voice alarm

Show timely order of errors

Show number of error event

Camera monitors controlled machine

Scan and display states of all actuators if controller fails

On error, send error over lightdiode to external pc, display

Stop error message after a certain time

Display status of controller

Graphical display of process as function of detected alarm signals

Operator can select a graphical screen at his will as help diagnostic
Perform an initial display process to check displays
Display instructions, program statements together with monitored parameter values
Display centrally detected user, function changes of remote device
Correct fault so that microprocessor functions correctly, without reset
Execute first diagnostic, service program before normal control program
Inhibit control until control lever is first set to neutral position
Delay software reset until critical operations are finished
No transmission of errors to central during intervention of maintenance operator
Continue program if crashed microprocessor, program module is not crucial
Continue critical operation only if detector, operator input is satisfied
Reprogram inserted module, reread parameters to enable operation machine
If error detected, shut down
Inhibit, disable control if program module not inserted or wrong module addressed
Compare control states to allowed and forbidden combination of states
On fault, detect bit pattern to indicate kind of fault and stop program
Inhibit automatic control if in manual control
Alarm filtering, level and direct precursor, required action, blocking condition
Identification of program, if not assigned for machine, reject, stop
Watchdog, check at timed intervals
Program stopped if instruction not executed or if output module is missing
Disable, inhibit control signal in I-O interface if alarm status set
Command and intermediate error feedback used to verify correct execution
means for safety such as resettable fuse, PPTC
Noise rejection, shielding board, bus, lines
Over voltage protection
Ground each module and total system
Use of high voltage 28-Volt logic level
Use of infra red for optical limit switch against daylight
Monitor load state of battery
Non volatile memory to store program on power loss
Battery backup
Recovery from power loss, failure
Capacitor backup
Program has a protected, independent part and a free programmable part
Inhibit control if device does not answer a start signal within time interval
Load new program, overwrite old program only if machine is halted
Test for collision of actuated devices, articles, if interference inhibit entry
Configure actuators to be switched off in case of emergency stop
Program entry, inhibit manual control if in automatic mode
Inhibit local control if in remote
Inhibit program entry if an essential sensor of apparatus is missing, broken
Inhibit programming if physical resources are missing, no gas for heating
Normal and emergency program are integrated
System controller can control independent from host
Password with time limited access to system, protect protocol
Load, enter program if device acknowledges received password, security signal
Inhibit program entry, keyboard by entering sequence of certain keys
Block, inhibit certain inputs by entering certain keycode
Access only for service, hide, forbidden tamperfree keys, program
Several levels of security, passwords
Use of key, in key is stored access level
Biometric sensor, fingerprint as user access password
Authentication tag in configuration file
Parts of program accessible only during execution, no access with programming tool
Use codes to activate features of controller
Perm from several operators to allow access
Encryption, password, user access privileges
Identify connected programmer to allow control, program entry
Identification of last person who changed program
Supervisor code to change passwords
Use of second password, different from first
One sensor, two I-O channels each for different processor
One channel is used for communication while other is tested, in redundant I-O
Redundant communication channel, if one fails use the other
Central controller may override redundant controller
State machine arbitrates which redundant controller is active
Controlled device decides which redundant controller will be active
Redundant storage of control parameters
Fail silent nodes, replicated nodes grouped into fault tolerant units
Redundancy
If error, spare unit takes over, message to master, confirm new configuration
Redundant I-O, software comparison of both channels
After repair, update redundant system during non critical periods
Redundant processors are synchronised
Redundant processors run identical programs
Redundant processors run different programs
Pc structure of the system

Instrumentation bus
Gpib-488, ieee-488, hp bus, parallel
Fieldbus general name of bus connected to
machines, detectors, actuators
G05B

2219/24189 . . . Redundant processors monitor same point, common parameters
2219/24191 . . . Redundant processors are different in structure
2219/24192 . . . Configurable redundancy
2219/24193 . . . Two transducers for same parameter
2219/24194 . . . One channel monitors correct programmode execution, other correct process state
2219/24195 . . . Compare data in channels at timed intervals, for equality
2219/24196 . . . Plausibility check in channels for correct sequence or result
2219/24197 . . . Dual analog output ports, second takes over if first fails
2219/24198 . . . Restart, reinitialize, boot system after fault detection, hanging up, stalling
2219/24199 . . . Recover from fault, malfunction, go to safe state, correct and set new sequence
2219/24201 . . . Inhibit restart program if start switch fails in normal run mode
2219/24202 . . . After failure and stop of program, special switch to restart
2219/24203 . . . Restart, recover from error only if detected states equal stored states
2219/24204 . . . Select restore procedure corresponding to matched abnormal condition, table
2219/24205 . . . Slow down processor activity if temperature rises above limit
2219/24206 . . . Identification by portable memory in a key
2219/24207 . . . If processor overloaded, reduce messages sent by other systems to it
2219/24208 . . . Go into safety mode if communications are interrupted
2219/24209 . . . Create film in case of error
2219/24211 . . . Override normal program, execute urgency program so machine operates safe
2219/24212 . . . Set off alarm state manually, acknowledge to restart normal control
2219/24213 . . . No shut down if after emergency detection, all control parameters are safe
2219/24214 . . . Detect if analog output signal is within range
2219/24215 . . . Scada supervisory control and data acquisition
2219/24216 . . . Supervision of system
2219/25 . . . Pc structure of the system
2219/25001 . . . CEBUS consumers electronics bus
2219/25002 . . . Interbus-S, output serial out, input serial in, as one shift register
2219/25003 . . . M3S bus with six lines, two power, two canbus, one to initialize, one as dead man switch
2219/25004 . . . Power and data bus
2219/25005 . . . Fluid bus for communication in process system with several fluidic control modules
2219/25006 . . . Interface connected to fieldbus
2219/25007 . . . UMS bus
2219/25008 . . . Different buses, protocols on same line, also dsl
2219/25009 . . . Profinet-I-O, producer-consumer mode
2219/25011 . . . Domotique, I-O bus, home automation, building automation
2219/25012 . . . Two different bus systems
2219/25013 . . . G64-bus
2219/25014 . . . Fieldbus general name of bus connected to machines, detectors, actuators
2219/25015 . . . Gpib-488, ieee-488, hp bus, parallel instrumentation bus
2219/25016 . . . Eiba bus, european installation bus association, ib installation bus
2219/25017 . . . ASI actuator sensor interface, bus, network
2219/25018 . . . Only actuator bus, network
2219/25019 . . . Parallel processors coupled to bus by configurable interface card
2219/25021 . . . Profibus
2219/25022 . . . LAN local area network for controllers
2219/25023 . . . Sercos serial real time communications system between servo and cpu
2219/25024 . . . Bitbus from intel
2219/25025 . . . Only sensor bus
2219/25026 . . . Lon local operating network, uses neutron chip with three microprocessors
2219/25027 . . . GSC general serial channel
2219/25028 . . . Power, data and clock bus
2219/25029 . . . Additional logic to mirror certain signals, permits node to adapt to bitrate
2219/25031 . . . TTCAN bus, time triggered can bus
2219/25032 . . . CAN, canbus, controller area network bus
2219/25033 . . . structure, control, synchronization, data, alarm, connect I-O line to interface
2219/25034 . . . Connect module to data, monitor, control lines, extra I-O and power to connector
2219/25035 . . . Star network
2219/25036 . . . Two clocks, high frequency for normal and low frequency for battery low, sleep
2219/25037 . . . Clock line and data line loop in a contrary sense, for data stability, settling
2219/25038 . . . During negative cycle of power supply, processor is set to active, else inactive
2219/25039 . . . Clock
2219/25041 . . . Select between several clock signals
2219/25042 . . . Clock derived from power supply
2219/25043 . . . Superposition time and other pulses
2219/25044 . . . Radio controlled clock
2219/25045 . . . Electronic cam, encoder for sequence control as function of position, programmable switch pls
2219/25046 . . . Real time clock to sample I-O states and store them in memory
2219/25047 . . . Common clock for redundant processors
2219/25048 . . . Master clock and several frequency dividers, for motion and sequence control
2219/25049 . . . Master processor gives timing information to slaves
2219/25051 . . . For serial communication a separate clock and data line
2219/25052 . . . VCO voltage controlled oscillator
2219/25053 . . . Frequency pulses as function of speed
2219/25054 . . . Calibration timer, compare 1st, number of pulses during calibration with second counter
2219/25055 . . . During calibration adapt vco, counter to deliver wanted frequency, pulses
2219/25056 . . . Automatic configuration of monitoring, control system as function of operator input, events
2219/25057 . . . Configuration stored in distributed database for real time use
2219/25058 . . . Job setup, use also library to select job setup
2219/25059 . . . Iterative configuration of identical modules, only config first one, copy to other
2219/25061 . . . Configuration stored in central database
2219/25062 . . . Detect physical location of field device
2219/25063 . . . Force node into an inactive state when required
Update component configuration to optimize program execution
Configure attributes of parameters
Configuration stored in each unit
Graphic configuration control system
Check correct configuration of device
Pseudo redundancy, eliminate failing element and reconfigure system
Synoptique display of system configuration, layout, evolution
Initialise each module during start up
Configuration of keys and related display, shown on keys
Check system, change failing element, compare with stored configuration
Select interconnection of a combination of processor links to form network
Configure connected module only if allowed, registered module
Each module can be programmed for number of input and output
Store in ram a second program adapted to local conditions
Function module makes bus termination, creates local bus on ok from central
Clone, copy configuration from first device, in teach mode, to second identical device
Display name of configuration, to recognise how device has been set, programmed
For each subsystem a configuration
Select configuration as function of operator
Several function expansion units for master, main unit, universal system
Assign functions to group of complete or partial cells, modules
Selector switch to set function of each module
Define scale value of analog signal, min and max value
Define state of digital signal, open, closed, maintained, momentary
Of alternative and parallel parts of program into synchronised tasks
Customized control features, configuration
During start, integration into machine, send module functionality to scheduler
At start, I-O modules receive functionality and check with its own functionality
Detect kind of display to configure display routine
Detect addresses of connected I-O, modules
Detect control panel connected, select corresponding program and parameters
Detect connected sensors, set parameters, gain automatically
Detect configuration I-O and select needed program
Detect connected module, load corresponding parameters, variables into module
Detect connected actuator, by code, select compensation non linearity
Detect during start, number of modules, groups, sub groups
Detect transfer of control module, use mean default values instead of normal
2219/25149 . . . Receiver detects communication error and requests emitter to retransmit data
2219/25151 . . . Check appropriate protocol voltage levels
2219/25152 . . . Parity detection
2219/25153 . . . Checking communication
2219/25154 . . . Detect error, repeat transmission on error, retransmit
2219/25155 . . . Encoded transmission against noise
2219/25156 . . . Full echo communication check, echo back
2219/25157 . . . Checksum CRC
2219/25158 . . . Watchdog
2219/25159 . . . Respond to signal if initialisation and address are received within set interval
2219/25161 . . . Only receiving station, read several times message, select correct one or reject
2219/25162 . . . Contention, if several transmitters avoid collision, by separate transmitter code
2219/25163 . . . Transmit twice, redundant, same data on different channels, check each channel
2219/25164 . . . Loopback
2219/25165 . . . Token ring network
2219/25166 . . . USB, firewire, iee-1394
2219/25167 . . . Receive commands through mobile telephone
2219/25168 . . . Domotique, access through internet protocols
2219/25169 . . . Half duplex, repeater
2219/25171 . . . Serial, RS232
2219/25172 . . . Duplex
2219/25173 . . . SCSI
2219/25174 . . . Ethernet
2219/25175 . . . Modem, codec coder decoder
2219/25176 . . . RS485, differential data signals, xor
2219/25177 . . . Using fm frequency modulation, fsk, biphase code
2219/25178 . . . Serial communication, data, also repeater
2219/25179 . . . Parallel
2219/25181 . . . Repeater
2219/25182 . . . Serial between host and modules, nodes, parallel in node to microcontroller
2219/25183 . . . Serial AND-OR parallel interface in one circuit
2219/25184 . . . Number of modules interfaces optimized in relation to applications with which to link
2219/25185 . . . Single serial line, virtual second line is earth
2219/25186 . . . Bluetooth
2219/25187 . . . Transmission of signals, medium, ultrasonic, radio
2219/25188 . . . Superposition high frequency data signal on power lines, current carrier
2219/25189 . . . Current mode sensor I-O, current loop, 40-mA loop instead of voltage
2219/25191 . . . Current loop
2219/25192 . . . Infrared
2219/25193 . . . Coaxial cable
2219/25194 . . . Twin core, twisted cable
2219/25195 . . . Multiwire cable, parallel
2219/25196 . . . Radio link, transponder
2219/25197 . . . Optical, glass fiber
2219/25198 . . . Brouter: transfers data from wireless to wired networks, router: wired to wired
2219/25199 . . . Router brouter broadcast configuration data periodically to update control units
2219/25201 . . . Program communication between remote I-O and controller via remote connection program object

2219/25202 . . . Internet, tcp-ip, web server: see under
2219/25203 . . . Keep correct order of messages sent, of messages sequence
2219/25204 . . . Translate between different communication protocols
2219/25205 . . . Encrypt communication
2219/25206 . . . Protocol: only devices with changed states communicate their states, event
2219/25207 . . . Only devices with changed states can receive control signals for actuator
2219/25208 . . . Control message, address and command portion
2219/25209 . . . Device status answer, response, acknowledge
2219/25211 . . . Broadcast mode, length message, command, address of originator and destination
2219/25212 . . . Master address node, node answers ready, master sends command, node executes it
2219/25213 . . . Synchronisation, address and data
2219/25214 . . . Wait, delay after message
2219/25215 . . . Time triggered protocol for fault tolerant real time application
2219/25216 . . . Packet switching
2219/25217 . . . Configure communication protocol, select between several
2219/25218 . . . Broadcast mode, originator, destination address, command, check data
2219/25219 . . . Probe packet to determine best route for messages
2219/25221 . . . Identification of messages and their relative priority
2219/25222 . . . Mailbox, email, mail system
2219/25223 . . . Slave has registers to indicate master, acknowledge, transfer address, read write
2219/25224 . . . Fieldbus messages services fms
2219/25225 . . . Peripheral messages services pms, for sensor actuator
2219/25226 . . . Combine CSMA-CD and TDM time multiplexed for rapid status exchange
2219/25227 . . . Polling time is variable for each node, as function of time needed for each node
2219/25228 . . . Scheduling communication on bus
2219/25229 . . . Partition control software among distributed controllers
2219/25231 . . . Command, task has deadline, time limit to be executed
2219/25232 . . . DCS, distributed control system, decentralised control unit
2219/25233 . . . Avoid communication delay by sending command and event, if event present, execute command
2219/25234 . . . Direct communication between two modules instead of normal network
2219/25235 . . . Associate a sequence function to each control element, event signature
2219/25236 . . . Detail, detect presence of operator to wake up system
2219/25237 . . . Drive record carrier
2219/25238 . . . Personalize message
2219/25239 . . . Relay assisted triac, in series for safety
2219/25241 . . . Serial bus controller
2219/25242 . . . Relay
2219/25243 . . . Digital filter
2219/25244 . . . State matrix connected to controller
2219/25245 . . . Keyboard encoder chip used as sequence controller
2219/25246 . . . Habituation, rehabilitation and recovery chip, responds only to critical information
2219/25247 . . . Program drum and reverse drum driven by timer motor
2219/25248 . . . Microcontroller as time switch
2219/25249 . . . Counter, timer plus microprocessor for real time, jitter
2219/25251 . . . Real time clock
2219/25252 . . . Microprocessor
2219/25253 . . . Transputer
2219/25254 . . . DSP digital signal processor
2219/25255 . . . Neural network
2219/25256 . . . Module is timer with variable time delay
2219/25257 . . . Microcontroller
2219/25258 . . . ASIC
2219/25259 . . . Bus arbiiter
2219/25261 . . . Hand calculator as time switch
2219/25262 . . . Oscillator to multiply pulses to counter
2219/25263 . . . Solid state simulating relay logic
2219/25264 . . . Synchronizer for pulses
2219/25265 . . . Flash memory
2219/25266 . . . Microcontroller combined with plc
2219/25267 . . . Shift register
2219/25268 . . . PLD programmable logic device
2219/25269 . . . Lifo
2219/25271 . . . Neuron controller, for lan
2219/25272 . . . Hall sensor, switch
2219/25275 . . . Fuzzy logic combined with delay element
2219/25274 . . . Communication processor, link interface
2219/25275 . . . Analog switch
2219/25276 . . . Fifo
2219/25277 . . . Tristate
2219/25278 . . . Timer plus microprocessor
2219/25279 . . . Switch on power, awake device from standby if detects action on device
2219/25281 . . . Detect usage of machine, adapt sleep mode timer
2219/25282 . . . Alternative energy for fieldbus devices
2219/25283 . . . Evaluate available energy prior to wireless transmitter-receiver activation
2219/25284 . . . Standby only for memory, prom
2219/25285 . . . Standby only for real time clock
2219/25286 . . . Switch on power, awake controlled machine from standby if command signal
2219/25287 . . . Power for display leds I-O only when case is open
2219/25288 . . . Detector to standby state if signal below certain level
2219/25289 . . . Energy saving, brown out, standby, sleep, powerdown modus for microcomputer
2219/25291 . . . Set module, component to sleep if no event or no other module needs it
2219/25292 . . . Standby for display, switch on if operator wants to use it
2219/25293 . . . Identify control parameters for several workpieces, control, both in parallel
2219/25294 . . . Part, workpiece, code, tool identification
2219/25295 . . . Identification has information on relationship with other controllers
2219/25296 . . . Identification module, type connected I-O, device
2219/25297 . . . Identify controlled element, valve, and read characteristics
2219/25298 . . . System identification
2219/25299 . . . Address memory with variable frequency
2219/25301 . . . Expansion of system, memory
2219/25302 . . . Program and data in separate memory
2219/25303 . . . Decode processor status bits to switch, select between memories
2219/25304 . . . Memory subdivided in separate blocks, high, low addressable with same address
2219/25305 . . . MMA, memory management, set ram and eprom part for flash memory, store state also
2219/25306 . . . Modules with hardwired logic
2219/25307 . . . Each module has file with all components in module and the available components
2219/25308 . . . Ecu, standard processor connects to asic connected to specific application
2219/25309 . . . Module in ring for power supply and ring for command signals
2219/25311 . . . Each module near controlled machine
2219/25312 . . . Pneumatic, hydraulic modules, controlled valves
2219/25313 . . . Clamp module on controlled system by magnet
2219/25314 . . . Modular structure, modules
2219/25315 . . . Module, sequence from module to module, structure
2219/25316 . . . Control unit and actuator in one unit, module
2219/25317 . . . Control unit, sensor and actuator in one unit, module
2219/25318 . . . Power supply module in common for all modules
2219/25319 . . . Standard connector between modules
2219/25321 . . . Connection modules by flexible printed circuit, printed cable, multiway, ribbon
2219/25322 . . . Stackthrough modules, modules are stacked, no need for backplane
2219/25323 . . . Intelligent modules
2219/25324 . . . Modules connected to serial bus
2219/25325 . . . Each connected module has own power supply
2219/25326 . . . Module with low maintenance connected to removable module with high maintenance
2219/25327 . . . Single channel module
2219/25328 . . . Module connected to parallel bus
2219/25329 . . . Each module, segment has only either a sensor or an actuator
2219/25331 . . . Module connected to canbus and to controlled device
2219/25332 . . . Module capability concerns allowable I-O and required sequence of operations
2219/25333 . . . Modules on bus and direct connection between them for additional logic functions
2219/25334 . . . Each module contains several channels, each with an input and an output
2219/25335 . . . Each module has connections to actuator, sensor and to a fieldbus for expansion
2219/25336 . . . Cascaded modules, one module connects to other, I-O, computing expansion
2219/25337 . . . She single board computer, stand alone
2219/25338 . . . Microprocessor
2219/25339 . . . Supervisory plus control computer
2219/25341 . . . Single chip programmable controller
2219/25342 . . . Real time controller
2219/25343 . . . Real time multitasking
2219/25344 . . . In one cycle, application task is executed, if time is left, communication or user interface task is executed
2219/25345 . . . Linux, preemption, low-latency patches for real time linux
2219/25346 . . . Several operating systems in one device
2219/25347 . . . Multitasking machine control
2219/25348 . . . Windows expansion for real time control under windows
2219/25349 . . . Operating system, Microsoft Windows
2219/25351 . . . MSDOS
2219/25352 . . . Preemptive for critical tasks combined with non preemptive, selected by attribute
2219/25353 . . . Inductive coupling of power, transformer
2219/25354 . . . Power or secondary control signal derived from received signal
2219/25355 . . . Motor winding used as power transformer
2219/25356 . . . Inductive coupling of power and signal
2219/25357 . . . Regulation of energy coupling
2219/25358 . . . During detection of input, switch over to dc power
2219/25359 . . . Special power supply
2219/25361 . . . DC-DC convertor on board
2219/25362 . . . UPS, no break
2219/25363 . . . Dual power supply, for digital circuit and for analog signals
2219/25364 . . . For each module a powersupply
2219/25365 . . . Initialize parameters
2219/25366 . . . Detect code, kind connected machine, device before execution of program
2219/25367 . . . Control of periodic, synchronous and asynchronous, event driven tasks together
2219/25368 . . . Start group of motors, machines in sequence, power up, down sequence
2219/25369 . . . Control of states, real time
2219/25371 . . . Recharge appratus with material, only when needed or during specific time
2219/25372 . . . Sequence command, next step if reference equals ramp signal level
2219/25373 . . . Detection position of program drum
2219/25374 . . . Home selection
2219/25375 . . . If error, execute subroutine for alternative command, no shut down
2219/25376 . . . Repeat part of program, kind of subroutine
2219/25377 . . . New sequence as function of deviation from predicted result, state
2219/25378 . . . Stop machine after execution of some instructions on tape, marked by code
2219/25379 . . . Operation on rotating table provided with a plurality of cases
2219/25381 . . . Restart program at predetermined position, crash recovery after power loss
2219/25382 . . . Skip sequences
2219/25383 . . . Jump
2219/25384 . . . Analog I-O to microprocessor to set switch moment for next step
2219/25385 . . . Control speed of conveyor as function of missing objects, to speed up
2219/25386 . . . Program execution as function of direction, forward or backward
2219/25387 . . . Control sequences so as to optimize energy use by controlled machine
2219/25388 . . . Race conditions
2219/25389 . . . Macro's, subroutines
2219/25391 . . . Start, stop sequence of different parts of machine, copier, textile, glass
2219/25392 . . . Convert control signal to deliver pulse modified in time and width
2219/25393 . . . Speed, delay, stand still of record carrier controlled, more commands possible
2219/25394 . . . Execute next step on feedback of result of previous step
2219/25395 . . . Clock dependant, select next cyclus, step as function of parameter
2219/25396 . . . Add pulses or stop pulses as function of changing clock, speed to compensate
2219/25397 . . . Compare real date with programmed date, if equal execute next command
2219/25398 . . . Sampling period is a product of integer number and scheduler interrupt period
2219/25399 . . . Variable, settable clock or cycle, phase duration
2219/25401 . . . Compensation of control signals as function of changing supply voltage
2219/25402 . . . Detect occurrence of signal by higher sampling when parameter value within range
2219/25403 . . . Compare real clock time with programmed time, if equal execute next command
2219/25404 . . . Command order is delayed as function of expected and real delay
2219/25405 . . . Command order is delayed, corrected as function of speed
2219/25406 . . . Delay as function of detected characteristics of controlled element
2219/25407 . . . Delay between operations
2219/25408 . . . Given order is latched for a certain delay in order to execute order surely
2219/25409 . . . Feedforward of control signal to compensate for delay in execution
2219/25411 . . . Priority interrupt
2219/25412 . . . Separate interrupt for, from each interface
2219/25413 . . . Interrupt, event, state change triggered
2219/25414 . . . Interrupt without saving register states
2219/25415 . . . Between processors using a single line and a switch
2219/25416 . . . Interrupt
2219/25417 . . . Identify capabilities necessary to produce article
2219/25418 . . . Enter description of capabilities of each module
2219/25419 . . . Scheduling
2219/25421 . . . Using resource data relative to each component, module of control system
2219/25422 . . . Aperiodic scheduling, executed only on certain condition
2219/25423 . . . Verification of controlled value by comparing with recorded value, signature
2219/25424 . . . Mixture of wall connectors, some with fixed address others no address
2219/25425 . . . Personal computer
2219/25426 . . . Microcontroller in smart card directly controls machine, runs control program
2219/25427 . . . Controller inside socket, wall connector, distributor, junction box
Field device

Microprocessor mounted near controlled machine, cheaper line connection

Dual Port memory

Multiplex

Dataflow processor

Microprocessor and control logic integrated on same circuit board

Multiplex for analog signals

Main board connected to bundle of analog input lines

Main board coupled to bundle of digital and analog input lines

Counter controls device, machine directly or via decoder

Use of flexible printed circuit

Piggy back mounting

Europa card

Connect pc card to industrial bus, additional timing and adapting logic

Stick label over opening for card, to seal opening and indicate program status

Electric wiring inside pneumatic, hydraulic path

Serial port has power connected to pin for external device

Detachable program unit can be replaced by supplementary display

Control module is pluggable into wall connector

Constructive details

Connect module to bus using interface with adaptive logic

Bootstrap logic and ram integrated in serial connector

Encoder, control knob connected to same microprocessor pins as keyboard matrix

Retrofitting

Buscouple interface can be integrated in actuator

Piggy back controller, old controller functions as before, new functions by new

Replace old processor by more powerful processor on additional card

Opto isolation, optical separation

Reed relay separation

Transformer separation

Galvanic separation, galvanic isolation

Optical separation for signals, transformer separation for power

MBO motherboard, backplane special layout

Output of one module connected to input next module by lines on motherboard

Motherboard has data, address, power and module identification lines

Detect if expansion board is connected

Deconnect automatically high voltage supply when taking out a module

Inserting or taking out circuit boards during power on

Replace existing control system with new different system in real time

Synchronize controllers, sensors, measurement with data bus

Compensation variable cycle time, synchronized processes

Synchronize microprocessor with process or I-O

Sequence synchronized with machine axis, like knitting machine

Synchronous state change by clock as function of allowed states to skip certain states

Master waits for signal from slave, slave active thereafter, during limited time

Synchronize several controllers using syncline

Synchronize controllers using messages, add transmission time afterwards

Broadcast to each controller an address of part of program to be used

Synchronize several sequential processes, adjust

Synchronize several controllers using messages over data bus

Synchronize microprocessor and connected, controlled state machine

Pc applications

Dispense machine glue, paste, flow

Water processing

Steering car

Test of external equipment

Wastewater treatment

Infusion controller

Tape transport, take up, rewind, play

Infusion controller

Hospital bed

Process control

Microprocessor driven caliper, to measure length distances

Data acquisition interface

Household appliance in general

HVAC, heating, ventilation, climate control

Audio, video, tv, consumer electronics device

Earth moving, work machine

Eye, ophthalmic, surgery system

Lubrication, greasing

Wind turbines

Conveyor, transfer line

Press

Combustion motor

Injection molding

Sprinkler, irrigation, watering

Sewing

Grinding machine

Door, window

Assembly line

Blasting, explosion

Hemodialysis

Washing, laundry

Loom, weaving

Glass forming

Reproduction, image copying machine

Vehicle, car, auto, wheelchair

Air conditioning

Energy management, use maximum of cheap power, keep peak load low
Selection of inspection devices
Determination of assembly tooling, fixture
assembly sequences
Selection of assembly processes, preferred
Interpretation of assembly design data
Planning, layout of assembly system
Planning, generate assembly plans
Find feasible assembly sequences
Hybrid system, combine expert system with
traveling salesman problem TSP

Machine balancing, distribute articles evenly
over machines
Enter pallet configuration, geometry, number of
parts
Bin, storage identifier and workstation
identifier
Assembly of modular products, variant
configurability
Show bin, compartment and number of parts to
be pick up
Aid for assembly, show display on screen next
workpiece, task, position to be assembled, executed
Display image of finished workpiece on screen,
show how, where to mount next part
Project on workpiece, image of finished
workpiece, info or a spot
Minimize assembly time, by grouping part
types into pallet groups

Interpretation of assembly design data
Systematic knowledge to assembly
planning, assembly sequences
Assembly of modular products, variant
configurability
Show bin, compartment and number of parts to
be pick up
Aid for assembly, show display on screen next
workpiece, task, position to be assembled, executed
Display image of finished workpiece on screen,
show how, where to mount next part
Project on workpiece, image of finished
workpiece, info or a spot
Minimize assembly time, by grouping part
types into pallet groups

several subsystems, special orders can be inserted. Display travels with workpiece, package, order, floppy disk. Data carrier, communication by exchange of read write intelligent chip on workpiece, devices, processors. Data exchange between modules, cells, with workcell, workpiece data at each station. Communication of carriage, agv data, client. Application scripts; in web server, not sent to part of module exchanges high level messages, machines, with states for map producers and consumers model. NDDS network data delivery service, to start communication. Detect position robot, agv relative to machine working together or independent. Two workstations and two manipulators, conveyors, robots. Detect position robot, agv relative to machine to start communication. NDDS network data delivery service, producers and consumers model. In server store virtual nodes for controlled machines, with states for map. Part of module exchanges high level messages, other part proprietary messages. Application scripts; in web server, not sent to client. Communication of carriage, agv data, workpiece data at each station. Transmission device between workcell and central control. Network communication between supervisor and cell, machine group. Direct communication between cooperating parts of a cell, not over server. One client handled by several servers. Network server for communication between plc's, using server. Communication between sensors, actuators and gateway. Data exchange between modules, cells, devices, processors, pallets. Read write intelligent chip on workpiece, pallet, tool for data exchange. Data carrier, communication by exchange of floppy disk. Display travels with workpiece, package, order, special orders can be inserted. Configuration editor for networking interconnection. Configuration of transfer control between several subsystems.

Configuration file with format of relevant messages for different equipment. Program network controller, connected devices. Configure parameters of controlled devices. Remote configuration parameters of controlled devices. Remote control of network controller. Auto configuration, each module responsible for own configuration. Start up of object manager module. Can controller in full can, detects if message is for controller. Can controller in basic can, microcontroller detects if message is for controller. Can controller and microcontroller integrated. Interface, SIOMS standard I-O for mechatronic systems, device drivers. General, vendor independent display and control interface for sensor actuator. Sensor on off switch level can be set and displayed by detachable module. Network controller. A-D interface between asi and fieldbus. Each node has several, three channels, for control, for data, for addressing. Universal interface between asi and fieldbus, for any fielddevice. Fielddevice comprises also controller and pneumatic actuator and sensor. Fielddevice, field controller, interface connected to fieldbus. Bridge between networks. Multi mode network controller, monitor, control, configuration, maintenance. Interface between communication network and process control, store, exchange data. Signal, sensor adapted interfaces build into fielddevice. Transmitter coupled to fieldbus and to sensor, a-d conversion. Repeater between two networks. No repeater, split into several analog segments and common digital, can, expansion. Universal interface for different fieldbus protocols. Field device with gateway functions for communication with pc and other field devices. FDT interfacing profibus field device drivers DTM with engineering tool. Contactless connector, identify module wirelessly, short distance like less than twenty cm. PCD profinet component description, field device description module. Fieldbus. Name of bus, canbus, controller area network. Sercos serial real time communications system between servo and cpu. Profibus process fieldbus. Lon local operating network, using neuron chip. Devicenet, can based net. Sds smart distributed system, can based.
for rapid status exchange
Combine csma-cd and tdm time multiplexed
Csma-cd csma-cd-w carrier sense multiple access collision detection wireless
Combine csma-cd and tdm time multiplexed for rapid status exchange
Time multiplex
2219/31231 . . . Lan and stations and fieldbus, each station controls own I-O
2219/31232 . . . Lan and station, each station has plc controlling own I-O over bus
2219/31233 . . . Map network and server in node and server controlled ethernet with machine nodes
2219/31234 . . . Host, router and backplane bus, communication with host or backplane
2219/31235 . . . St network, each module of first controls second similar network etc., tree
2219/31236 . . . Plc exclusive network connected to map
2219/31237 . . . Host and rs232, rs485 to network controller and rs232 to controlled devices
2219/31238 . . . First network connected by repeater to second, second connected by repeater to third
2219/31239 . . . Cache for server to fast support client
2219/31241 . . . Remote control by a proxy or echo server, internet - intranet
2219/31242 . . . Device priority levels on same bus, net, devices processes data of exactly lower priority device
2219/31243 . . . Add serial number to message from station to check missing messages in host
2219/31244 . . . Safety, reconnect network automatically if broken
2219/31245 . . . Redundant bus, interbus, with two masters
2219/31246 . . . Firewall
2219/31247 . . . Reconnect network if connection was broken
2219/31248 . . . Multiple data link layer masters, if one fails, other takes over
2219/31249 . . . Display name of communication line and number of errors detected and corrected
2219/31251 . . . Redundant access, wireless and hardware access to fielddevices
2219/31252 . . . Watchdog, client sends regular message to server, server must answer
2219/31253 . . . Redundant object manager
2219/31254 . . . Request from client waits until corresponding server functions again
2219/31255 . . . Verify communication parameters, if wrong, refuse communication
2219/31256 . . . Object managers arranged in logical ring for monitoring purposes
2219/31257 . . . Redundant wireless links
2219/31258 . . . Compensate control in case of missing message
2219/31259 . . . Communication inhibited during certain process steps
2219/31261 . . . Coordination control
2219/31262 . . . Deca dynamic coordinated concurrent activities
2219/31263 . . . Imbedded learning for planner, executor, monitor, controller and evaluator
2219/31264 . . . Control, autonomous self learn knowledge, rearrange task, reallocate resources
2219/31265 . . . Control process by combining history and real time data
2219/31266 . . . Convey, transport tool to workcenter, central tool storage
2219/31267 . . . Central tool storage, convey a whole tool drum, magazine to workcenter
2219/31268 . . . Central workpiece storage, convey workpiece, work pallet, holder to workcell
2219/31269 . . . Convey tool and workpiece to workcenter
2219/31271 . . . Priority workpiece pallet selected instead of routine workpiece pallet
2219/31272 . . . Avoid piling up, queue of workpieces, accommodate surges
2219/31273 . . . Buffer conveyor along main conveyor
2219/31274 . . . Convey products, move equipment according to production plan in memory
2219/31275 . . . Vehicle to convey workpieces is manually operable
2219/31276 . . . Transport a lot to stations, each with different types of manufacturing equipment
2219/31277 . . . Dispatching rules, shortest travel time or bidding based to reduce empty travel
2219/31278 . . . Store optimum number of workpiece, between max min, in bins, compartment, save travel time
2219/31279 . . . Prevent introduction of two pallets in same cell
2219/31281 . . . Calculate optimum path for conveying workpieces
2219/31282 . . . Data acquisition, BDE MDE
2219/31283 . . . Communication memory, storage, ram, eprom on workpiece or pallet
2219/31284 . . . Set begin and end of collection time for concerned machines, parameters
2219/31285 . . . Send required data to computer as function of specified condition
2219/31286 . . . Detect position of articles and equipment by receivers, identify objects by code
2219/31287 . . . Indicate output for data, screen or printer or database
2219/31288 . . . Archive collected data into history file
2219/31289 . . . Read card with operator and another card with process, product, work order info
2219/31291 . . . Store value detected signal and machine name and name of part of machine, mask
2219/31292 . . . Data in categories, each with a priority factor
2219/31293 . . . Enter size measurements, store in data base, analyze and identify in size data group
2219/31294 . . . Compare measurements from sensors to detect defective sensors
2219/31295 . . . Use integrated controller, processor during product, car assembly for ide, display, test
2219/31296 . . . Identification, pallet object data and program code for station
2219/31297 . . . Read only that ide information which is needed for specific operation
2219/31298 . . . Store on actual pallets also id of several other upstream, following pallets
2219/31299 . . . If workpiece rejected, write in id and erase operation code
2219/31301 . . . Restore lost id by using entry number of preceding, following pallet
2219/31302 . . . Verify id data and reread, rewrite or alarm on fault
2219/31303 . . . If workpiece transferred to other pallet, transfer also id
2219/31304 . . . Identification of workpiece and data for control, inspection, safety, calibration
2219/31305 . . . Robot arm identifies object during movement
2219/31306 . . . Read identification only if object is present
2219/31307 . . . Identification structure is partly a copy of operating structure
2219/31308 . . . Capture image asynchronously with processing of analysis, identification
2219/31309 . . . Identification workpiece and time limit for processing of workpiece
Data are id, destination, number of pieces, alternative destination, process data
Identify pallet, bag, box code
Measure weight, dimension and contents of box, tray
Store in workpiece detected defects
Use of data by host, send work order to operator after pallet detection
Output test result report after testing, inspection
Outputs delivery ordersheet, relating to finished products, to packing cell
Data analysis, using different formats like table, chart
Use data groups as inventory control value, adapt inventory need to new data
Print, output finished product documentation, manual using id of all workpieces assembled, processed
Work still to be done on workpiece
Database for CIM
Distributed real time knowledge, database
Machine selection support, use of database
Database to manage communication networks
Directory service for database
Objects report their location to directory service
Distributed, among several servers, directory service
Select manufacturing information by entering product number
Back order management with back order, part maker delivery, production databases
Database to backup and restore factory controllers
Database with devices, configuration, of plant
Database of address of devices registers in different networks, mapping
Store machines performance; use it to control future machining
Failure information database
Design, flexible manufacturing cell design
From parameters, build processes, select control elements and their connection
Design of factory information system
Design of process control system
Design of factory, manufacturing system control
Element, file server
Map backbone bus
Network manager
Communication adaptors between network and each machine
Gateway
Server node as operator panel, with display for lon
Expert system to select best suited machining centre
Expert system integrates knowledges to control workshop
Expert system to design cellular manufacturing systems
Hybrid expert, knowledge based system combined with ann
Fault, if one station defect, stop it, other stations take over
Automatic fault detection and isolation
Observer based fault detection, use model
Markov model
Object oriented model for fault, quality control
Verify if right controllers are connected to carrier, conveyor controller
Verify correct configuration of system
Action, if one station defect, execute special program for other stations
If one station defect, return other stations to original programmed modes
Send message to most appropriate operator as function of kind of error
Operate faulty tool in degraded mode
MMS manufacturing message specification, rs511, iso9506
MAP manufacturing automation protocol
Translation, conversion of protocol between two layers, networks
VMD virtual manufacturing device for robot task control, cell
Mes manufacturing execution system
You virtual operative organisational unit, extension of vmd
FAL fieldbus application layer, application service elements ase and application relations ar
LAS link active scheduler, distribute bandwidth between processing nodes
MFL material flow
From stored machine groups and relation machine workpiece, send workpiece to idle
Queue control
Master monitors controllers, updates production progress, allocates resources
Matrix cluster, machines in cell according to parts, row is part, column is machines
Find shortest way, route
Compare ratio of running work with optimum, decrease number of idle machines
Produce construction sequence, make parts, store, assemble equipment, ship
Determine rate of MFL out of each process within each workstation
Determine size of batch of material for each process to meet mfl rate
If resources, material, pieces under tolerance level, renew them until upper level
Just in time JIT, kanban is box to control flow of workpiece
Pull type, client order decides manufacturing
Administration tasks and factory control tasks
Lims laboratory information and management Administration
Object oriented engineering data management
Field management, low level, instruments and controllers acting in real time
Process management, specification, process and production data, middle level
Business management, production, document, asset, regulatory management, high level
2219/31397 . . . Instrument information management, subset of process management
2219/31398 . . . Simultaneous, concurrent engineering
2219/31399 . . . Station corrects nc program, sends back modified program to program generator
2219/31401 . . . Keep notebook for keeping track of process, can be executed to make product
2219/31402 . . . Keep log book, for activities of a station, equipment
2219/31403 . . . EDI electronic data exchange
2219/31404 . . . Computer assisted complaint management, customer complaint
2219/31405 . . . EDM electronic data management
2219/31406 . . . Data management, shop management, memory management
2219/31407 . . . Machining, work, process finish time estimation, calculation
2219/31408 . . . Cost calculation of use of certain machine types
2219/31409 . . . Calculation approach time
2219/31411 . . . Down time, loss time estimation, calculation
2219/31412 . . . Calculate machining time, update as function of load, speed
2219/31413 . . . Estimate capacity of plant
2219/31414 . . . Calculate amount of production energy, waste and toxic release
2219/31415 . . . Cost calculation in real time for a product manufactured
2219/31416 . . . Calculate effect of different actuators on optimal path sequence
2219/31417 . . . Calculate capacity by back propagating capacity, constraint from last to first module
2219/31418 . . . NC program management, support, storage, distribution, version, update
2219/31419 . . . Select file from a list, directory
2219/31421 . . . File with parameters for station and identification of station
2219/31422 . . . Upload, download programs, parameters from, to station to, from server
2219/31423 . . . After cap, send resulting programs to different nc machines
2219/31424 . . . Print label of finished part, with info, history, attach to part, docket
2219/31425 . . . Plan availability of operator for cell as function of time and operation calendar
2219/31426 . . . Real time database management for production control
2219/31427 . . . Production, CAPM computer aided production management
2219/31428 . . . Production management for lot production and for individual components of lot
2219/31429 . . . Predict end of job execution, schedule new job beforehand
2219/31431 . . . Identify and classify excess raw material; reuse
2219/31432 . . . Keep track of conveyed workpiece, batch, tool, conditions of stations, cells
2219/31433 . . . Diagnostic unit per zone of manufacturing
2219/31434 . . . Zone supervisor, collects error signals from, and diagnoses different zone
2219/31435 . . . Paging support with display board, status monitoring and report compiling
2219/31436 . . . Host monitors plc, control processor without interrupting its program
2219/31437 . . . Monitoring, global and local alarms
2219/31438 . . . Priority, queue of alarms
2219/31439 . . . Alarms can be warning, alert or fault
2219/31441 . . . Simocode, overload protection, detection of trips, life time connected to fieldbus
2219/31442 . . . Detect if operation on object has been executed correctly in each station
2219/31443 . . . Keep track of nc program, recipe program
2219/31444 . . . Compare actual manufacturing sequence with simulated sequence, correct actual
2219/31445 . . . Detect changed working conditions, to correct machine load, balance
2219/31446 . . . Detect if workpiece, object present
2219/31447 . . . Process error event detection and continuous process image detection, storage
2219/31448 . . . Display at central computer, slave displays for each machine unit
2219/31449 . . . Monitor workflow, to optimize business, industrial processes
2219/31451 . . . Petrinet for monitoring process
2219/31452 . . . Send a warning message that an event has to be monitored before the event occurs
2219/31453 . . . Repeat sending warnings to operator until certain event is monitored
2219/31454 . . . Keep track of vehicles
2219/31455 . . . Monitor process status
2219/31456 . . . Product progress, taking into account products on vehicle
2219/31457 . . . Factory remote control, monitoring through internet
2219/31458 . . . Test workpiece during transport
2219/31459 . . . Library with metrology plan for different type of workpieces
2219/31461 . . . Use risk analysis to identify process parts that should be specially monitored
2219/31462 . . . Add time stamp to alarm message
2219/31463 . . . Status of whole system calculated from status of its components
2219/31464 . . . Select between different models corresponding to diff process control configurations
2219/31465 . . . Determine which variables of the system to be monitored
2219/31466 . . . Display position of different workpieces, tools in system
2219/31467 . . . Display of operating conditions of machines, workcells, selected programs
2219/31468 . . . Display jig, pallet number, status and clamp jig number
2219/31469 . . . Graphical display of process as function of detected alarm signals
2219/31471 . . . Operator can select a graphical screen at his will as help diagnostic
2219/31472 . . . Graphical display of process
2219/31473 . . . Fish eye view, sharp detailed view of main subject, rest much smaller, navigate
2219/31474 . . . Icon display for quick access of detailed information
2219/31475 . . . Zoom or pan display for flexible access to information
2219/31476 . . . Display of several transactions, sub-displays for other transactions
2219/31477 . . . Display correlated data so as to represent the degree of correlation
2219/31478 . . . Display all processes together or select only one
Operator select part of process he wants to see, video image is displayed.

Safety monitoring system, redundant display, print systems for process data.

Verify working state of printers, displays, switch over if defect.

Verify monitored data if valid or not by comparing with reference value.

Operator confirms data if verified data is correct, otherwise amends data.

Verify and update all related data in relational database.

Operator till task planning.

Computer assisted machining, signals guide operator to manual machine object.

Operator interface, manual control at cell, if host fails or priority.

Manual control at central control to control workcell, select pallet.

Graphical, textual instructions, sheet for operator to resume process.

Graphical, text operator instructions synchronous with product distribution.

Operator addresses machines to give commands or retrieve data.

Operator is assisted by expert system for advice and delegation of tasks.

Operator changes schedule, workload in allowed range by graphical interface.

Optimal task allocation between operator and machine.

Operator adapts manufacturing as function of sensed values.

Operator must signify his continued attendance at the workstation.

Operator marks processes, scheduler detects marks, releases control to operator.

Augmented reality assists operator in maintenance, repair, programming, assembly, use of head mounted display with 2-D 3-D display and voice feedback, voice and gesture command.

Optimize, process management, optimize production line.

Minimize setup time of machines.

Adapt real process as function of changing simulation model, changing for better results.

Adapt process as function of results of quality measuring until maximum quality.

Dynamic reconfiguration to maintain optimal design, fabrication, assembly.

Energy management, balance and limit power to tools.

Ordering, remote ordering, enter article and operations needed, create jobfile.

Print label, instructions for operator and job code for machining parameters.

Remote ordering, electronic selection article and fitting to form of client.

Automatic marking of article.

Order code follows article through all operations.

Order, plan, execute, confirm end order, if unfeasible execute exception operation.

Electronic catalog, to select material, resources, make lists with prices.

Enter also delivery location, transport means, kind of truck.

Use item and structure information.

Salesman creates order, system answers back with price, estimated date.

Send article design, needed material, packaging and shipping info to manufacturer.

Electronic market, network broker.

Compose, configure article and order.

Enter data, values for custom made articles.

Order picking.

Client can develop programs, parts on remote server located by manufacturer.

Send also testing program.

Combine orders from different customers.

Halting, initiating or resuming production of a product on order.

Program, information flow.

Shift workpiece and agv, carriage data in memory on advance to next station.

Each machine knows sequence of pallets, each pallet knows sequence of operations.

On detection workpiece code load program for workpiece from central.

Workcell end instruction selects next workpiece with related program.

Wait state between two successive machining steps.

Store program data, manufacturing history on workpiece, shifts to next.

Central control, modify program slave computers as function of production demand from host.

Lookup table, identify job to be executed by master or slave.

Adjust work parameter as function of other cell.

Send request for object carry out to other cell.

Identify workpiece, read status centrally, machine, adapt status centrally.

Balance load of workstations by grouping tasks.

Control cell as function of correlation between stored and detected machine state.

Execute program as function of deviation from predicted state, result.

Send code, data for workpiece to each workstation to be used, update data.

Central controls modules grouped according to function.

Set machines to new lot work, send them operation schedule, nc and handling data.

Adapt speed of tool as function of deviation from target rate of workpieces.

Production change over.

Synchronise set points of processes.

Central stores operation code in id and in concerned station.

Change combinations of operation codes in station, id for flexibility.

Execution at station only permitted if operation code of station and id equal.
Divide process into machining methods and normal operations

From order, production time divide into special operations

Calculate machining axis, best feasible data extraction from geometric models for known case

CAPP computer aided machining and process Batch programming using oop

Recipe programming for flexible batch control

Batch, recipe configuration for flexible batch programming, phase sequence, parameters

Text, menu driven editor for batch

Dedicated language for batch processing, enter search directions are forbidden and attempt to improve it

Algorithm, genetic algorithm, evolution strategy

Heuristic algorithm, accept feasible solution and attempt to improve it

Search, adaptive, after each iteration some search directions are forbidden

Dedicated language for batch processing, enter number of workpieces

Text, menu driven editor for batch programming, phase sequence, parameters

Batch, recipe configuration for flexible batch control

Recipe programming for flexible batch

Batch programming using oop

CAPP computer aided machining and process planning

CASE based process planning, using older, known case

Select machine type

Select size of tool

Data extraction from geometric models for process planning

Calculate machining axis, best feasible orientation for machining

Calculate machining volumes for turning operations

Operative process planning

From order, production time divide into special and normal operations

Divide process into machining methods
G05B

2219/32151 . . . Prepare teach data by selecting data from two tables as function of type of work
2219/32152 . . . Inhibit further editing of entered parameters
2219/32153 . . . Exchange data between user, cad, caq, nc, capp
2219/32154 . . . Object, attribute for geometry, technology, function oop
2219/32155 . . . Editor and library for objects
2219/32156 . . . Each defined object has corresponding set of geometrical macros
2219/32157 . . . Create a new object by combining existing objects
2219/32158 . . . Object groups, for object replication, naming, messaging and retrieving
2219/32159 . . . Each hardware unit together with its software forms one object
2219/32161 . . . Object oriented control, programming
2219/32162 . . . Tasks or control icons are linked to form a job
2219/32163 . . . Indicate synchronisation tags on icons of tasks
2219/32164 . . . Petrinet and procedural language combined
2219/32165 . . . Petrinet
2219/32166 . . . Convert petrinet to sequence program for cell and to control program for machine
2219/32167 . . . Convert petrinet to ladder diagram
2219/32168 . . . Generation and analysis of synthesis rules for petrinet
2219/32169 . . . Stochastic pn, spn
2219/32171 . . . Transform, convert operator goals and information into petri nets
2219/32172 . . . Control petri net together with modeling petri net, cascaded
2219/32173 . . . Table, memory table with identification code for all parts to be used
2219/32174 . . . Memory table parts classification and working, manufacturing conditions
2219/32175 . . . Table with correlation between part codes and part classification
2219/32176 . . . Correspondence between manufacturing part list and design part list
2219/32177 . . . Computer assisted quality surveyance, caq
2219/32178 . . . Normal and correction transferline, transfer workpiece if fault
2219/32179 . . . Quality control, monitor production tool with multiple sensors
2219/32181 . . . Monitor production, assembly apparatus with multiple sensors
2219/32182 . . . If state of tool, product deviates from standard, adjust system, feedback
2219/32183 . . . Test cell
2219/32184 . . . Compare time, quality, state of operators with threshold value
2219/32185 . . . Calculate entropy, disorder
2219/32186 . . . Teaching inspection data, pictures and criteria and apply them for inspection
2219/32187 . . . Correlation between controlling parameters for influence on quality parameters
2219/32188 . . . Teaching relation between controlling parameters and quality parameters
2219/32189 . . . Compare between original solid model and measured manufactured object
2219/32191 . . . Real time statistical process monitoring
2219/32192 . . . After inspection create correction table with position, correction data
2219/32193 . . . Ann, neural base quality management
2219/32194 . . . Quality prediction
2219/32195 . . . Feedforward quality control
2219/32196 . . . Store audit, history of inspection, control and workpiece data into database
2219/32197 . . . Inspection at different locations, stages of manufacturing
2219/32198 . . . Feedforward inspection data for calibration, manufacturing next stage
2219/32199 . . . If number of errors grow, augment sampling rate for testing
2219/32201 . . . Build statistical model of past normal process, compare with actual process
2219/32202 . . . Integration and cooperation between processes
2219/32203 . . . Effect of material constituents, components on product manufactured
2219/32204 . . . Performance assurance; assure certain level of non-defective products
2219/32205 . . . Use model error adapted to type of workpiece
2219/32206 . . . Selection from a lot of workpieces to be inspected
2219/32207 . . . Action upon failure value, send warning, caution message to terminal
2219/32208 . . . Rearrange production line
2219/32209 . . . Stop production line
2219/32211 . . . Outputs new workorders to operators
2219/32212 . . . If parameter out of tolerance reject product
2219/32213 . . . If parameter out of tolerance during limited time, accept product on condition
2219/32214 . . . Display on screen what fault and which tool and what order to repair fault
2219/32215 . . . If detected shape not correct, simulate new machine, tool and adapt path
2219/32216 . . . If machining not optimized, simulate new parameters and correct machining
2219/32217 . . . Finish defect surfaces on workpiece
2219/32218 . . . Sort workpieces as function of quality data
2219/32219 . . . Slow down production after failure
2219/32221 . . . Correlation between defect and measured parameters to find origin of defect
2219/32222 . . . Fault, defect detection of origin of fault, defect of product
2219/32223 . . . Fixture failure diagnosis, measure assembly, derive influence of fixture on error
2219/32224 . . . Identify parameters with highest probability of failure
2219/32225 . . . Randomize workpiece treatment order within lot to improve lot-to-lot comparisons
2219/32226 . . . Computer assisted repair, maintenance of system components
2219/32227 . . . On error detected by zone supervisor, maintenance of particular zone
2219/32228 . . . Repair, rework of manufactured article
2219/32229 . . . Repair fault product by replacing fault parts
2219/32231 . . . Inspection and correction, repair station in one unit, correction data in memory
2219/32232 . . . Inspection and correction, repair station are separate, transmit correction data
2219/32233 . . . Scheduling repair
2219/32234 . . . Maintenance planning
2219/32235 . . . Sharing of data between process control and maintenance management computers
2219/32236 . . . Automatic order of parts needed for maintenance schedule
For a quick and slow production line
2219/32282 . . . Machine scheduling, several machines, several
2219/32283 . . . jobs
2219/32284 . . . Job shop, two, more operations may not occupy
2219/32285 . . . same machine simultaneously
2219/32286 . . . Multi manipulator assembly cell
2219/32287 . . . Monitoring items connected to certain different
2219/32288 . . . entities, activities
2219/32289 . . . Medical, chemical, biological laboratory
2219/32290 . . . Create daily or weekly production matrix
2219/32291 . . . Determine number of components, start of their
2219/32292 . . . production, allocate processor
2219/32293 . . . Task sequence optimization
2219/32294 . . . Large, medium and fine schedule, with
2219/32295 . . . feedback from fine to large
2219/32296 . . . Minimize work in progress, system at
2219/32297 . . . maximum productivity
2219/32298 . . . Optimize throughput of cell
2219/32299 . . . Production start time from order and
2219/32300 . . . production specification, satisfaction degree
2219/32301 . . . If error search in a repair library, trained by
2219/32302 . . . operator, to correct schedule
2219/32303 . . . Adaptive scheduling, feedback of actual proces
2219/32304 . . . sate time to adapt schedule
2219/32305 . . . Optimize throughput of cell
2219/32306 . . . Each pallet has working plan, information and
2219/32307 . . . machine selection data
2219/32308 . . . Convert program to fit rescheduled machine
2219/32309 . . . Minimize flow time, tact, shortest processing,
2219/32310 . . . machining time
2219/32311 . . . Fastest interrupt time, change jobs dynamically
to fastest machine
2219/32312 . . . Rules to make scheduling decisions
2219/32313 . . . Last buffer first serve, lifo
2219/32314 . . . Shortest, narrowest non full queue
2219/32315 . . . Shortest remaining capacity
2219/32316 . . . Shortest queue next
2219/32317 . . . Largest imminent operation time
2219/32318 . . . Largest remaining processing time
2219/32319 . . . Shortest remaining processing time
2219/32320 . . . Machine with least work
2219/32321 . . . First buffer first serve, fifo
2219/32322 . . . Smallest ratio for imminent processing time
divided by total processing time
2219/32323 . . . Smallest value of product of imminent
2219/32324 . . . processing time with total processing time
2219/32325 . . . Shortest imminent operation time, part of
2219/32326 . . . machining time
2219/32327 . . . Largest processing, machining time
2219/32328 . . . Machines with least frequency of errors
2219/32329 . . . Determine lot priority as function of sum of
2219/32330 . . . queue and processing time
2219/32331 . . . Quality data determines optimum machine
2219/32332 . . . sequence selection, queuing rules
2219/32333 . . . Object oriented scheduling, use machine, part,
tool object and coordinator
2219/32334 . . . Local scheduler, each machine own scheduler,
independent from defective machines
2219/32335 . . . Structure, fuzzy logic expert system scheduler
Dynamic scheduling, resource allocation, multi-agent negotiation
Real time learning scheduler, uses ANN, fuzzy logic
Network of coordinating planning systems for each cell, factory
Expert scheduler
Use of genetic algorithm
Use of reinforcement learning, agent acts, receives reward
Use of ann, neural network
Normal, special order lines share some common machines, part of production line
Simulation, statechart SC
Use new conditions for model, check, calculate if model meets objectives
Object oriented modeling, design, analysis, implementation, simulation language
Grafnet model, graph based simulation
Real time simulation
Derive control behaviour, decisions from simulation, behaviour modelling
Modular verification of real time systems
Of interconnection of cells, subsystems, distributed simulation
Using acd, activity cycle diagram
Knowledge based simulation engine, use answers from user, database
Process reengineering, rethink manufacturing process, continuous improve
Simulate effect of stoppages of production facilities, operate as function of simulation
Visual, graphical animation of process
Modular modeling, decompose large system in smaller systems to simulate
Use elementary control task, finite state machine and loop, inhibit, synchronisation connections
Divide, analyse process into subprocesses, untill elementary unit operations
Simulation control process using virtual bus
For diagnostics
Simulation of material handling, flexible conveyor system fcs
Strain, stress of manual work, operator strain
Modeling, simulating assembly operations
Master production scheduling
Bulk manufacturing, handling dry or fluid products
Batch job routing in operation overlapping
Simulate batch processing
For resource planning
Line performance evaluation
Parallel experimentation machines
Quality control
Cape-mode computer aided plant enterprise modeling environment for plant life cycle modelisation & management
Predict failure time by analysing history fault logs of same machines in databases
Petrinet, coloured, inhibitor arc, timed, object token Petrinet
Timed petrinet, timed event graph
Display of petrinet, graph editing
Petrinet synthesis tool
Coloured petrinet
Cbpn controlled batches petrinet, model influence control part on physical part
Fuzzy timed petrinet
Object oriented petrinets
Continuous petrinet, contrary of timed petrinet
Hybrid petrinet, comprises continuous and timed petrinet
Controlled speed continuous petrinet, considers delays in execution and transport time
Fuzzy petrinet fpn
What is simulated, manufacturing process and compare results with real process
Arm accurate robot motion time model, needed in scheduling
Effects of highspeed hardware operations on throughput, use scheduler
Autonomous flexible system, cells and agv autonomous
Reception, assembly, testing, management workorder, schedule, history, file, packing
Machining center, pallet stocker, setup station, conveyor, control unit
Warehouse and loading, unloading station and shop and machining centers and in out buffer
Host and central distribution control between storage and cells
Fractal manufacturing system with autonomous agents: observer, analyser, organiser, resolver, reporter
Manufacturing structure is flow shop, mass production
Job shop, batch production system
Machining cells
Operator controls setting, changing of setting, of different machines
Select lan by switching bus connected to several lan
Select displays by switching bus connected to several displays
Select one lan to be connected to one display by central control
Supervisory control, monitor and control system, by operator or automatic
Scada supervisory control and data acquisition
Hybrid supervisor control, des supervisor and diagnostic and alternate strategy route
Distributed scada
Real time processing of data
Case based diagnosis to assist decision maker, operator
Adaptive agent for diagnostic, helps operator to describe new cases
Derive control data from displayed element, describe new cases
Expert scheduler
Real time learning scheduler, uses ANN, fuzzy logic
One engineering, workstation can supervise several processes
Pc generates control strategy, download in plc to monitor and react to events
Workstation has two displays, for process control and for general applications
Select tools in next workcell during transport workpiece
Spline membership function

ANNS artificial neural network with sigmoid function

Gaussian network

Function, rbf radial basis function network, gaussian network

ANNs artificial neural network with sigmoid function

Wavelet artificial neural network, wavelet network

Recurrent artificial neural network

Sums of tables addressed by input section, output section

RAM artificial neural network, several lookup tables addressed by input section, output summed

Pi sigma network, summing in hidden layers, error backpropagation

Time delay artificial neural network

Higher order multilayer artificial neural network

Product in output layer

Self repair

Ontogenetic learning, agent learns and adapts its own behaviour

Phylogenetic learning, group agents learn and adapt their behaviour

HCP help based cooperation protocol, when to ask or give help from or to agent

CCP coordination cooperation protocol

Immune algorithm, agent distinguishes self and foreign, lymphocyte, antibody agent

Director is the nc controller, computer

Automatic control, manually limited, between machine, manipulator and man

Manual control of manipulator, machine

Rule based system KBS

Artificial intelligence AI, expert, knowledge, controller

Task flow editing

Tool management and database management

Manufacturing planning and control agent and manager agent to tasks to active agent

Self repair

Hopfield network, single layer with neurodes, with sigmoid, and between output is linear

Kohonen network, single layer with neurodes, associated with codebook vector

Phylogenetic learning, group agents learn and adapt their own behaviour

Ontogenetic learning, agent learns and adapts its own behaviour

Manufacturing planning and control agent and manager agent to tasks to active agent

Self repair

Ontogenetic learning, agent learns and adapts its own behaviour

Phylogenetic learning, group agents learn and adapt their behaviour

HCP help based cooperation protocol, when to ask or give help from or to agent

CCP coordination cooperation protocol

Immune algorithm, agent distinguishes self and foreign, lymphocyte, antibody agent
2219/33071 . . . Self sufficient, agent responsible for own energy, tools
2219/33072 . . . Two layer agent for execution of tasks and for communication, coordination
2219/33073 . . . Iot control agent has communication, database, suggestion, decision, action, detect
2219/33074 . . . Calculation loop, first one slow changing value, then several quick varying values
2219/33075 . . . Calculate only necessary, critical values, to speed up calculation
2219/33076 . . . Optimize time by parallel execution of independent blocks by two processors
2219/33077 . . . Calculation iterative, recursive
2219/33078 . . . Error table, interpolate between two stored values to correct error
2219/33079 . . . Table with functional, weighting coefficients, function
2219/33081 . . . Parallel computing, pipeline
2219/33082 . . . Data parallelism, one administrative process and many worker process
2219/33083 . . . Clock for microprocessor synchronized with pulses from encoder
2219/33084 . . . Clock for microprocessor synchronized with multiplexer
2219/33085 . . . Real time calendar clock
2219/33086 . . . Interrupt frequency as function of rating of servomotor or desired control frequency
2219/33087 . . . Two clock, clock for software counter and calender clock, synchronized
2219/33088 . . . Clock
2219/33089 . . . Two clock, one for sequence control, one for motion control, pulses
2219/33091 . . . Two clock, one for controller and one for calibration
2219/33092 . . . Using several selectable and settable dividers
2219/33093 . . . Real time clock interface between serial I-O and processor
2219/33094 . . . Send clock from pc board, via extension bus to PLL circuit on nc boards, to servo
2219/33095 . . . External clock delivers interrupts for real time execution of programs
2219/33096 . . . Use clock to control main spindle rotational speed
2219/33097 . . . Variable ticks, align clocks, to synchronise cycles with other machine, robot
2219/33098 . . . Several nc machines, dnc, cnc
2219/33099 . . . Computer numerical control [CNC]; Software control [SWC]
2219/33101 . . . Dnc, direct numerical control
2219/33102 . . . Dnc and cnc combined
2219/33103 . . . Object manager handles objects having own procedures, messages oop
2219/33104 . . . Tasks, functions are distributed over different cpu
2219/33105 . . . Identification of type of connected module, motor, panel
2219/33106 . . . Configure I-O by using logical and physical address
2219/33107 . . . Designate each actuator by a name and corresponding operations
2219/33108 . . . Exchange of type of controller is easy, before operation, adapt control to type
2219/33109 . . . Select out of plurality of alternative control parameters
2219/33111 . . . Graphic configuration control, connect pictures, objects to each other
2219/33112 . . . Configuration software for network
2219/33113 . . . Initialise each drive during start, load data to drive and image to controller
2219/33114 . . . Configure motion controller to drive any kind of motor type connected
2219/33115 . . . Group functions
2219/33116 . . . Configuration of motion control
2219/33117 . . . Define function by user programmable basic operations
2219/33118 . . . Identify bus, interface select automatic adaption for bus, interface
2219/33119 . . . Servo parameters in memory, configuration of control parameters
2219/33121 . . . Host loads program from attached module to control that module
2219/33122 . . . Adapt nc control to type of machine, read machine and measuring parameters
2219/33123 . . . Identify kind of transducer, encoder used
2219/33124 . . . Configuration of different kind of tool magazines, tool changers and buffers
2219/33125 . . . System configuration, reconfiguration, customization, automatic
2219/33126 . . . Identification of address connected module, processor
2219/33127 . . . Display each control parameter by name and its value
2219/33128 . . . Different spindles, axis controlled by configured paths, channel
2219/33129 . . . Group spindles, axis into motion groups, nc channel structure
2219/33131 . . . Synthesize programmable axis, to simulate a non existing, virtual axis
2219/33132 . . . Configured function disabled if concerned axis not referenced
2219/33133 . . . For each action define function for compensation, enter parameters
2219/33134 . . . Enter parameters for relationship between axis
2219/33135 . . . Data compression before sending data to allow control of more axis, spindles
2219/33136 . . . Com: communication, inter processor communication, either local or network
2219/33137 . . . Time left during polling used for other communication, priority for polling
2219/33138 . . . Control program and communication are totally separated
2219/33139 . . . Design of industrial communication system with expert system
2219/33141 . . . Communication system software module independent from medium, protocol, address
2219/33142 . . . Address switches on each controller, peripheral are set by operator
2219/33143 . . . Position of module in ring, loop determines address of module
2219/33144 . . . Module clock, synchronised by controller message, to send message in time slice
2219/33145 . . . Count clock pulses to determine address of node, module
2219/33146 . . . Each node occupies in address space a length equal to number of bits to be exchanged
2219/33147 . . . Address peripheral, controller
2219/33148 . . . CLS client server architecture, client consumes, server provides services
Publisher subscriber, publisher, master broadcasts data to slaves, subscriber
Distributed client server
Server has organisation, tree data to access user data, client sends also both
AR application relationship, cooperation through logical links
Data exchange between processors of different axis of same or different cnc
Communication between motor current controller and position controller
Communication between two processors over shared, dualport ram
Between processor and sensor, encoder
Remote procedure call to each other
Communication between acyclic and cyclic, loop programs
Data exchange between controller and processors
Two bus, high speed and low speed bus, linked or not
Multichannel master bus
Bus timing adjustment by buffer with controller
Gps gp general purpose serial channel, link
Rs485 bus to control several modules, motors
Bus arbitration, switch computer to different memory
Two bus, master bus and local servo bus
Name of bus, vme-bus
Sdbus
Multibus
Bitbus
Sds smart distributed system, honeywell
Ia bus
Rs485, mpi multipoint, multidrop interface
Interface, scsi, parallel
Centronics
Pcmcia
Isdn
Uart, serial datatransmission, modem
IEEE-488, hp interface, instrumentation
Rs232c to rs485 converter
Rs232c switch box, break out box, to connect different devices
Circuit for signal adaption, voltage level shift, filter noise
Serial transmission rs232c, rs422, rs485 communication link
Twisted pair
Optical, glass fiber
Data exchange combined with inductively coupled power supply
Radio link, wireless
Inductive transmission of measured values
Data and power supplied over optical fiber
Wave guide, also used as rails for movable station
Data and power each on a different line to all peripheral, bus
Current loop 4-20-mA milliampere
Laser, light link, infrared
Transponder
Twisted pair combined with optical fiber for critical emc zones
Single serial line, virtual second line is earth
Wireless transmission of power and data, inductively, rotary transformer
Optocoupler, galvanic separation, isolation
Coax or optical fiber or twisted pair
Ultrasonic
Physical means, radio, infra red, ultrasonic, inductive link
Superposition of control signals on supply lines
Protocol, mailbox, email, mail system
Polling
Processor for communication with, evaluation of signals form detector to pc
Communication cpu to synchronize axis between different machines
Bus between different axis controllers and cpu
Synchronization pulses on bus for axis controllers
Operational, real time for system, and service for configuration is non real time
Continuity communication controlled by client
Motor encoders, resolvers on common bus with drives, servo controllers
Drives, servo units, main control on internal net, lan, ethernet, tcp-ip, wireless
Drives, servo units, sensors, motors, on local network, ethernet, tcp-ip, wireless
High speed serial link combined with medium speed serial link
Serial ring, loop pam programmable axis manager
Several serial channels, each provided with d-a to terminals of servomotor
Interface nc machine to data server
Daisy chain
Safety, echo back to verify correctness message
Detection of line failure, breakage of transmission, failure of receiver
Differential amplifier, xor to cancel noise, balanced rs422
Decoupling, to avoid noise, crosstalk between wires of bus
Detect, respond to lost message
If servo data corrupt, use previous value, no repeat
Detect bad data transfer
Redundant communication channels, processors and signal processing hardware
Add check data to message to check faulty communication
Detect short circuit of bus
Switch from differential to single line communication if short between two wires
Switch off, stop, halt transmission on detection of fault
Compare results from two masters on two busses, if not equal shut down machines
Watchdog for datacommunication, on error switch off supply to bus modules
Detect quality of received data, message
Packet information exchange
Autosend, send information from cad station automatically to peripheral
Timing of transmission data to peripheral
Synchronize transfer, take over, change of parameters and reference values
Time window for each controller or controlled function
Compress, pack data before transmission
Schedule periodic and aperiodic traffic, real time, time critical
Real time synchronous transmission, model
Correction data transmission errors, protection against noise, twisted pair
Serial position feedback, serial to parallel conversion and reverse
Transfer of data parallel
Resolver to digital conversion
Conversion of designed 3-D tolerance, allowance to real coordinates of machine
Common coordinate conversion for multiple heads, spindles
Conversion of measuring robot coordinates to workpiece coordinates
Conversion of detected pulses to voltage, frequency to voltage converter
Current to voltage conversion
Conversion, transformation of coordinates, cartesian or polar
Conversion of angle between links to linear displacement of actuator
Conversion of voltage, resistance to pulses
Pulse to frequency conversion, frequency to pulse
Pneumatic, air to hydraulic conversion
D-A, A-D
Convert cartesian to machine coordinates
Convert workpiece to machine coordinates
Conversion, transformation of data before and after interpolator
DCS distributed, decentralised control system, multiprocessor
Integrated communication and control, transmission delay, sampling rate effect
Distributed, decision made by negotiation among executive components, execute its own decision, executes only own decision
Distributed system with host as leader, host with multiple of agents
Cooperation between autonomous modules by receipts, messages, no synchronisation
Expansion by using secondary access to each module, extension module
Architecture, nodes for communication and measuring on serial bus
Node with communication, transducer, common core, application specific modules
Customized nodes for desired functionality
Remote diagnostic
Diagnostic
Test, simulation analysator
Program panel to program, enter data for diagnostic
Switch, select between normal and diagnostic control program
During diagnostic of servocontroller, motor is isolated
Logic analyser function of cnc
Storage oscilloscope function of cnc to diagnose servo drive, axis oscilloscope
For each actuated axis, set a bit in a word in memory, state of axis in word
Nc in case of propagation error, search previous module, origin of error
Fuzzy expert system for diagnostic, monitoring
ANN for diagnostic, monitoring
Diagnostic, test, debug
Remote videoconferencing
Real time, online diagnostic, integrated in normal control system
Simulation during machining
Different sets of monitoring parameters for each operation mode
Expert system for diagnostic, monitoring use of tree and probability
Display of diagnostic
Display of relevant errors together with time mark
Configuration file to set how data will be displayed
On error, failure, fault automatically search and dial maintenance person
If error message not clear, search help by index of message vocabulary
Error recovery, automated error recovery
System code for error recovery
Operator selects action, system stores state, zero based error state
Frames, database with environment and action, relate error to correction action
Failure reason analysis, simple strategy or multiple outcome analysis
Failure detection and reconfiguration
On the fly software replacement on error
Alternative strategy driver revises control behaviour
Knowledge acquisition
Interference justification network
Observation learning
Failure driven learning
Self diagnostic of boards, own test program
What to diagnose, whole system, test, simulate
Diagnostic of only machining, operation
Analyzer, diagnostic for servovalve
Self diagnostic of control system, servo system
Diagnostic for bus system of computer
Measuring system, encoder
Test, diagnostic of field device for correct device, correct parameters
Each processor can execute all programs
Network multiprocessing
Load balancing, distribution between processors
Microprocessor for max 3-D control otherwise host takes over for more axis
2219/33336 . . . first dsp calculates commands for each motor, second dsp regulates position
2219/33337 . . . For each axis a processor, microprocessor
2219/33338 . . . DNC distributed, decentralised nc, concurrent, multiprocessing
2219/33339 . . . Controller with lowest operation rate is selected as master
2219/33341 . . . Peer to peer, change master if overloaded
2219/33342 . . . Master slave, supervisor, front end and slave processor, hierarchical structure
2219/33343 . . . Each slave stores communication program to be used by master, exchangeability
2219/33344 . . . Each slave has several processors operating in parallel
2219/33345 . . . Several master modules, connection modules and slave modules
2219/33346 . . . Only memory of master module stores all position programs of slaves
2219/33347 . . . Master sends servo address, speed, kind of interpolation to slave
2219/33348 . . . Processor adapts signals to connected display
2219/34 . . . Director, elements to supervisory
2219/34001 . . . PLL phase locked loop
2219/34002 . . . Analog multiplexer
2219/34003 . . . Tri state driver
2219/34004 . . . Shift register
2219/34005 . . . Motion control chip, contains digital filter as control compensator
2219/34006 . . . Fifo
2219/34007 . . . Neuromine, input pulse train, can be inhibited or excited, output TTL, neuron
2219/34008 . . . Asic application specific integrated circuit, single chip microcontroller
2219/34009 . . . Coprocessor
2219/34011 . . . MMU
2219/34012 . . . Smart, intelligent I/O coprocessor, programmable sensor interface
2219/34013 . . . Servocontroller
2219/34014 . . . Sample hold circuit
2219/34015 . . . Axis controller
2219/34016 . . . Pulse processor
2219/34017 . . . Vector processor
2219/34018 . . . Forth controller
2219/34019 . . . Array of processors, parallel computing
2219/34021 . . . Dsp digital sensor signal processor
2219/34022 . . . Dcas of digital controlled analog signal processor
2219/34023 . . . Risc processor
2219/34024 . . . Fpga fieldprogrammable gate arrays
2219/34025 . . . Polynomial analysis
2219/34026 . . . Pga programmable gate array
2219/34027 . . . Dual servo controller, for two motors
2219/34028 . . . Hold relay
2219/34029 . . . Pam programmable axis controller, to control large number of axis
2219/34031 . . . Synchronous detector
2219/34032 . . . Asic and microcontroller cooperate
2219/34033 . . . Control processor and signal processor cooperate
2219/34034 . . . Multiplier, prm, brm
2219/34035 . . . Time relay
2219/34036 . . . Saturable reactor

G05B . . .

2219/34037 . . . Brm followed by postprocessor to smooth curve
2219/34038 . . . Web, http, ftp, internet, intranet server
2219/34039 . . . Access central database through internet
2219/34041 . . . Dda
2219/34042 . . . Filter
2219/34043 . . . Delay line
2219/34044 . . . Mathematical coprocessor - processor
2219/34045 . . . Timer
2219/34046 . . . Analog multiplier
2219/34047 . . . Dsp digital signal processor
2219/34048 . . . Fourier transformation, analysis, fft
2219/34049 . . . Adder
2219/34051 . . . Bcd
2219/34052 . . . Software counter
2219/34053 . . . Counters, tellers
2219/34054 . . . Half serial half parallel
2219/34055 . . . Correction 3-excesscode
2219/34056 . . . Nine complement
2219/34057 . . . Complement
2219/34058 . . . U p-down
2219/34059 . . . Preset counter
2219/34061 . . . One counter per axis to unload cpu
2219/34062 . . . Comparator
2219/34063 . . . Bcd
2219/34064 . . . N+1 comparator
2219/34065 . . . Fuzzy logic, controller
2219/34066 . . . Fuzzy neural, neuro fuzzy network
2219/34067 . . . Multilayer fuzzy controller, execution and supervisor layer
2219/34068 . . . Fuzzy neural petri controller
2219/34069 . . . Shared memory
2219/34071 . . . Content addressable memory
2219/34072 . . . Non volatile memory, core memory
2219/34073 . . . Backup battery
2219/34074 . . . Associative memory
2219/34075 . . . Cognitive memory
2219/34076 . . . Shared, common or dual port memory, ram
2219/34077 . . . Fuzzy, rules are function of material, tool used
2219/34078 . . . Membership functions as parameters for shape pattern
2219/34079 . . . Extract only rules needed to obtain result
2219/34081 . . . Fuzzy art map neural network, one art for input map, lookup table, other for output
2219/34082 . . . Learning, online reinforcement learning
2219/34083 . . . Interpolation general
2219/34084 . . . Software interpolator using microprocessor
2219/34085 . . . Software interpolator
2219/34086 . . . At fixed periods pulses from table drive plural axis in unison
2219/34087 . . . Enter at fixed periods distances in counter for each axis, pulse distribution
2219/34088 . . . Chamfer, corner shape calculation
2219/34089 . . . Parametric, polynomial representation of path per axis as function of time
2219/34091 . . . Interpolate backwards
2219/34092 . . . Polar interpolation
2219/34093 . . . Real time toolpath generation, no need for large memory to store values
2219/34094 . . . Library with different kind of interpolation curves
2219/34095 . . . Look ahead segment calculation
Approximate, replace curve, surface with circle, linear segments, least error
Calculate movement from part program offline, calculate axis references online
Slope fitting, fairing contour, curve fitting, transition
Extrapolation
Data compression, look ahead segment calculation, max segment length
OCI on line interpolation
Taking planar slices from a 3-D shape
Postprocessor coarse fine
Area pocket machining, space filling curve, to cover whole surface
Using spiral collapsed boundary, contour parallel machining
Zigzag workpiece parallel sweeps, direction parallel machining
Using zigzag isoparametric parallel sweeps
Using spiral bounded boundary
Using hilbert curves, fractals, only visible points of patches taken
TSP traveling sales problem, SOM self organizing map for tool path
Determine centerline, medial axis and branches in shape
Construct concentric polygons
Area, pocket machining for area with partially open boundary
Machine workpiece along, parallel to smallest side, dimension
Machine workpiece along, parallel to largest dimension
Using a pseudo-random or random tool path
Function generator, filter after interpolator to control position error
Edge generator
Function, profile generator
Sine cosine generator
Cordic processing
Sum squares
Overlap of counted axis pulses to servo
Brm followed by postprocessor to smooth curve
General surface replaced by sphere, cylinder, toroid, calculate quickly
Approximation for calculation
Split in approximation and accurate calculation
Choosing largest, major coordinate axis
Choosing slowest axis
Choose optimal coordinate system
Spline
Ellipse, hyperbola
Helicoidal
Cubic interpolation
Parabolic interpolation
B-spline, NURBS non uniform rational b-spline
Polynomial
Approximate corner by polynomial
Involute, evolute
Bezier interpolation, spline
Helical, spiral interpolation
Epitrochoid
Coons interpolation, patch
Circular interpolation
Analog
Circular interpolation in space, on arbitrary planes
Linear interpolation
Analog
Third degree
Slope control, delta x, y proportional to x, y
Synchronize interpolation of different axis boards, simultaneous start
Tangents form curve
Delta theta
Superposition curves, combine xy slides with other xy or polar slides
Linear in one axis, circular in other axis
Rotate a segment
Superposition manual control pulses on motion control pulses
4-D via 2-D+2-D
Select between rectangular and polar controller, interpolator
Coarse fine, macro microinterpolation, preprocessor
External interpolation
Coarse interpolator, path calculator delivers position, speed, acceleration blocks
Generate polynomial fitting in tolerance zone around polygon
Of the two or three axis, only one or two are controlled as function of tangent to other axis, plane
Switch between involute, circular and linear interpolation
Rotate segment over a certain angle
Overlap, between two blocks, continuous, smooth speed change, movement
Block segments, find next point on next segment by cross point circle and segment
Calculate for different inclined segments stitch points evenly distributed
Simulated pulse for better resolution
Variable interpolation speed or resolution
Adapt resolution as function of machining load, in corner, to keep constant surface speed
Variable resolution
Window path, contour of rectangle
Straight cut
Following line+circle
Degree line
Any angle, slope
Safety, stop, slowdown interpolator if speed, position, torque error too large
On each axis, for each block, a software limit switch, for safe slow down
Pneumatic
Memory management
Memory refresh
Bank switching, ping-pong memory for communication between processors
Part program in consecutive memory blocks, each with spare space for corrections
2219/34196 . . . Memory management, dma direct memory access
2219/34197 . . . Search blank memory space to load program, storage, memory allocation
2219/34198 . . . Electric and fluidic modules integrated on one substrate
2219/34199 . . . Module with low maintenance connected to removable module with high maintenance
2219/34201 . . . Each module uses functions of a real time kernel
2219/34202 . . . Reusable software, generic resource model library
2219/34203 . . . Module has a general, high level and a specific, proprietary part
2219/34204 . . . Independent units, stackthrough in cabinet, no backplane
2219/34205 . . . Modular construction, plug-in module, lsi module
2219/34206 . . . Motion controller independent from nc, lmc local motor controller
2219/34207 . . . Array vlsi processor
2219/34208 . . . Motion controller
2219/34209 . . . Microprocessor only for display
2219/34211 . . . Microprocessor only for hand control
2219/34212 . . . Microprocessor only for mdi, control panel
2219/34213 . . . Same microprocessor for data input and for servoco
2219/34214 . . . I-apx-432 processor
2219/34215 . . . Microprocessor
2219/34216 . . . Programmable motion controller
2219/34217 . . . Microprocessor with build in pwm
2219/34218 . . . Transputer
2219/34219 . . . Special interface, peripheral to motor
2219/34221 . . . Computer delivers control pulses from table directly to motors
2219/34222 . . . Computer sends displacement and selected device to output register
2219/34223 . . . Combined input output module, single module
2219/34224 . . . Select appropriate interface, according to kind of tool or other detection
2219/34225 . . . Interface board for measuring system, for resolver, encoder or interferometer
2219/34226 . . . Select address of motor, control serial switches in power supply ring
2219/34227 . . . Alteable connector board between controller and machine
2219/34228 . . . Counter takes over measuring and pwm task from microprocessor
2219/34229 . . . SUi serial interface unit takes over communication task from microprocessor
2219/34231 . . . Interface controls either dc, ac or step motors
2219/34232 . . . Test with microcomputer self
2219/34233 . . . Multiplexed subsystem stores state of controlling microprocessor on switch off
2219/34234 . . . Each subsystem has own interrupt which is switched on during multiplex
2219/34235 . . . Control order of multiplexed axis
2219/34236 . . . Multiplex for servos, actuators
2219/34237 . . . Multiplexed d-a-a-d
2219/34238 . . . Hydraulic multiplexer
2219/34239 . . . Multiplex for whole system
2219/34241 . . . For reading data only
2219/34242 . . . For measurement only

2219/34243 . . . Single feedback sensor, transducer for plurality, one at a time, driven tools
2219/34244 . . . Multiplex for control only
2219/34245 . . . Address several motors, each with its own identification
2219/34246 . . . OOC object oriented control
2219/34247 . . . Machining objects are hierarchically organised
2219/34248 . . . Machining object comprises a slide, a palet, workpieces, machining, a contour
2219/34249 . . . Sub divide machining object in machining groups, geometry, start point, special
2219/34251 . . . Cnc works with different operating systems, windows, os-2, vms in parallel
2219/34252 . . . OSY operating system
2219/34253 . . . Unix
2219/34254 . . . Operating system controls selection and execution of program modules
2219/34255 . . . Msdos
2219/34256 . . . Api application programming interface
2219/34257 . . . OS-2
2219/34258 . . . Real time system, gqx, works together with non real time system, windows nt
2219/34259 . . . Common language run time CLR, MS-NET, DOTNET, java run time environment
2219/34261 . . . Windows, microsoft windows
2219/34262 . . . DDE direct data exchange, DLL dynamic library linking
2219/34263 . . . OLE object linking and embedding, OPC ole for process control
2219/34264 . . . Odbc open database connectivity
2219/34265 . . . Windows nt, windows-2000
2219/34266 . . . Windows-95
2219/34267 . . . Windows nt and cooperating real time extension
2219/34268 . . . Cnc and pic controlled alternately by same processor, using timer
2219/34269 . . . Programmable computer controller, plc implemented with pc
2219/34271 . . . Nc integrated into pic, plc, combination of commands
2219/34272 . . . Communication pc and nc, pic over file system of pc, direct access pc to nc, pic
2219/34273 . . . Pc and plc and nc integrated, pcnc concept
2219/34274 . . . Connect pc card to industrial bus, with additional timing and adapting logic
2219/34275 . . . Windows file server to control pc hosted boards under ms windows
2219/34276 . . . Pc has priority over cnc controller
2219/34277 . . . Pc bypasses robot controller processor, access directly encoders, amplifiers
2219/34278 . . . Motion control board, card, in pc
2219/34279 . . . Pc, personal computer as controller
2219/34281 . . . Osaka open system architecture for control in automation, umc universal machine control
2219/34282 . . . Using special api's allowing user access to control machine, motion, servo
2219/34283 . . . Using windows nt for general control and real time unix for motion, plc control
2219/34284 . . . Using an operator console and a motion chassis connected by network
2219/34285 . . . Open system architecture, in general
2219/34286 . . . Intelligent positioning I-O
2219/34287 . . . Plc and motion controller combined
2219/34288 . . . Plc as main controller for cnc
2219/34289 . . . Plc as motion controller combined and plc for work type dependant data, parameter
2219/34291 . . . Programmable interface, pic, plc
2219/34292 . . . Filtering noise I-O
2219/34293 . . . Image table
2219/34294 . . . Diagnostic, locate failures
2219/34295 . . . System, logic analyser, simulation
2219/34296 . . . Level conversion
2219/34297 . . . Analog input, comparator delivers interrupt
2219/34298 . . . Custom window between pic, plc and nc, programmable adapter
2219/34299 . . . Memory with I-O and pointer, external I-O with map, edit map, pointer to adapt I-O
2219/34301 . . . Nc system has direct access to I-O of pic, plc
2219/34302 . . . Plc controls movement via nc, no direct interface to servo
2219/34303 . . . PNC is plc, pic and nc cooperation
2219/34304 . . . Pc as input, edit device for plc
2219/34305 . . . Connect, disconnect host computer by sleep command from local pc
2219/34306 . . . Power down, energy saving
2219/34307 . . . On nc power on or off, synchronize power on or off of displays with own supply
2219/34308 . . . Power supply sets relay switch, allows push button or automatic switch on off nc
2219/34309 . . . Dual power supply, for digital circuit and for analog signals
2219/34311 . . . Energy saving by recuperating braking, deceleration energy
2219/34312 . . . Power supply for servo delivered by, derived from 4-20-mA current loop
2219/34313 . . . Power supply for communication delivered by, derived from 4-20-mA current loop
2219/34314 . . . Slow down, limit speed for energy saving
2219/34315 . . . Power supply turning on or shutting off
2219/34316 . . . Install nc system, check voltages, power supply with incorporated a-d
2219/34317 . . . Execute same program on different machines by differently addressing axis
2219/34318 . . . Verify if workpiece is already machined, by its weight
2219/34319 . . . Sequence as function of nc controlled axis position, axis zone
2219/34321 . . . Database for control of a single machine
2219/34322 . . . Initialize execution program at reference position on workpiece
2219/34323 . . . Commanding different axis in sequential order as function of direction of movement
2219/34324 . . . Switch some axis over to manual control, while other stay automatic
2219/34325 . . . Speed up, optimize execution by combining instructions belonging together
2219/34326 . . . Program controls two operations simultaneously in opposite directions
2219/34327 . . . Modify, adapt system response to signals from process
2219/34328 . . . Cueing commands table
2219/34329 . . . Generate extended plc program during machining, execution of nc program
2219/34331 . . . First processor filters instructions for indexing only, all other instructions for second controller
2219/34332 . . . Program execution as function of direction, forward or backward
2219/34333 . . . Multi threading
2219/34334 . . . Scalability
2219/34335 . . . First look ahead for acyclic execution, followed by cyclic execution
2219/34336 . . . Avoid deadlock, lock-up
2219/34337 . . . Manual to automatic, tracer
2219/34338 . . . Execute control tasks, programs as well as user, application programs
2219/34339 . . . Single step execution of program
2219/34341 . . . Choose between electronic cam or time-dependent as function of required machining accuracy
2219/34342 . . . Matching closest patterns stored in database with actual components
2219/34343 . . . Generation of electronic cam data from nc program
2219/34344 . . . Standby commands, let proces wait while program controls other process
2219/34345 . . . Database for sequential control of several machines by messages
2219/34346 . . . User program fetches part of system program when flags are set and detected
2219/34347 . . . Execute auxiliary function, tool change, while concurrent machining
2219/34348 . . . Coordination of operations, different machines, robots execute different tasks
2219/34349 . . . Proper allocation of control components to the required task
2219/34351 . . . Knowledge acquisition of environment
2219/34352 . . . Explore discrete event properties, reliability, parallelism, availability
2219/34353 . . . Independent positioning motor controlled by microprocessor only if event, limit, pulse passed
2219/34354 . . . DES discrete event system, deds discrete event dynamic system
2219/34355 . . . List of failure events, list of actions, events, trigger actions
2219/34356 . . . Compensation variable interrupt execution delay, interrupt jitter
2219/34357 . . . Interrupt driven message passing network
2219/34358 . . . Interrupt changed to uninterruptable interrupt
2219/34359 . . . Real time based interrupt to control axis, other function
2219/34361 . . . Mask for interrupts, inhibit during more important tasks
2219/34362 . . . Sampling interrupt is product of integer times scheduler interrupt
2219/34363 . . . Encoder generates interrupt to synchronize closed loop
2219/34364 . . . Delay interpolation interrupt as function of machining rates and feeds of machine groups
2219/34365 . . . After interrupt of operation, do other task and go on - resume operation
2219/34366 . . . Interpolation interrupt so as to avoid fractions of command pulses
2219/34367 . . . Interrupts, different tasks foreground, midground, background
2219/34368 . . . Priority
2219/34369 . . . Cause of interrupt is sensor and actuator failure
2219/34371 . . . Abrupt change in system dynamics
Inability to process, execute assigned task within allocated time interval

Actuator overloading

False alarm states

Generate interrupt after a certain number of position, counter pulses

Management nc programs, files

Selection out of several databases according to workpiece or conditions

Erase plural programs in a single operation

Job management

Multitasking

Preemptive multitasking, cpu decides upon priority scheme, which task to start

Dynamic preemptive, special event register manages time slices for applications

Execute next block after predetermined time

Execute next block if largest axis distance is reached

Advance program without M function completion signal

Delay command as function of speed

Detect correct moment, position, advanced, delayed, then next command

After rough plunge grinding, initiate backoff grinding as function of delay wheel position

Synchronize axis movement and tool action, delay action, simulation inertia

Stop program on detection of undefined variable, symbol, enter definition, continue

Stop program if needed workpiece, tool or data lacks, misses

Execute a certain number of program blocks and stop

Synchronize between panel and control

Control different groups of functions, commands simultaneously, synchronized

Synchronize manipulators and machine by using a reference clock for all

Channel stops and waits for marker until other channel puts that marker

Switch between synchronous and asynchronous mode of controllers

Synchronize position controller drive with interpolator

Synchronize programs for machines, processes, tasks, if one stops other also

RTI real time, kernel, processing

Allocate storage, memory in each processor for a copy of needed data

Switch register banks, each storing process states, for quick real time execution

Effect of computer, communication delay in real time control

Calculate elapsed time, store in counter, start task when time elapsed

Design real time control system

RNOS real time networked operating system

Handling time critical and time non critical program sequences

Mark some sequences of time non critical sequences as locked, non interruptible

Add time stamp to command message

Maximize utilisation workstation

Execute urgent jobs quickly

Examine, analyse sensor data for co-exclusion sets, memorize, correlate actions

Multi­processor scheduling

Scheduler for sequential control, task planning, control sequence

Structure of control system

Termination for each device, enables easy insertion, connection or disconnection

SBC single board computer

Optical isolation, galvanic isolation

Data flow architecture

Same microprocessor for programming and for machine control

Same hardware, servo controller for different control modes

Diagnostic, monitoring incorporated in controller

LSI

Servo controller near main cpu but remote from servomotor, integrated in cnc

Main uninterruptable servo loop processor and interruptable servo event processor

Speed and current control integrated into nc control system

Multitask processor controls real time processor via communication memory

Separate power controller for drive, servodrive, one per axis, connected to cnc

Position encoder and motor connection in one interface between motor and microprocessor

Interface circuit build into connector, dongle

Parallel processing of functions, each layer has own sample rate

Multitask processor controls real time processor via communication memory

Panel connected to nc by means of switch matrixes

One cable between controller and amplifier, two between amplifier and motor

Common communication interface for panel and remote I-O

Control unit serves also to match drive motor to power supply

Sensors and actuator integrated into tool

Web control system, with intelligent control components each with web server

Several power modules for same actuator, motor

No change of operation mode when slave axis is out of synchronisation

A microprocessor for programming and a microprocessor for control execution of program

Integrated servo control circuit fixed to housing, remote from cpu

Fault tolerant control, task from one microprocessor can be done by other

False alarm states evaluation, threshold to verify correctness alarm

Synchronize control with pulse, if loss, excess, error, then stop

Stop spreading, propagation failure through system, inhibit drivers defect boards

Check functioning controller, cpu or program
Different parameters are evaluated to indicate different faults

Authorize control of machine, robot if control panel has been connected

Emit alarm signal

Inhibit start or related control switches if path boundary is outside limits

Plausibility check on connection of module, control unit to machine

Inhibit access to area if dangerous, cover taken off

Interlock, stop motor if microprocessor starts interrupt, because no watchdog pulse from microprocessor

Alarm canceled automatically when program corrected

Adaptive threshold, level for alarm, eliminate false alarm

Safety, control of correct operation, abnormal states

Bad circuits, watchdog, alarm, indication

Try again program

Check memory by storing beforehand complement of expected result

Normally messages over network, if failure, messages from operator over I-O

Program memory is inhibited, not accessible as long as power fails

Configure alterable memory as read only, to avoid erasing

Inhibit control until control lever is first set to neutral position

Sense voltage drop of system, shut down servo

Detect abnormality of control system without inverted model, using input command

Local control predicts next command data from past stored data if host control fails

Fault prediction, analyzing signal trends

Urgent safety signals treated with hardware; others with software

Flush enclosure of circuit with air, keep clean air over pressure

EFC explosion free control, intrinsically safe

Redundancy, processors watch each other for correctness

Monitor absolute position independently by two processors, if out of range

Use dual channels

Same function code, program is fully used in normal and abnormal case

Monitor axis movement, speed, independently by two processors, if out of range

Redundant diagnostic controllers watch redundant process controllers

One computer, controller replaces other, backup computer

Watchdog with adaptive timeout as function of speed of motor

Count certain number of faults before delivering alarm or stop

Time out, decide only after a lapse, period of time

Supervision, display diagnostic, use or select between different stored screen

Display machining time and real time clock to control machining time

Nc in input of data, input till input file format

Data input, data handling, programming, monitoring of nc

Parametric machine control, direct control from cad data, no nc data

Kad kam knowledge aided design, knowledge aided manufacturing

Mechanical design and electronic design integrated

Sheet metal cad

Object oriented design

Cad makes template of tool as function of spindle, machine tool and set on spindle

Www cad, world wide design and manufacturing

Dynamic simulation

Use of spreadsheet

Cad cam

Define workpiece, dimension from characteristics, strength, performance

From design, calculate additional parameters, for strength

Calculate production compensation, heat shrinkage, overetching

Analyse model, decide on number of sections to take

Finite elements analysis, finite elements method FEM

Determining bending die radius from part data, estimated radius and calculation

From product constraints select optimum process out of plurality of DTM means

Identify object characteristics, elasticity, density, hardness and select material

Calculate gear dimensions, tooth surfaces for optimum contact

Constraint based modeling, keep relationships between elements

Incremental constraint solving, constraints are handled in sequence

Design and manufacture jig

Design of machine tool, of cnc machine

Design for assembly DFA, ease of object assembly

Adapt design as function of manufacturing merits, features, for manufacturing, DFM

Design of modular control system

Redesign, use former design

Check correctness, violation of design, rule check

Reliability by design, error free object

Adapt design to customer feedback

Design gear, tooth surfaces

Correct model by comparing 3-D measured data of modified workpiece with original model

Use medial axis transformation to decompose a domain, limits combinations

Combine, superpose model, foot data with style data

Model for analysis of workpiece displacement due to clamping, fixture
Genetic algorithm for self-organizing designs
Add finishing allowances to a cutter path
Tool, fixture design
Tool, design of tool, mold, die tooling
Design tool for minimal tool change
Design tool to minimize manufacturing, machining time
Design tools in pairs, to be used together
Recognition of punch shapes provided in die component catalogue
BCL binary cutter location, rs494 standard CL format
Data exchange between cad systems, cad and cam
High level language conversion program, DXF format to nc format
IGES initial graphics exchange specification
STEP or PDES, standard for exchange of product data, form or surface data
Data modeling language
Manual entry of source, destination, data, format to be used for transfer
Create also operation data concerning operating device
Block cyclus time, time to prepare a block of data to be sent to machine
Convert pb design data to control data for surface mounting machine
From cad make drawing with text for dimensions, scan it and read dimensions
Derive mating, complementary, mirror part from computer model data
Geometrical transformation of image
Transform sketch by replacing free curves with mathematical curves, two display
Undo part of design
Modify design, modify shape, stretch, scale, add, delete
Parametric function, group of lines, curves, change one, all change
Command files, subroutines for drawing
Derive missing surface from mirror part of computer model
Drawing function, rotate designed figure, rotation
Scale, zoom a designed figure
Copy, duplicate a designed figure
Display object, recognition of geometric forms
Display picture of scanned object together with picture of cad object, combine
Display from bottom or top side, adjust drawing lines, visible or not
Display part and patterns to be machined on part, make selection
Do not load non necessary or obstructive parts of drawing, remove from screen
Features, functions like special relationship, assembly locations
Product design and process machining planning concurrently, machining as function of design
Product, feature based modeling, geometric and engineering info
Parametric design, parameters for geometric design and for process planning
Geometric feature extraction, concave and convex regions, object recognition
Incremental feature recognition, extraction, changes are added as new features
Machining feature extraction, geometry and machining parameters
Hole extraction for sheet metal
Using graph grammars to describe parts
Feature definition language
Feature conversion, from design to process features or else
MBM modular boundary model, FFC face to face composition model
Feature is std single tool approach direction, or mtad multiple tool approach
Object oriented feature finder
Features library
Kind of feature, rotational parts with machining features and relation
Generation of cutter path, offset curve
Automatic coarse, rough and finish cutting path generation
Generation of cutter path for only a designated part of surface
CC cutter contact path
Isoparametric, contact points at intersection of parameter lines on surface
Cl cartesian method, apt style, cutter tangent, parallel to drive planes
Steepest directed tree approach intelligent cutter path planning
Polyhedral machining, cutter moved between centroids of adjacent surface triangles
Contour map, cutter moved along contour lines, terraces of part surface
Generate planar section toolpath
Generate offset tool moving path in restrained curved plane
Clean up region, volume left uncut by too large tool pass after finishing
Automatically search for clean up regions, generate clean up tool pass
Define object with spline, convert to raster, mosaic of points to make object
Generation of compound, composite surface
Generation of connection between two or more surfaces
Project 3-D surface on 2-D plane, define grid in plane
RFS rotation free surfaces, needs c x y z axis, non axis symmetrical surfaces
Define surface by elements, meshes
Generate intersection of offset surfaces
Combine different forms, shapes
Generate connection between two paths
Generate random paths along a raster path
Calculate volume of object
Calculate center of gravity of object
Surface with changing cone angle, different upper and lower surface shape
Bezier or Ferguson surface
2219/35127 . . . Visibility maps, tool sees all points of interest on workpiece
2219/35128 . . . Propeller blade
2219/35129 . . . Generate composite surface by a single polynomial calculation
2219/35131 . . . Generate polynomial surface
2219/35132 . . . Generate path as function of precision and surface finish of each portion
2219/35133 . . . B-spline surface fitting
2219/35134 . . . 3-D cad-cam
2219/35135 . . . Predict surface machining precision
2219/35136 . . . Determine offset using closed ball expansion, 2-D square, 3-D cubic approximation
2219/35137 . . . Create part generic, derive from known part or combination of parts
2219/35138 . . . Superpose part of 3-D model on a straight, curved wall
2219/35139 . . . Define surface by cyclides, circular sections with variable radius
2219/35141 . . . Specify side of zone, line, circle for allowed region
2219/35142 . . . Generate tile patterns, mosaic
2219/35143 . . . Reconstruct free form surfaces
2219/35144 . . . Egosphere: spherical shell 2-5-D around robot, objects are projected on it
2219/35145 . . . Voxel map, 3-D grid map
2219/35146 . . . Enter data, calculate 3-D curve or surface, sculptured surface, okisurf
2219/35147 . . . Generation of nice looking composite surface
2219/35148 . . . Geometric modeling for swept volume of moving solids
2219/35149 . . . Generate model with haptic interface, virtual sculpting
2219/35151 . . . Modeling geometric, generation or forming of curved surface
2219/35152 . . . Part coding, description from 3-D cad database
2219/35153 . . . Group and retrieve similar designs from cad data
2219/35154 . . . Convert 2-D workpiece in rectilinear polygon, simplified skeleton
2219/35155 . . . From parts catalog, database, define part relationships, product definitions, specifications
2219/35156 . . . Group technology, identify and group similar parts, tools and machines
2219/35157 . . . Machinability, producibility, reject nc program if tool motion not possible
2219/35158 . . . Calculation of contact point of tool on surface, curve
2219/35159 . . . With nominal blank and model in memory define tool path and machine workpiece
2219/35161 . . . Determine orientation of workpiece
2219/35162 . . . Determine workpiece placement, nesting in blank, optimize, minimize loss material
2219/35163 . . . Generation of inverse offset surface, tool center on surface, tip shows offset
2219/35164 . . . Reverse engineering, camera and probe to inspect workpiece and machine are the same ones
2219/35165 . . . Automatic cutter selection
2219/35166 . . . Virtual boundary method to plan coarse and then fine machining
2219/35167 . . . Automatic toolpath generation and tool selection
2219/35168 . . . Automatic selection of machining conditions, optimum cutting conditions
2219/35169 . . . Automatic generation of set up data as function of form to be machined, kind of operation
2219/35171 . . . Automatic selection of machining conditions as function of controlled machine
2219/35172 . . . Lookup tables for technology, machining parameters
2219/35173 . . . Automatic selection of machine type
2219/35174 . . . Decide if blank has to be measured beforehand
2219/35175 . . . Select machining parameters with fuzzy logic
2219/35176 . . . Constraint, machining constraint, process type like only milling possible
2219/35177 . . . Power constraint for horizontal and vertical cutting forces
2219/35178 . . . Machining parameter constraint, feed, speed, dimension of part
2219/35179 . . . Tolerance constraints as function of process capability and manufacturing costs
2219/35181 . . . Machining condition constraints, coolant, chip removal, previous forming
2219/35182 . . . Scallop hull generation and its offset, interference free offset
2219/35183 . . . Maximizing side step, constant CUSP, scallop height, smaller CL datafile for minimizing machining time
2219/35184 . . . Variable step over, from toolpath to toolpath
2219/35185 . . . Select optimum tool radius
2219/35186 . . . Variable step forward on same toolpath
2219/35187 . . . Surface ridges, cusps, scallops, distance of tool traverses as function of curvature
2219/35188 . . . Project workpiece and sheet on screen, position layout to be cut, store contour
2219/35189 . . . Manufacturing function, derive gripper position on workpiece from cad data
2219/35191 . . . Project workpiece and gripper, control relative movement, store result
2219/35192 . . . From design derive sequence of bending so that bending is possible
2219/35193 . . . Manufacturability
2219/35194 . . . From workpiece data derive tool data
2219/35195 . . . Design mosaic, cut tiles, paint tiles and pack mosaic
2219/35196 . . . From workpiece data derive assembly tool data
2219/35197 . . . Assemblability
2219/35198 . . . Combine component electronic catalog, cdrom with cad data to generate nc program
2219/35199 . . . Processability
2219/35201 . . . Use cad data to test function of designed part, design for test DFT
2219/35202 . . . Macroplanning, setup fixture cafp, library machine tables, sequence
2219/35203 . . . Parametric modelling, variant programming, process planning
2219/35204 . . . Planning, generic process planning
2219/35205 . . . Planning of toolstages, comprising selection tools, position and motion
2219/35206 . . . Microplanning, specific machining operations and parameters
2219/35207 . . . Design agent selects planning agent, which selects fabrication agent
2219/35208 . . . Object oriented planning
2219/35209 . . . Modifying, adding machining features to elementary cad-parts as function of their assembling
2219/35211 . . . Using a search tree
2219/35212 . . . Estimating a cost associated with each operation, amount of time, target cost
2219/35213 . . . Minimize number of setups
2219/35214 . . . Setup planning, number of them, machines needed, part orientation, order
2219/35215 . . . Generate optimal nc program variant as function of cost, time, surface, energy
2219/35216 . . . Program, generate nc program, code from cad data
2219/35217 . . . Cagd computer aided geometric design, sbgd scanning based geometric design
2219/35218 . . . From cad data derive fixture configuration and assembly program
2219/35219 . . . From cad data derive cutting, stacking, sorting program
2219/35221 . . . Generate cutter path as function of speed, acceleration condition selected by operator
2219/35222 . . . From cad derive data points for endball mill, grinder, then radius compensation
2219/35223 . . . Tolerance, consider tolerance in design, design for assembly
2219/35224 . . . Kinematic tolerance analysis, variation in kinematic function as function of tolerance
2219/35225 . . . Tolerance in setup planning
2219/35226 . . . Analysis of tolerance propagation
2219/35227 . . . Use FMEA failure modes and effects analysis in tolerance assignment design
2219/35228 . . . Automated tolerance chain generation
2219/35229 . . . Code
2219/35231 . . . Biquinary code, 2-of-7 symbols
2219/35232 . . . Bed
2219/35233 . . . Octal
2219/35234 . . . First column has 1-2-4, second column has 8-16-32
2219/35235 . . . Decimal to binary
2219/35236 . . . Excess-code
2219/35237 . . . Under four is 0xxx, over four is 1xxx
2219/35238 . . . Gray-code
2219/35239 . . . Ternary code
2219/35241 . . . End, stop code of program
2219/35242 . . . To enable manual operation on detection of inserted code
2219/35243 . . . Inserted code calls parallel execution of another program, synchronize
2219/35244 . . . Select in corner different program according to inner, outer machining
2219/35245 . . . Expansion of control words, code of standard language to increase functionality
2219/35246 . . . Data handling for auxiliary functions as function of setting of switch, block delete
2219/35247 . . . Mode selection between two machining modes, laser beam and laser shutter control
2219/35248 . . . Pallet exchange code to get mating nc program
2219/35249 . . . In corner change cutting command to piercing command, to keep angle point intact
2219/35251 . . . Several M codes sent to several machines simultaneously
2219/35252 . . . Function, machine codes G, M
2219/35253 . . . To stop program until a cycle start key is pressed
2219/35254 . . . GPF, G preparatory functions, G111 indicate switch to polar, absolute to reference
2219/35255 . . . G112 switch to polar, relative to last polar coordinate
2219/35256 . . . Assign a macro to a key
2219/35257 . . . Macro, assign a name to macro
2219/35258 . . . A named macro can be called from a program, a key, a menu
2219/35259 . . . Divide program in machining division blocks, and name them
2219/35261 . . . Use of mathematical expression, functional equation
2219/35262 . . . Macro instruction, canned cycles, subroutines, subprogram
2219/35263 . . . Using variables, parameters in program, macro, parametrized instruction
2219/35264 . . . Reread same data
2219/35265 . . . Check time differences of command signals
2219/35266 . . . On error display code, message for recovery from fault
2219/35267 . . . Compare ram data to rom data, verify correctness, validity data, tolerance
2219/35268 . . . Detection of presence of rom cassette or similar, if coupled to internal memory
2219/35269 . . . Checking data, parity, diagnostic
2219/35271 . . . Checking electronics
2219/35272 . . . Watchdog, count or integrate number of data errors before alarm
2219/35273 . . . Sensor to detect functioning of signal conditioning elements
2219/35274 . . . Parity
2219/35275 . . . Excess in error
2219/35276 . . . Two identical tapes
2219/35277 . . . Double reader
2219/35278 . . . Checksum CRC
2219/35279 . . . Ignoring invalid program
2219/35281 . . . Detect overlap of program, if new data is entered before old is handled, stop
2219/35282 . . . Verify if loaded program into memory or stored into tape, cassette is correct
2219/35283 . . . Plausibility check for function, program, inhibit dangerous, unallowed program
2219/35284 . . . Programmed speed automatically limited to min and max transmission range speed
2219/35285 . . . Plausibility check for data, within permissible range
2219/35286 . . . Run tape without machining, tape proving, dry run, test run
2219/35287 . . . Verify, check program by drawing, display part, testpiece
2219/35288 . . . Verification of instructions on tape, direct or by comparing with reference
2219/35289 . . . Display machining state and corresponding control program
2219/35291 . . . Record history, log, journal, audit of machine operation
2219/35292 . . . By making, plotting a drawing
2219/35293 . . . Execute program and check block of data, on interrupt display block
2219/35294 . . . Display concentric circles
G05B

2219/35295 . . . Stop test run, correct instruction or block, restart test run
2219/35296 . . . Inhibit operation if part shape not compatible with raw material shape
2219/35297 . . . Convert program to voice output to check program
2219/35298 . . . Print screen display
2219/35299 . . . Verify if generalised data block has all words required
2219/35301 . . . On error, push button to reverse execution mode of block, stop, correct
2219/35302 . . . Set and store command code together with display colour, detected on execution
2219/35303 . . . Dry run, compare simulated output with desired finished profile, alarm, inhibit
2219/35304 . . . Real time analysis, check of program, just before machining
2219/35305 . . . Before machining, verify if all different machining start points are correct
2219/35306 . . . Interference of all tools of turret, or part of tool base with chuck, workpiece
2219/35307 . . . Print out of program on paper, on screen
2219/35308 . . . Update simulator with actual machine, control parameters before start simulation
2219/35309 . . . Actual execution times acquired during machining used in simulation
2219/35311 . . . Remote simulation of machining program
2219/35312 . . . Display working state, process
2219/35313 . . . Display, validate tool path for boundary, surface interference
2219/35314 . . . Display workpiece and machine, chuck, jig, clamp, tool
2219/35315 . . . Projection, two, three section views
2219/35316 . . . Interference checking between tool, machine, part, chuck, machining range
2219/35317 . . . Display tool shape, to select tool for program, or for interference
2219/35318 . . . 3-D display of workpiece, workspace, tool track
2219/35319 . . . Show alternatively static and dynamic locus, during static update of dynamic
2219/35321 . . . Display only tool locus, dynamic
2219/35322 . . . Display dynamic tool locus from entered start point to present position
2219/35323 . . . Point to two points on tool locus, calculate and display value
2219/35324 . . . Two, more pictures separated on screen, display
2219/35325 . . . Display of locus with possible correction of machining
2219/35326 . . . Scale image automatically to display whole tool locus or indicated area
2219/35327 . . . Display tool locus together with correlated machining parameter, load motor
2219/35328 . . . Shift view as function of shift of tool with respect to workpiece
2219/35329 . . . Display entire image within an enlarged image
2219/35331 . . . Display only machined part
2219/35332 . . . Use solid and wire frame plotting to display tool locus, workpiece
2219/35333 . . . Display raw material, blank, tool locus, workpiece, alarm if error
2219/35334 . . . Display entire part and zoom of detail

2219/35335 . . . Update display image only if tool advanced over a defined distance
2219/35336 . . . Display locus and corresponding actual block
2219/35337 . . . Program has instruction to display specific information
2219/35338 . . . Display virtual tool, locus, part to check possibility of execution next block
2219/35339 . . . A mark for present position of tool, a mark for end point of block, colour
2219/35341 . . . Display finishing, finishing margin, work, tool and chuck shape, different colours
2219/35342 . . . Set colour change for a block, display locus for that block in different colour
2219/35343 . . . Display path and coating thickness and painting time
2219/35344 . . . Display part, programmed locus and not yet machined, uncompleted portions of part
2219/35345 . . . Display entry of high level program together with corresponding nc program
2219/35346 . . . VMMC: virtual machining measuring cell simulate machining process with modeled errors, error prediction
2219/35347 . . . Replace tool by light emitter, operator checks light path on workpiece
2219/35348 . . . Different colour, texture as function of distance, direction between tool and workpiece
2219/35349 . . . Display part, programmed locus and tool path, trajec, dynamic locus
2219/35350 . . . While machining probe model, sense drawing by same program, stop if deviation
2219/35351 . . . By making a testpiece
2219/35352 . . . While machining compare real path with simulated, command path, contour display
2219/35353 . . . Polar coordinates, turntable
2219/35354 . . . Generate at jump a fictive instruction equal to sum of previous instructions
2219/35355 . . . Data handling
2219/35356 . . . Setup data, includes scale, range, type, selected together with part program
2219/35357 . . . If a pattern contains another pattern, separate date to avoid overlap
2219/35358 . . . Discriminate between setup data and machining data
2219/35359 . . . Discriminate between data for servocontrol directly and nc processing data
2219/35360 . . . Group similar operations, to select correction, compensation values
2219/35361 . . . Generate data on component arrangement
2219/35362 . . . Merge normal nc program with manual entered monitoring, diagnostic criteria
2219/35363 . . . Configure buffer dynamically, store two 3-D blocks or one 6-D block
2219/35364 . . . Fill buffer dynamically, track read out and write in addresses, fifo
2219/35365 . . . Only read buffer, advance tape while machining with data from read buffer
2219/35366 . . . Read and work buffer, machine while read in, no switching between buffers
2219/35367 . . . Read and work buffer, machine while read in, buffers switched alternative
2219/35368 . . . Data from read instead of work buffer, load data directly to work buffer
2219/35369 . . . Store variable block, word length into memory
2219/35370 . . . Data storage, buffer
Remote instruction to operate machine tool

DPC direct programming at the console

Clamp detachable teaching box magnetically on housing

Special interface for manual input to pc

Manual device is automatically recognised and its interface selected

Remote instruction to operate machine tool

3-D three dimension, space input, spaceball

3-D joystick

Handle, joystick connected to n+1 wires for n degrees of freedom

Bird, free flying hand controller, receives signals from transmitters in space

Four and more-DOF hand controller, joystick, manipulandum

DPC direct programming at a 3-D surface, position displaced elements read by computer

User controls machine with eye motion, activates icons on display

Block selection, search

Enter code number directly for function, no use of function keys

Interactive

Format guide to guide user during input of data

During execution, display asks for parameters, operator answers, machine again

Display, if needed, tolerance memo data at place where real data must be input

Means, manual input, input reference, hand wheel

Decimal

Joystick

Keys or buttons

Production design metaphor, tool, operation like input system

Hand wheel turns resolver to control movement slide

Portable drill, screw driver to set position of axis instead of handwheel

Gesture interface, controlled machine observes operator, executes commands

Joystick for coarse and handwheel for fine movement

Earprotection, earphone

Potentiometer

Datsuit, arm sleeve, actor, operator wears datsuit and generates motion

Joystick and buttons for menu and function selection, scrolling, + sign and - sign

Mouse with additional wheel, switches for position control

Two axis foot pedal

Voice announcement, oral, speech input

Switch between joystick and pedal control

Foot pedal

Disk segments connected to different inputs of microprocessor, represent different positions

Joystick for coarse, rotary encoder for fine movement
2219/35458 . . . Control command embedded in video, audio stream, signal
2219/35459 . . . Knob, handle, handwheel delivers pulses, electronic handwheel, digitop
2219/35461 . . . Digitizing, menu tablet, pencil
2219/35462 . . . Mouse
2219/35463 . . . Trackball
2219/35464 . . . Glove, movement of fingers
2219/35465 . . . Hand wheel
2219/35466 . . . Select with mouse button coarse or fine movement control
2219/35467 . . . Select between control modes, jog, freeform, grid, corner, locate, contour, slot
2219/35468 . . . Select between teaching, regulate position and direct control of position
2219/35469 . . . Select with button specified picture, interrupt addresses selection table
2219/35471 . . . Select between run and step command mode, step forward, reverse
2219/35472 . . . Mode selection
2219/35473 . . . Input limit values of speed, position, acceleration or force
2219/35474 . . . Enter fuzzy command, instruction, like move closer
2219/35475 . . . Set tolerance values
2219/35476 . . . Switch from auto to manual if operator moves feedback detector, to set parameter
2219/35477 . . . Accelerate input data, exponent as function of pressure, time, turning speed
2219/35478 . . . Set flexibility of axis in working coordinates, to move real axis manually easily
2219/35479 . . . Set values, speed of machine as function of force, pressure, duration on key
2219/35481 . . . Display, panel
2219/35482 . . . Eyephone, head-mounted 2-D or 3-D display, also voice and other control
2219/35483 . . . Synoptic display for work shape during machining
2219/35484 . . . Use two image memories, update second memory while display first memory
2219/35485 . . . Library of images, pictures, select and modify each, compose them
2219/35486 . . . Use of two cursors on screen
2219/35487 . . . Display and voice output incorporated in safety helmet of operator
2219/35488 . . . Graphical user interface, labview
2219/35489 . . . Discriminate, different colour, highlight between two states
2219/35491 . . . Workpiece data display, position, height
2219/35492 . . . Display needed workpiece, tool or data to continue execution of program
2219/35493 . . . Display workpiece and tool data together
2219/35494 . . . Online documentation, manual, procedures, operator, user guidance, assistance
2219/35495 . . . Messages to operator in multimedia, voice and image and text
2219/35496 . . . Display cursor in changing colour to indicate that object can be selected
2219/35497 . . . Use colour tone, hue to indicate amount of processed quantity
2219/35498 . . . Synoptic display of available, selectable control modules with their functions
2219/35499 . . . Model of process, machine and parameters
2219/35501 . . . Colour display
2219/35502 . . . Display picture, image of place of error
2219/35503 . . . Eye tracking associated with head mounted display to detect eye position
2219/35504 . . . Multilingual communication, messages in different languages
2219/35505 . . . Display two windows, one with nc-data, other with general application data
2219/35506 . . . Camera images overlaid with graphics, model
2219/35507 . . . Spider, radar, parallel axes, multivariate plot
2219/35508 . . . Operator chooses among different GUI formats
2219/35509 . . . Double large character on screen
2219/35511 . . . Cursor on screen
2219/35512 . . . Display entered, measured values with bargraph
2219/35513 . . . Setting tool condition, tool set in tool exchanger, present or not
2219/35514 . . . Display tool data
2219/35515 . . . Workpiece set condition, workpiece present or not
2219/35516 . . . Three linear movements in a single plane for three actuators
2219/35517 . . . Use same data, program for workpieces with different length, but same profile
2219/35518 . . . Superposition data, three memories for 2-D projection and z profile and surface structure
2219/35519 . . . Machining data and tool data
2219/35521 . . . Machining and parts on workpiece arrangement data, machine each, then cut out
2219/35522 . . . Database for standard machining data and for personal machining data
2219/35523 . . . Data one bit better than measurement, rest accumulated in memory
2219/35524 . . . Approach data and machining data
2219/35525 . . . Use same data for different operations, coarse and fine, cutting and grinding
2219/35526 . . . Number of workpieces to be machined, cut
2219/35527 . . . Range of number of workpieces to be machined, cut
2219/35528 . . . Create machining conditions database by analyzing actual machining nc program
2219/35529 . . . Monitoring current machining, store information in database as a new working case
2219/35531 . . . Operator inputs manually evaluation of current machining
2219/35532 . . . Comment, work directive, message to operator and control signals together
2219/35533 . . . Use, input 2-D data, sectional profile to machine 3-D surface
2219/35534 . . . Conversion input data
2219/35535 . . . Decimal to binary
2219/35536 . . . Digital to analog
2219/35537 . . . Bed to phase
2219/35538 . . . Bed to decimal
2219/35539 . . . Gray to frequency
2219/35541 . . . Bed to 5-2-1-1-code
2219/35542 . . . Bed to binary
2219/35543 . . . Cartesian to polar and vice versa
2219/35544 . . . Convert male to female form, die to stamp form
2219/35545 . . . Serial to parallel conversion
2219/35546 . . . Convert input data to execution data
2219/35547 . . . 1-to-8-bit conversion
2219/35548 . . . 1-to-16-bit conversion
Convert buffer content to executable data in case of short execution time.

Convert and select between EIA and ISO code.

ISO and EIA code detected by difference of parity bit.

Convert ISO or EIA code to internal or standard code.

Mirror, other conversions.

Turn figure over 90-degrees or 180-degrees, convert data for new state.

Conversion inch to metric.

Workpiece related data to axis related data.

Convert speed value into two signals sin, cos representing position.

Convert 15-bit image into 20-bit image.

Analog to digital.

Radius to diameter.

Use of conversion tables.

High speed data processor between host and nc for direct conversion of data.

Communications adapter converts program to machine or controls directly machine.

Use of only delta x values, no absolute values.

Each block contains connection, index to other blocks, to form patterns.

Array structure corresponding to display format.

Single block format indicates change of speed at start and end.

Table with constant speed and corresponding distance for each segment.

Data contains header and type of data.

Header has code to select proper load program.

Header with information for display position.

Part program contains movement and condition statements.

Data divided in blocks to be covered by small movement, to origin by large movement.

Gerber, hp format to drive plotter or similar xy device.

Store motion parameters as function of encoder position.

Position data for module and position data within module.

Control format in browser, use of xtml and xslt.

Difference between signals and sign of difference are the controlling signals.

Link geometry, workpiece data with machining data, select region.

Motion command profile.

Position, time and slope, tangent of curve.

Store curves with packed code, indicating bezier curve parameters.

Pack, compress data efficiently in memory.

Nc in input of data, input key till input tape.

File format, initial graphics exchange specification, iges standard.

Dimensional measurement interface specification dmis standard.

Start key, switch to start performing program.

Program mask depends on physical position of panel.

Same knob, different functions, turn for position, push and turn for speed.

A key delivers a series of key codes.

Special keys, automatic switch over x or y to numerical values.

Illuminated, lighting up keys, build in led, display, show sequence data entry.

Keys with variable control code, multifunction keys.

Page key, go to next or previous page.

Percentage keys, input percentage values.

Up-down keys for calling sequentially functions, parameters.

Overlay to indicate function of key.

Display areas, fields on screen correspond to position of keys on panel, matrix.

Unified language for machines and translation to each.

Graphical assisted robot programming, display projection of surface.

Language for dimensional measuring, inspection.

Using interpreted descriptive measuring, giving G-codes.

Switch high level and assembly, machine language as function of capacity memory and speed.

Switch between machining language for execution and high level for editing.

Attribute programming.

State language.

Link, connect icons together to form program.

Combine general high level language and specialised plc language.

Decompiler, translate machine code to hll, reverse processing, easy modification.

C++

Basic.

Programming in assembler, machine or high level language.

Script, interpreted language.

High level graphics language, gks.

APT

Special language, task programming, oop object oriented programming.

Motion, graphical motion control language gnc1.

Application programming interface associates component code with driver function.

Ladder program for plc, using functions and motion data.

Learning task dynamics, process.

Edit program step by step.

Point to defect, faulty instruction or locus, call up corresponding command block.

Correction or modification of program.

Program modified after breakage, crash, jamming.

Skip of program blocks, jump over certain blocks.

Adapt, modify program as function of configuration of machine.
Function menu, switches, keys replaced by
execute a programmed sequence

Select out of library, beforehand only functions
pointer, number

Screen with certain display menu called by
Store statistical history of selected menus,
Operator menu with submenu for each item
select mode

Tree oriented menu, go to root, scroll up down,
selection of menu instead of pointing

Mouse with buttons to assist operator with
short cut menu

Amend, modify program by inserting wait and
wait dismiss command

Replace faulty instructions from rom, tape by
instructions from ram, error setting

Select, modify machining, cutting conditions

Edit, modify program for position errors,
moving path, use conversion matrix

Machining parameters, override

Modification, override as function of
conditions, distance

Override limit contour

Lookup table with override for each pattern,
tool path

Inhibit or permit override by separate manual
switch

Inhibit or permit override by program
instruction

Override program by selecting another font,
size for letters

Override program to scale workpiece

Overide program to execute a certain number
of same blocks, repeat pattern

Stop machine and correct position manually

During machining keep override log, history,
journal, kind of record playback

Display override log and nc instructions, select
nc block to modify permanent

Adapt, update machining parameters
automatically as function of state of processing

Cd rom

Cassette

Bubble memory

Eprom, earom, eerm

Flash memory

Local memory instead of tape, or combined

Floppy disk, diskette

Rom

Eprom, prom

Card

Harddisk

Magnetic tape cassette

Adapt interactive dialog, help to experience,
short cut menu

Mouse with buttons to assist operator with
selection of menu instead of pointing

Tree oriented menu, go to root, scroll up down,
select mode

Operator menu with submenu for each item

Store statistical history of selected menus,
recall for quick data entry

Screen with certain display menu called by
pointer, number

Select out of library, beforehand only functions
needed for part program

Programmable, configurable function keys,
execute a programmed sequence

Menu, help menu for operator, messages

Function menu, switches, keys replaced by
menu

Menu keys, function of keys soft defined
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2219/36131 . . . Cyclic selection of functions or values by pushing a single key
2219/36132 . . . Selection of menu with lightpen on screen, display
2219/36133 . . . MMI, HMI: man machine interface, communication
2219/36134 . . . Osf-motif standard
2219/36135 . . . Link between sequence, motion or process and diagnostic control
2219/36136 . . . User configurable graphics selected as function of kind of machining, display builder
2219/36137 . . . Configuration of display device, operator panel
2219/36138 . . . Configuration of operator panel, using os-2 modular programs, masks
2219/36139 . . . Edit templates for screen display, and use of keyboard
2219/36141 . . . Configuration with visual basic extension
2219/36142 . . . Using window display, selection of function calls in a window
2219/36143 . . . Use of icon to represent a function, part of program
2219/36144 . . . Display of not allowed function in a different way, light
2219/36145 . . . In case of alarm a window is maximised automatically
2219/36146 . . . Group windows into coherent sets to facilitate a task
2219/36147 . . . Limit number of windows displayed simultaneously
2219/36148 . . . Main process, alarm window takes priority, always on top, safe view
2219/36149 . . . Window, X window
2219/36151 . . . Display is a TV
2219/36152 . . . Panel
2219/36153 . . . Two, several consoles, displays, panels, two different input, joystick
2219/36154 . . . Two displays, for part shape and for corresponding instructions, block
2219/36155 . . . Plc switches functions of panel when changing kind of machining
2219/36156 . . . Keyboard as a drawer
2219/36157 . . . Pendant control box for handwheel control, mounted on controlled axis
2219/36158 . . . Panel for disabled, scanned sequentially
2219/36159 . . . Detachable or portable programming unit, display, pc, pda
2219/36161 . . . Common program panel for nc, pc, switch display diagnostic or part
2219/36162 . . . Pendant control box
2219/36163 . . . Local as well as remote control panel
2219/36164 . . . Common CRT for two input devices
2219/36165 . . . Common program panel for host and cnc, at cnc place, for data from host, cnc
2219/36166 . . . Several panels can be selected by rotation, limited space needed
2219/36167 . . . Use camera of handheld device, pda, pendant, head mounted display
2219/36168 . . . Touchscreen
2219/36169 . . . Remote, host controlled, operated manual data input, keyboard
2219/36171 . . . Edit velocity, motion profile, graphic plot of speed as function of time, position
2219/36172 . . . Select block, item, highlight, colour this block with respect to rest
2219/36173 . . . Combine record play back, hand wheel with normal cnc programming, software
2219/36174 . . . Program divided into modules
2219/36175 . . . Capture image of part, create automatically geometry, sequence of machining
2219/36176 . . . Select servo control parameters
2219/36177 . . . Derive finishing allowance, tolerance from shape and work information
2219/36179 . . . Combine nc programming with cad and order system
2219/36181 . . . Input part data, dimensions, without graphical representation of part
2219/36182 . . . First block contour then parameter input
2219/36183 . . . Offline teaching is sound assisted
2219/36184 . . . Record actions of human expert, teach by showing
2219/36185 . . . Application, for cylindrical groove shape
2219/36186 . . . Programming languages for lathe, mill or general use mixed
2219/36187 . . . End shape data input for end surface configuration
2219/36188 . . . Deep drilling cycle
2219/36189 . . . Wheel dressing program
2219/36191 . . . Prepare rough, coarse machining program
2219/36192 . . . End facing
2219/36193 . . . Semi finish and finish machining
2219/36194 . . . Taper angle machining
2219/36195 . . . Assembly, mount of electronic parts onto board
2219/36196 . . . Grinding cycle
2219/36197 . . . Non circular workpiece, radius and angle input
2219/36198 . . . Gear, thread cutting
2219/36199 . . . Laser cutting
2219/36201 . . . Hole machining
2219/36202 . . . Freeform surfaces
2219/36203 . . . Bending of workpiece, also for long slender workpiece
2219/36204 . . . Lathe, turning
2219/36205 . . . For aspheric non symetrical mirrors
2219/36206 . . . Embroidery
2219/36207 . . . Involute curve, compressor
2219/36208 . . . Roll grinding
2219/36209 . . . Specify hole shape pattern for boring and store in hole file
2219/36211 . . . Using different cutter sizes, largest as possible for minimizing machining time
2219/36212 . . . Using generic virtual pocket, having virtual boundary, arbitrarily shaped
2219/36213 . . . Grouping of decomposed volumes with similar features
2219/36214 . . . Pocket machining, area clearance, contained cutting, axis milling
2219/36215 . . . Insert automatically program sequence, for corner execution, avoid machining error
2219/36216 . . . Replace entered position data with previous if difference less than tolerance
2219/36217 . . . Commands trigger programming functions
2219/36218 . . . Reuse stored data as programming data after confirmation

G05B
Calculate machining information, like time, surface to be machined from program
Entry of chamfer, beveling, rounding of corner shape
Indicate entered element on top, next element below, after input, update top
Enter machining conditions, determine automatically machining data
Enter machining and positioning elements, derive order of execution in real time
Select and insert program from library, select case, variant
Global selection of grid or circle of points by number, distance, angle
Assist operator to calculate unknown points, contours
Combine two programs to obtain new shifted positions and new processing data
Generate missed line when last end point is different from next start point
Translate, convert machine independent to machine dependent program
Before machining, convert, adapt program to specific possibilities of machine
Convert program so that it can be executed in reverse order
Convert program for a 2-axis machine into program for 4-axis machine
Convert grinding machine oriented language to nc machine oriented
Convert character, ascii, text code to internal code and vice versa
Prepare nc program for selected, distinct nc machines
Derive marking from punching program, secondary from principal program
Determine automatic, manual machining of workpiece as function of specific possibilities of machine tool
Convert, translate milling to laser machining program
Convert program for different machines with different M-code, G-code, header
Convert source, high level code to machine, object code
Means, use of tables, correlating functions to instructions
Use of tables to store order of execution of functions
Comments, messages displayed with program instructions, explain process
Remarks, comments as hierarchical structure, indented, corresponds to instructions
Generate automatically machining, stitching points from scanned contour
Generate automatically a balance program for workpiece, dynamic balance
Superpose scanned or finished object image on workpiece model for best fitting
Generate machining program based on a simulation to optimize a machine parameter
Generate machining program from previous test run
Generate machining program from history of similar tools
Machining condition, parameter is workpiece conicity, inclination between surfaces
Define upper lower limit of reciprocating machining, chopping
Indicate region and kind of machining on shape of part
Machining planning, indicate kind of operation
Indicate primary and secondary operations on shape, deliver nc data for each
Program with subroutines for machining process
Input workpiece mounting position, setup
Select cutting direction
Program movement from first to second machining area
Set machining start point from tool, machining data avoiding interference
Tool path editor, for offset, multi-passes
Process planning editor
From blank and finished entered shape, derive machining features
Separate machining data as function of dependence or independance of material
Enter, edit workpiece data
Enter start position, program number for each workpiece
Use general and tool data to select available tool and machining operation
Automatic calculation cutting conditions, but operator can enter them also
Select automatically transmission conditions, but operator can enter them also
Program virtual, logical tools, select tool from function of programmed speed
Flexible fixturing, clamp workpiece, mark clamp regions and store them
Topological classification of forming, machining process
Machining parameter is strategy for making corners
Machining parameter is technology: surface roughness, corner, contour tolerance
Divide complex sculptured surface into smaller, easier to machine areas
Select, enter machining, cutting conditions, material file, tool file
Use of database for machining parameters, material, cutting method, tools
Display symbol pattern for kind of machining performed
Show shape of workpiece, point to coordinates to enter machining parameters
Selection of speed as function of tool diameter
Select machining method, parameters as function of dimensions of workpiece
Cutting, machining conditions by optimisation of time, cost, accuracy
Cutting, machining conditions by empirical equation, like tool life
Method to drill, machine based on ratio bore depth, diameter, select tools
2219/36293 . . . Set feed and speed for specified tool, workpiece as function of ratio cutting force, speed
2219/36294 . . . Stored coefficients, standard cutting conditions, calculate for entered material
2219/36295 . . . Select optimum process for manufacturing articles with longer life
2219/36296 . . . Order, select, determine, change machining sequence, order
2219/36297 . . . Machining plan, indicate order of machining as function of presence of operator
2219/36298 . . . Enter, change order of different programs to be executed
2219/36299 . . . Generate sequences of operations starting from finished product, end with raw
2219/36301 . . . Optimisation of sequence of operations
2219/36302 . . . Determine several machining processes and order as function of available tools
2219/36303 . . . Determine several machining processes and order as function of number of mountable tools
2219/36304 . . . Divide into several machining processes, divide each also in several sub processes
2219/36305 . . . Table, correlation tool type and machining category, process
2219/36306 . . . Table correlation different turrets, slides and possible simultaneous operations
2219/36307 . . . Table with workpiece features and corresponding machining parameters, methods
2219/36308 . . . Table for cutting conditions
2219/36309 . . . Program has different modules, each with own load program
2219/36311 . . . Machining mode selection, pocket, grooving, raster, area, profile
2219/36312 . . . Enter shape with cursor, joystick directions up, down, left, right, slash
2219/36313 . . . If elements cannot be combined, show error
2219/36314 . . . Superpose and combine shapes
2219/36315 . . . Library for shapes of tool holders, fixtures, chucks
2219/36316 . . . Define profile from elements, show only selectable elements
2219/36317 . . . Input symbol for element, search in library and display
2219/36318 . . . Enter start, begin and stop, end point
2219/36319 . . . Simplify display, calculation of shapes by deleting holes, grooves
2219/36321 . . . Program only shape, add approach path and machining conditions automatically
2219/36322 . . . Program shape interactively and tool change position manually by teaching
2219/36323 . . . Shape is alphabetical character
2219/36324 . . . Scan drawing, sketch of part, enter on screen coordinates, lines, circles
2219/36325 . . . Enter shape with mouse, tablet, enter on screen coordinates, lines, circles
2219/36326 . . . Define blank, part, area
2219/36327 . . . Define shape of part
2219/36328 . . . Display closed shape
2219/36329 . . . Display path on cylinder by developing cylinder into a plane
2219/36331 . . . Display block with cursor or highlight actual contour element
2219/36332 . . . Display different faces of work in different colour
2219/36333 . . . Selection from standard forms, shapes, part programs, enter value for variable
2219/36334 . . . Select a shape, select a point or line and enter data
2219/36335 . . . Select and show already defined lines, circles to define from them new element
2219/36336 . . . Select a shape and use it to create a similar shape
2219/36337 . . . Select similar shape and derive motion defining sentences from original shape
2219/36338 . . . Create program for parallel, simultaneous operated slides, timing
2219/36339 . . . Time necessary for one slide equals time for second slide
2219/36341 . . . Prepare program to control multiple slides at the same time
2219/36342 . . . Tool path processing, sequence to cut paths
2219/36343 . . . Select machining method as function of selected tool
2219/36344 . . . Display different tools in different colours
2219/36345 . . . Prepare program for minimal idle strokes with multitool turret
2219/36346 . . . Display feed quantity and cutting speed as function of material to help user
2219/36347 . . . Select tool if tool life duration is sufficient for operation
2219/36348 . . . Enter, edit tool, cutter data
2219/36349 . . . Compensation part program with form of tool, in memory
2219/36351 . . . Display tool shapes to select tool and enter tool dimensions
2219/36352 . . . Select tool as function of part shape, number of grooves and groove width
2219/36353 . . . Display different offset surfaces in different colours to select right tool
2219/36354 . . . Select from table with machining type and corresponding tools
2219/36355 . . . Select tool with fuzzy logic
2219/36356 . . . Select tool as function of collision avoidance
2219/36357 . . . Tool line up, select right order of tool, optimal tool order loading, tool file
2219/36358 . . . Use of cd rom with catalog of tools
2219/36359 . . . As function of tool location
2219/36361 . . . Tool change time, program for optimal tool change time
2219/36362 . . . Tool change time as function of location in tool magazine, index
2219/36363 . . . Tool change time as function of cutter trajectory, spindle and slide times
2219/36364 . . . Tool change time as function of tool switch time, to replace tool with another
2219/36365 . . . Program so that minimal tool changes are needed
2219/36366 . . . Data, read in, distribution
2219/36367 . . . A tape reader for each axis
2219/36368 . . . Tape reader
2219/36369 . . . Measuring object, spectacle glass, to derive position data
2219/36371 . . . Barcode reader
2219/36372 . . . Light, magnetic pen
2219/36373 . . . Common tape reader for two controllers
2219/36374 . . . Dual, multiple tape reader
2219/36375 . . . Combination of two devices, floppy disk and tape reader
2219/36376 . . . Read out of memory synchronized with machine driven axis
2219/36377 . . . Read of several jobs
2219/36378 . . . Either from tape or other source, using same electronics
2219/36379 . . . Read in
2219/36381 . . . Timing, synchronization, start of reader
2219/36382 . . . Speed of read in of data as function of available power for driving servo, safety
2219/36383 . . . Manual input combined with input from computer or tape
2219/36384 . . . Load machining program and workpiece delivery program together
2219/36385 . . . Transfer, load data from rom, bubble memory into ram
2219/36386 . . . Bootstrap loader
2219/36387 . . . Interface between reader and nc
2219/36388 . . . Simulate reader to input data direct to nc, behind tape reader BTR
2219/36389 . . . Switch between input from internal manual thumbwheel and external input
2219/36391 . . . Keep subsystem stopped while load of program
2219/36392 . . . Rewrite date if power loss, check flag area, marked at start, end of writing
2219/36393 . . . Variable read in speed, from max to zero, controls execution speed of program
2219/36394 . . . Read in data from connected pc instead of nc control panel
2219/36395 . . . Load local computer program from host, data transfer ram to rom, BTR
2219/36396 . . . Load also function code needed to execute part program, compact controller
2219/36397 . . . Read reference data only after certain delay, to be sure data will not change
2219/36398 . . . Read of handwritten text
2219/36399 . . . On excess error or on release joystick stop movement, dead man, shut off motors
2219/36401 . . . Record play back, teach position and record it then play back
2219/36402 . . . Use rope, wire, cable, chain to record position and for playback
2219/36403 . . . Incremental detector of position deviation attached to tool for correction
2219/36404 . . . Adapt taught position as function of deviation 3-D, 2-D position workpiece
2219/36405 . . . Adjust path by detecting path, line with a photosensor
2219/36406 . . . Use a spring or gas pressure to keep tool on desired path
2219/36407 . . . Follow path with probe, store deviations for correction during normal operation
2219/36408 . . . During machining, store begin and end of region not finished during first pass
2219/36409 . . . Geometric adaptation by sensing force on surface of workpiece, object
2219/36411 . . . By coarse model of robot to modify commands, learned by feedforward controller
2219/36412 . . . Fine, autonomous movement of end effector by using camera
2219/36413 . . . Adapt playback as function of hardness material, time comparison to reach start point
2219/36414 . . . Compare image detected path with stored reference, difference corrects position
2219/36415 . . . Adjust path and attitude tool by detecting path, line with a photosensor, laser
2219/36416 . . . Adapt taught position as function of deviation 3-D, 2-D position of end effector, tool
2219/36417 . . . Programmed coarse position, fine position by alignment, follow line, path adaptive
2219/36418 . . . Modify trajectory by operator gesture, gesture force sensed by end effector
2219/36419 . . . Compare modified, corrected path with stored reference, difference too large alarm
2219/36421 . . . Assist in correction of position to form a circle or line
2219/36422 . . . During teaching shut off, disable motor to move arm easy
2219/36423 . . . During teaching release brake or decouple clutch from motor
2219/36424 . . . Balance mechanically arm to be moved
2219/36425 . . . Move manually, touch surface, record position
2219/36426 . . . Pilot lamp on end effector to guide operator
2219/36427 . . . Jog feed to a command position, if close enough robot takes over positioning
2219/36428 . . . During teaching set torque instruction for motor to zero
2219/36429 . . . Power assisted positioning
2219/36431 . . . Tv camera in place of tool, on display operator marks points, crosshair
2219/36432 . . . By putting some constraints on some DOF, move within limited volumes, areas, planes, limits motion in x, y or z planes, virtual reality constraints
2219/36433 . . . Position assisted teaching
2219/36434 . . . During teaching direct control signal to power servo for quick response
2219/36435 . . . Electromyographical, myoelectric control signal
2219/36436 . . . Arm follows movement of handheld device, camera detects, analyses motion
2219/36437 . . . Follow coarse programmed surface, detect contact feeler or no force, record point
2219/36438 . . . Manually selection of points on surface to select area to scan automatically
2219/36439 . . . Guide arm in path by slaving arm to projected path, beam riding
2219/36441 . . . Follow contour, line with sensor and record points
2219/36442 . . . Automatically teaching, teach by showing
2219/36443 . . . Auto follow coarse contour, operator can correct contour before recording
2219/36444 . . . Contour, teach contour of sawblade
2219/36445 . . . Mode selection between large displacement and precision work
2219/36446 . . . Keep tool stationary, move workpiece
2219/36447 . . . Project light on path to be followed, keep also distance constant
2219/36448 . . . Teaching, consider workpoint on workpiece temporarily as tip of end effector
2219/36449 . . . During teaching use standard subroutines, assemble them to macro sequences
2219/36451 . . . Handheld tool like probe, work instructor, lightweight, connected to recorder
2219/36452 . . . Touch points with handheld probe, camera detects position and orientation probe
2219/36453 . . . Handheld tool like probe
2219/36454 . . . Master slave, director agent, operator replication
2219/36455 . . . Sensor, tactile feedback, operator feels forces of tool on workpiece
2219/36456 . . . Learning tool holding dynamics
2219/36457 . . . During teaching, force set point is automatically adapted to circumstances
2219/36458 . . . Teach only some points, for playback interpolation between points
2219/36459 . . . offline program for plural robots, send data to corresponding robots
2219/36461 . . . Teach for each next similar fixture, piece only some reference points
2219/36462 . . . Minimize teach time, compress data, many points in curve, few in line
2219/36463 . . . Manual switch to drive motor to wanted position, store, memorize position
2219/36464 . . . Position, teach, store extreme, full open, closed positions
2219/36465 . . . Teach and store also intermediate, between full open and closed positions, areas
2219/36466 . . . Teach motion profile in both directions, between full closed and open position
2219/36467 . . . Teach and store time needed from open to closed and closed to open position
2219/36468 . . . Teach and store intermediate stop position in moving route to avoid collision
2219/36469 . . . Separate axis movement with higher acceleration replaces simultaneous movement
2219/36471 . . . Recording speed different from playback speed
2219/36472 . . . During teaching low servo power, during playback high servo power
2219/36473 . . . Prohibit teaching if force, speed, acceleration of end effector is out of safe range
2219/36474 . . . Prohibit normal manipulator control during teaching
2219/36475 . . . When operator near robot, local pendant is enabled otherwise select local remote
2219/36476 . . . Record points if sufficient difference with previous position exists
2219/36477 . . . Timing record position according to pulses coding wheel
2219/36478 . . . Record on predetermined time, read in position, measured data
2219/36479 . . . Record position on trigger of touch probe
2219/36481 . . . Record at predetermined distances, read in position, measured data
2219/36482 . . . Recording of position and of command instructions
2219/36483 . . . Recording mechanical properties, tonal quality by force detection
2219/36484 . . . Each taught point has a correlated amount of shift data, independently modified
2219/36485 . . . Memorize open and closed state, motion parameters at each start up
2219/36486 . . . Memorize workpiece deviations as function of angle, compensate, extra feed
2219/36487 . . . Record position, motion and sound
2219/36488 . . . Record motion and emotion, mimics
2219/36489 . . . Position and force
2219/36491 . . . Contour of workpiece where other workpiece is to be installed
2219/36492 . . . Record position and orientation, posture of probe, tool
2219/36493 . . . Position of stillstand if no reverse and acceleration only, data compression
2219/36494 . . . Record position and inclination of tool, wrist
2219/36495 . . . Recording position and other parameters, current, tool diameter, voltage
2219/36496 . . . Memorize open, closed state of hand and corresponding motion parameters such as open, close and move, no move
2219/36499 . . . Part program, workpiece, geometry and environment, machining dependant, combine
2219/36501 . . . For each contour a tape, a program
2219/36502 . . . Ram for variable servo data, rom for fixed servo routine
2219/36503 . . . Adapt program to real coordinates, software orientation
2219/36504 . . . Adapt program to real coordinates, shape, dimension of tool, offset path
2219/36505 . . . Compare stored conditions to actual, adapt program
2219/36506 . . . Store in Rom and Ram
2219/36507 . . . Select program or execute command, control instructions as function of axis position
2219/36508 . . . Each pallet, workpiece, tool holder, selects corresponding tape reader, program
2219/36509 . . . Select as function of shape, dimension of workpiece
2219/36511 . . . Select by a detector
2219/36512 . . . Select by a selector, dip switch
2219/36513 . . . Select out of a plurality of programs, patterns
2219/36514 . . . Select by force, height or other detection
2219/36515 . . . As function of material or pattern direction, nerves of wood for optimal cutting
2219/36516 . . . Select acceleration deceleration profile as function of kind of machine
2219/36517 . . . Selecting nc program points to mated manipulator, robot program
2219/36518 . . . Selection of calibration program as function of parameter to be calibrated
2219/36519 . . . After sporadic change of program, return to program in use before
2219/36521 . . . Select by combination of detected force, acceleration, speed, work rate
2219/36522 . . . Select program using a management, workpiece number
2219/36523 . . . Select with code on workpiece, fixture, clamp, object
2219/36524 . . . Selection of Rom and ram
2219/36525 . . . On bad data block, reverse motion, correct and execute block
2219/36526 . . . Regenerate, hold reference previous block for bad actual value, block
2219/36527 . . . Separate input for machine data from operator and for program from programmer
2219/36528 . . . Interlock, inhibit nc control while tranferring data from host
2219/36529 . . . Warn, alert, notify operator to confirm a preset override value, command
2219/36531 . . . Inhibit, ignore or postpone new command if previous is still in execution
2219/36532 . . . Detect overflow of buffer
2219/36533 . . . Writing critical contour data as a whole, inhibit read out during writing
2219/36534 . . . Manual input overrides automatic control
2219/36535 . . . Check if instruction is executable, if not message to operator
2219/36536 . . . Inhibit, forbid, prevent execution of program if no tool or worpiece data
2219/36537 . . . On error acoustic signal
2219/36538 . . . Different tunes, melodies, voice patterns for different error indication
2219/36539 . . . Different colours for program and machine error, failure display
2219/36541 . . . Operation command stored in register, on completion also in other register
2219/36542 . . . Cryptography, encrypt, access, authorize with key, code, password
2219/36543 . . . Input a standard value automatically on power up or after power loss
2219/36544 . . . Inhibiting manual control while under automatic, other control vice versa
2219/36545 . . . Safety, save data at power loss
2219/36546 . . . Memory protection, protected fields
2219/36547 . . . Use binary code to avoid program tampering
2219/36548 . . . Save data if trigger signal received
2219/36549 . . . Regenerate faulty program block from previous and next block
2219/36551 . . . Inhibiting control after detecting data error
2219/36552 . . . Inhibiting simultaneous input from local and remote keyboard
2219/36553 . . . Track, channel on tape for each direction of movement
2219/36554 . . . Copy modified, corrected program to another tape, keep original intact
2219/36555 . . . Two tapes, programs one for position data, one for commands
2219/36556 . . . Compare, check original tape with converted, copy tape
2219/36557 . . . Copy entered program in memory to tape
2219/36558 . . . Forward and backward reading of tape, reverse execution program
2219/36559 . . . Copy one tape to another, transfer program from tape to tape, back-up
2219/36561 . . . Tape, band
2219/36562 . . . One tape, copy feeler controls several machines
2219/36563 . . . Two tapes
2219/36564 . . . Position of hole in tape corresponds with position of hole on worpiece
2219/36565 . . . Cartesian and polar data mixed
2219/36566 . . . Mix polar data with cartesian data
2219/36567 . . . On tape also commands for equipment attached to machine
2219/36568 . . . Control data is sequence of position, axis indication, time delay for speed
2219/36569 . . . Enter, punch only different, changed data, same not repeated in next block
2219/36571 . . . Coarse and fine dimensions
2219/36572 . . . Macro data or coarse dimension on tape
2219/36573 . . . X, y, z and tooloffset values or direction values
2219/36574 . . . Absolute x or delta x values
2219/36575 . . . On tape reference and command signals
2219/36576 . . . Relative phase of signals is variable
2219/36577 . . . Signals have a position dependant frequency
2219/36578 . . . Tracks for x, two for delta x, one for sign, three for y
2219/36579 . . . Only true dimension is recorded, no tool offset
2219/36581 . . . X, Y, Vx, Vy
2219/36582 . . . Special order
2219/36583 . . . Each punched hole is one pulse, increment
2219/36584 . . . X, Y, Z and tool offset or corrections
2219/36585 . . . Speed and acceleration, rate of change of speed
2219/36586 . . . Word address format
2219/36587 . . . Binary format
2219/36588 . . . Endless loop
2219/36589 . . . Making control tape
2219/36591 . . . Tape moves synchronized with machine driven axis
2219/36592 . . . Each track controls an axis
2219/37 . . . Measurements
2219/37001 . . . Measuring problems
2219/37002 . . . Absence, detect absence, presence or correct position of workpiece
2219/37003 . . . Detect if no workpiece in holder
2219/37004 . . . Detect absence of tool
2219/37005 . . . Absence of tool accessories, material, like nails, staples, glue
2219/37006 . . . Measuring bars
2219/37007 . . . Join bars or cylinders binary
2219/37008 . . . Calibration of measuring system, probe, sensor
2219/37009 . . . Calibration of vision system, camera, adapt light level
2219/37011 . . . Set absolute marks on disk as exact position or address to position memory
2219/37012 . . . Adjust angular position of transducer
2219/37013 . . . Faulty number of total scale increments corrected evenly over scale
2219/37014 . . . Use of calibration bar, bar with cams
2219/37015 . . . Adaptive online camera, vision calibration
2219/37016 . . . Calibrate dc offset, measure offset and maintain fixed level
2219/37017 . . . Calibration of vision system, set correct attitude of sensor to worpiece
2219/37018 . . . Make measuring scale machine tool
2219/37019 . . . Position detection integrated in actuator, lvdt integrated linear actuator
2219/37021 . . . Robot controls position of touch probe
2219/37022 . . . Detector, measuring device incorporated within workpiece holder
2219/37023 . . . Step motor used as measuring device and as drive motor
2219/37024 . . . Measure single value, parameter with two detectors
2219/37025 . . . Retract, swing out of the way, measuring device during normal machining for protection
2219/37026 . . . Adjust sensor radially
2219/37027 . . . Sensor integrated with tool or machine
2219/37028 . . . Detail, extended range, discrimination, switch from one range to other
2219/37029 . . . Power supply position detector in common with drive motor
2219/37031 . . . Lvdt for x and y in a plane, center lines intersect at locating point
2219/37032 . . . Generate vibrations, ultrasound
2219/37033 . . . Energy saving by powering feedback device, potentiometer only during measuring
2219/37034 . . . Actuator coil is also used as measuring coil
Sensor in air gap of drive, detect directly speed or position

Position normally, stop, measure position tool with second independent sensor

Remeasure workpiece regularly for deformation

Protection cover over measuring device, probe, feeler opened when measuring

Digitize position with flexible feeler, correction of position as function of flexion

Digitize, electric wires form grid on surface

Photographic, picture on film, photogrammetry

Touch probe, store position of touch point on surface

Ultrasound transmitters on surface, touch probe detects ultrasound, triangulation

Probe detects electromagnetic fields from grid, antenna like digitizing tablet

Use simultaneous several pairs of stereo cameras, synchronized

After digitizing, edit graphically data

Split beam, stripe projection on object, lines detected with cameras

First a rasterscan, then align workpiece as function of height average, scan again

First coarse measurement, around each point a fine measurement of surface

Sense surface, mean value used as reference surface

Optical triangulation

Digitize every grid point of a raster

Project stripes having a regular sine wave

Mark point to be digitized graphically on screen

Several feelers, probes touch model in rasterpoints

Digitize not only position but also colour

Probe connected to three pair of wires of which the length is measured

Use matrix of optical sensors to detect form, edges of object

Regulated scanning, the head deflection is controlled by a regulation circuit

Controlled scanning, the head is moved along a given path

After digitizing, reconstruct surface by interpolating the initial mesh points

Map of stiffness, compliance of object

Image from object together with references on background

Calibrate work surface, reference markings on object, work surface

Setting reference coordinate frame

Calibrate probe, imitated tool, repeated measurements for different orientations

Measurement program is created, executed on object data, no real object, no CMM is present

Surface covered with grid of electric wires, of coloured tape on object

Workpiece surface covered with shielding coating, against disturbing fields

Projection device, monitor, track tool, workpiece form, process on display

Print out of document measured results or record on tape

Display load on tool, motor graphically on screen

Relative movement

Display machining, processing parameters with curves, pictograms

Display probing result on drawing taken from cad data

Indicate, point region on path, locus, display path and machining parameters

Switch display from normal mode to inspection mode, to monitor conditions

Display tool parameters

Display in real time of state variables of control system

Display real, measured machining load

Cutting forces

Indicate service condition, status

Speed error

Motion and force

Display position actual and or target

Display speed

Hall sensor

Digital handheld device with data interface

Invar scale, low temperature coefficient

Marker on workpiece to detect reference position

X y scale plate instead of two ruler scale, two dimensional scale

One detector for coarse and fine target location, variable resolution

Vector gauge, telescopic ballbar

Single detector for whole range, both x and y axis

Limit, proximity switch

Absolute encoder

Soft limit, store limits in counters, use content of counters as limit

Inductive, differential transformer, pins

Acupin

Rasters, grid on xy-plane

Photoelectric scanned raster, rule and photocell, microscope

Rule and photocell, microscope

Several scales with one device

Psd position sensitive detector, light spot on surface gives x, y position

Precision screw

Photogrammetric position detection

Shape sensor leads tool, in front of tool

Optical sensor, delivers analog signal as function of displacement

Inductive, coil moves over conical, tapered core

Atomic force probe

Linear transducer

Signal analyser

Extensible ball bar with potentiometer, ldvt

Magnetic sensor

Photosensor, as contactless analog position sensor, signal as function of position
2219/37126 . . . Wire, tape around cylinder measures displacement, string encoder
2219/37127 . . . Spm scanning probe microscopy, stm scanning tunneling microscopy
2219/37128 . . . Tool itself emits vibrations to be detected to build an image of surface
2219/37129 . . . Mark, engrave workpiece at specific surface point for measurement, calibration
2219/37131 . . . Moire pattern, diffraction grating, fringe
2219/37132 . . . Polyhedral prism
2219/37133 . . . Linear, rotary variable differential transformer, lvdt, rvdt
2219/37134 . . . Gyroscope
2219/37135 . . . Two counters receiving pulses from two encoders, one for speed, one for position
2219/37136 . . . Control resolution of encoder
2219/37137 . . . Encoder combined with barcode label, reader
2219/37138 . . . Encoder and gear and absolute coder, give together absolute position of rotation
2219/37139 . . . Sampling output of encoder at precisely defined intervals
2219/37141 . . . Programmable divider for counter as buffer for microprocessor, read on interrupt
2219/37142 . . . Center position between two pulses, in the middle of a bit
2219/37143 . . . Divide feedback pulses to make feedback independent from resolution encoder
2219/37144 . . . Delay marker to synchronize motions
2219/37145 . . . Multiturn fine counter counts total pulses, index counter counts turns
2219/37146 . . . Second counter reset to zero on marker, to detect counting errors
2219/37147 . . . Sampling rate low during power loss
2219/37148 . . . Switch between rise, fall of pulses of one phase and of both phases, coarse fine
2219/37149 . . . Multiplexer to send encoder and rotor pole position to same output lines
2219/37151 . . . Handling encoder signal, compensation for light variation, stray light
2219/37152 . . . Combination 00-01-10-11, previous, actual pulses, or two series of pulses, and rom
2219/37153 . . . Encoder delivers only one channel of pulses, using only one detector
2219/37154 . . . Encoder and absolute position counter
2219/37155 . . . Encoder and delta position counter
2219/37156 . . . Pulse derived from belt driving drum
2219/37157 . . . Pulses derived from brake disk having north and south poles
2219/37158 . . . Pulse derived from perforated belt along track
2219/37159 . . . Source of pulse, pulse derived from gear, plate teeth
2219/37161 . . . Motor rotor has a normal magnetised ring and a second ring, magnetic decoder
2219/37162 . . . Marker, reflector mounted on chuck, workpiece holder
2219/37163 . . . Marker derived from phase of motor
2219/37164 . . . Pulse derived from encoder built into ball bearing
2219/37165 . . . Derive pulse from commutation position, build into brushless motor
2219/37166 . . . Rotating magnets shunt motor over resistance, cause current variations
2219/37167 . . . Count number of periods of voltage supply
2219/37168 . . . Inductive sensor senses fluctuations, spikes in motor current
2219/37169 . . . Derive incremental pulse from motor current deviation
2219/37171 . . . Commutation brushes, sensors deliver increment
2219/37172 . . . Encoder with hall effect and reed relays, and decoder gives absolute position
2219/37173 . . . Encapsulate electronics of encoder in resin, electronics and encoder integrated
2219/37174 . . . Encoder with infrared
2219/37175 . . . Normal encoder, disk for pulses, incremental
2219/37176 . . . Disk emits phase shifted pulses, special convertor
2219/37177 . . . Linear encoder
2219/37178 . . . Magnetic marks on screw
2219/37179 . . . Encoder delivers sinusoidal signals
2219/37182 . . . Split plate encoder
2219/37183 . . . Marker or index or coded information as well as position pulses
2219/37184 . . . Hall generator cooperates with magnetic ring, gives signal with dc offset
2219/37185 . . . Magnetic ring and sensor
2219/37186 . . . Camera reads large number of marks, derive frequency of dark-light
2219/37187 . . . Disk with magnetic, inductive sensors
2219/37188 . . . Encoder pulses reset high resolution clock, get position from counting clock pulses
2219/37189 . . . Camera with image processing emulates encoder output
2219/37191 . . . General problems for standing waves, torque, surface inspection
2219/37192 . . . Problems
2219/37193 . . . Multicoordinate measuring system, machine, cmm
2219/37194 . . . Probe work, calculate shape independent of position, orientation, best fit
2219/37195 . . . Measuring dimension independent from accuracy of nc, machine tool
2219/37196 . . . Measuring station, flexible, integrated cmm
2219/37197 . . . From measured data derive form, roundness, orientation, parallel, straightness
2219/37198 . . . Machine as measuring station, use tool or probe, in process incycle
2219/37199 . . . Hole location
2219/37201 . . . Measuring several points at the same time
2219/37202 . . . Footprint, probe piece on machine, then on cmm to avoid errors of machine
2219/37203 . . . Compensate probed values as function of reference plane of fixture, clamp
2219/37204 . . . Move synchronously associated sensor elements independently at both sides
2219/37205 . . . Compare measured, vision data with computer model, cad data
2219/37206 . . . Inspection of surface
2219/37207 . . . Verify, probe, workpiece
2219/37208 . . . Vision, visual inspection of workpiece
2219/37209 . . . Estimate life of gear, drive
2219/37211 . . . Measure temperature, compensate cmm program for temperature
2219/37212 . . . Visual inspection of workpiece and tool
2219/37213 . . . Inhibit measuring if one of the joints is near endstop
2219/37214 . . . Detect failed machine component, machine performance degradation
2219/37215 . . . Inspect application of solder paste, glue to workpiece
2219/37216 . . . Inspect component placement
2219/37217 . . . Inspect solder joint, machined part, workpiece, welding result
2219/37218 . . . Compensate for offset due to probe diameter, detect exact contact point
2219/37219 . . . Predict next probed point from previous probed points
2219/37221 . . . Probe fixture to know datum points
2219/37222 . . . Probe workpiece for correct setup
2219/37223 . . . Identify minimum number of appropriate measuring points
2219/37224 . . . Inspect wafer
2219/37225 . . . Tool holder, measure forces in chuck, tool holder
2219/37226 . . . Monitor condition of spindle, tool holder, transmit to nc controller
2219/37227 . . . Probing tool for its geometry
2219/37228 . . . Tool inspection, condition, dull tool
2219/37229 . . . Test quality tool by measuring time needed for machining
2219/37231 . . . Tool used as touch probe, sensor
2219/37232 . . . Wear, breakage detection derived from tailstock, headstock or rest
2219/37233 . . . Breakage, wear of rotating tool with multident saw, mill, drill
2219/37234 . . . Monitor tool before, after and during machining
2219/37235 . . . Detect bad tool by relative movement of tool with respect to tool holder
2219/37236 . . . Tool serves, acts also as measuring device
2219/37237 . . . Tool collision, interference
2219/37238 . . . Missing tool
2219/37239 . . . Plastic deformation of tool
2219/37241 . . . Displacement of tool, miss inserted
2219/37242 . . . Tool signature, compare pattern with detected signal
2219/37243 . . . Tool breakage by comparing tool image, length before and after machining
2219/37244 . . . Detect tool breakage already in tool magazine
2219/37245 . . . Breakage tool, failure
2219/37246 . . . Compare estimated torques of different axis with reference for breakage
2219/37247 . . . By electrical contact, disappears when breakage
2219/37248 . . . By monitoring changes in capacitive circuit
2219/37249 . . . Correction coefficient of life time as function of kind of machining
2219/37251 . . . Selfcorrecting, counter for tool life adapts correction
2219/37252 . . . Life of tool, service life, decay, wear estimation
2219/37253 . . . Fail estimation as function of lapsed time of use
2219/37254 . . . Estimate wear of subsystem of machine with measures from other subsystems
2219/37255 . . . Using fuzzy logic techniques
2219/37256 . . . Wear, tool wear
2219/37257 . . . Crater wear of tool
2219/37258 . . . Calculate wear from workpiece and tool material, machining operations
2219/37259 . . . Resolver for coarse, photo cell for fine position on grid crossing
2219/37261 . . . Encoder and potentiometer to detect fault measurement
2219/37262 . . . Mixing pins and fine positioning
2219/37263 . . . Absolute and incremental encoder, detector combined
2219/37264 . . . Cam for absolute positions, encoder for incremental position
2219/37265 . . . Rotary potentiometer and incremental counter for each maximum
2219/37266 . . . Infrared
2219/37267 . . . Thermocouple
2219/37268 . . . Tool workpiece junction, thermoelectric interface
2219/37269 . . . Ultrasonic, ultrasound, sonar
2219/37271 . . . Using standing waves
2219/37272 . . . Capacitive
2219/37273 . . . Wheatstone bridge
2219/37274 . . . Strain gauge
2219/37275 . . . Laser, interferometer
2219/37276 . . . Position changes frequency
2219/37277 . . . Inductive proximity sensor
2219/37278 . . . Optical waveguide, fiberoptic sensor
2219/37279 . . . Fiber optic proximity sensor
2219/37281 . . . Laser range finder
2219/37282 . . . Current transformer
2219/37283 . . . Photoelectric sensor
2219/37284 . . . Capacitive 3-D proximity sensor
2219/37285 . . . Load, current taken by motor
2219/37286 . . . Photoelectric sensor with reflection, emits and receives modulated light
2219/37287 . . . Fiber optic interferometer
2219/37288 . . . Tracking lasers follow object, reflection gives 3-D position
2219/37289 . . . Inductive
2219/37291 . . . Electro acoustic
2219/37292 . . . Eddy current
2219/37293 . . . Magnetostrictive effect on ferrous rod, ultrasonic wave, time delay measured
2219/37294 . . . Coarse digitized position combined with fine digitized analog position signal
2219/37295 . . . Measure workpiece while machining other workpiece
2219/37296 . . . Electronic graduation, scale expansion, interpolation
2219/37297 . . . Two measurements, on driving motor and on slide or on both sides of motor
2219/37298 . . . Two measurements, position of slide and position of tool
2219/37299 . . . Measure same parameter from three different space directions
2219/37301 . . . Two measurements, speed with tachometer and speed with encoder
2219/37302 . . . Measure tool length, workpiece configuration without stopping movement
2219/37303 . . . Two measurements, speed of motor and speed of load
2219/37304 . . . Combined position measurement, encoder and separate laser, two different sensors
G05B

Drive step motor with pulses, at stop with dc current to avoid emi when measuring
Two sensors and two scales for same measurement of relative movement between x y
Detector in line, in plane of tool to avoid parallax
Measure workpiece relieved from stress, redrawn, disengaged tool
Selecting a desired sensor structure
Derive speed from current, use of lookup table
Derive speed from motor current
Derive speed from position
Derive position from speed
High speed and low speed signals are derived in a different way
Derive speed from two phased position signals, with high range and resolution
Derive position from current, voltage, back electromotive force bemf
Derive speed from back electromotive force, bemf
Derive acceleration, force, torque from current
Derive acceleration from net driving force
Derive position from frequency power supply
Derive position from acceleration
Derive position, speed from acceleration
Multisensor integration, fusion, redundant
Automatic configuration of multisensor, adaptive, active sensing
Select lookup table corresponding to sensor
Decentralised data fusion
Far away and near by sensor groups
Sensor fusion using extended kalman filter
Detect power of noise source using sound and sensor fusion using extended kalman filter
Decentralised data fusion
Select lookup table corresponding to sensor
Select multisensor structure
Detecting contact between workpiece and tool, orientation of workpiece or tool
Bending, springback angle
Differential pressure
Pressure
Thickness
Pressure
Differential pressure
Flatness, roughness of surface
Bending, springback angle
Orientation of workpiece or tool, surface sensor
Contact detection between workpiece and tool, probe, feeder
Detect position of detector contact point relative to reference on tool slide
Detect position of detector contact point relative to reference on tool
Combination of contact and contactless detection to avoid tool contact with workpiece
Measure different pressure of fluid flow on contacting surface
2219/37411 . . . Measure contact from force and velocity detection
2219/37412 . . . Acoustical detection of contact
2219/37413 . . . By conductivity, short circuit between tool, probe and metallic surface
2219/37414 . . . By microswitch
2219/37415 . . . By cutting light beam
2219/37416 . . . By measuring phase shift between voltage and current of feed motor
2219/37417 . . . By linear varying electrical signal
2219/37418 . . . By capacitive means
2219/37419 . . . Measuring rotation of non driven axis after being touched by driven axis
2219/37421 . . . Measure braking, slower rotation of driven axis, tool upon contact
2219/37422 . . . Distance and attitude detector
2219/37423 . . . Distance, gap between tool and surface sensor
2219/37424 . . . Calculate distance from known inner diameter of coil, bobbin and detected image
2219/37425 . . . Distance, range
2219/37426 . . . Detected with infrared sensor
2219/37427 . . . Detected with thermocouple
2219/37428 . . . Temperature of tool
2219/37429 . . . Temperature of motor
2219/37431 . . . Temperature
2219/37432 . . . Detected by accelerometer, piezo electric
2219/37433 . . . Detected by acoustic emission, microphone
2219/37434 . . . Measuring vibration of machine or workpiece or tool
2219/37435 . . . Vibration of machine
2219/37436 . . . Prediction of displacement, relative or absolute, motion
2219/37437 . . . Prediction of cutting force with flexible ball end milling model
2219/37438 . . . Prediction of machining error with flexible ball end milling model
2219/37439 . . . Computer assisted inspection, cad interactive with manual commands
2219/37441 . . . Use nc machining program, cad data for measuring, inspection
2219/37442 . . . Cad and cap for cmm
2219/37443 . . . Program cmm, coordinate measuring machine, use cad data
2219/37444 . . . Program cmm by using a stylus to detect points on a real workpiece
2219/37445 . . . Load teaching program from file server, enter teaching data at pendant
2219/37446 . . . Select measuring program together with control parameters
2219/37447 . . . Path planning using ann, for measurement task pattern, optimal path, dummy points
2219/37448 . . . Inspection process planner
2219/37449 . . . Inspection path planner
2219/37451 . . . Plan sensor placement for optimal inspection
2219/37452 . . . Generate nc program from metrology program, defining cmm probe path
2219/37453 . . . Simulate measuring program, graphical interactive generation of program
2219/37454 . . . Interactive, enter also tolerance
2219/37455 . . . After entering one measuring cycle, display in separate window instruction list
2219/37456 . . . Program proposes measuring points
2219/37457 . . . On machine, on workpiece
2219/37458 . . . Reference on machine, on workpiece and on tool
2219/37459 . . . Reference on workpiece, moving workpiece moves reference point
2219/37461 . . . Two rotary potentiometers, only one used, switch over to other on ambiguity
2219/37462 . . . Resistor, potentiometers
2219/37463 . . . Tapped resistors, not continuous
2219/37464 . . . Potentiometer with dual wiper
2219/37465 . . . Magnetic resistor
2219/37466 . . . Dual potentiometers with sin and cos output
2219/37467 . . . Continuous rotary potentiometer, no end
2219/37468 . . . Magnetic resistor sensors used as incremental encoder
2219/37469 . . . Two, more slides use resolver with common secondary, different primary frequency
2219/37471 . . . Resolver, synchro
2219/37472 . . . Synchro
2219/37473 . . . Resolver
2219/37474 . . . Resolver with several phases
2219/37475 . . . Resolver emits two redundant signals for safety
2219/37476 . . . Single resolver for speed, rotor and absolute position, IMAS
2219/37477 . . . Inductosyn
2219/37478 . . . Excitation of resolver by pulses instead of continuous wave, to save energy
2219/37479 . . . Excitation as function of speed of rotor, to get always stable detection waves
2219/37480 . . . Sampling rate for output of resolver as function of pulse rate of excitation
2219/37482 . . . Control amplitude of excitation of resolver
2219/37483 . . . Synchronize resolver reference frequency with clock of position control
2219/37484 . . . Differential resolver
2219/37485 . . . Phaseshift to reference counted
2219/37486 . . . Resolver emits pulses at zero crossings, counter
2219/37487 . . . Counter combined with angle to digital convertor
2219/37488 . . . Angle to digital conversion
2219/37489 . . . Emit binary code at quadrant 00+01+10+11, count pulse for 11-to-000 and 00-to-11
2219/37491 . . . Compensate non linearity of transducer by lookup table
2219/37492 . . . Store measured value in memory, to be used afterwards
2219/37493 . . . Use of different frequency band pass filters to separate different signals
2219/37494 . . . Intelligent sensor, data handling incorporated in sensor
2219/37495 . . . Correction of measured value as function of given, reference surface
2219/37496 . . . Root mean square
2219/37497 . . . Summing, integration of signal
2219/37498 . . . Variable amplification, gain for detected signal, select correct level range
2219/37499 . . . Determine cumulative deviation, difference
2219/37501 . . . Delay detected signal avoids transients, start up noise
2219/37502 . . . Input signal converted to logarithmic value
2219/37503 . . . Set integrator of acceleration detector to zero at velocity zero, avoids drift
2219/37504 . . . Differential use of sensors, to double precision
2219/37505 . . . Debounce contact signal from absolute reference position cam
2219/37506 . . . Correction of position error
2219/37507 . . . Spectral density analysis
2219/37508 . . . Cross correlation
2219/37509 . . . Intelligent sensor, incorporation temperature compensation
2219/37511 . . . Select and process only those detected signals needed for a certain purpose
2219/37512 . . . Correction for detection delay
2219/37513 . . . Convert time domain signal to frequency domain signal
2219/37514 . . . Detect normality, novelty in time series for online monitoring
2219/37515 . . . Error separation, eliminate eccentricity
2219/37516 . . . Combine results, opinions of multiple but same sensors, fuzzy logic
2219/37517 . . . Compensation of position for vibration of probe, calibration x-y lookup table
2219/37518 . . . Prediction, estimation of machining parameters from cutting data
2219/37519 . . . From machining parameters classify different fault cases
2219/37521 . . . Ann to map sensor signals to decision signals
2219/37522 . . . Determine validity of measured signals
2219/37523 . . . Reduce noise by combination of digital filter and estimator
2219/37524 . . . Sampling of forces and signal analysis are triggered as function of rotation angle
2219/37525 . . . Mean, average values, statistical derived values
2219/37526 . . . Determine time or position to take a measurement
2219/37527 . . . Frequency filtering and amplitude qualification
2219/37528 . . . Separate force signal into static and dynamic component
2219/37529 . . . Synchronous demodulation
2219/37531 . . . Superpose modulated measuring signal on servo command reference
2219/37532 . . . Synchronized data acquisition
2219/37533 . . . Real time processing of data acquisition, monitoring
2219/37534 . . . Frequency analysis
2219/37535 . . . Signal processing, ratio of signals against fluctuation of signals
2219/37536 . . . Rate of change, derivative
2219/37537 . . . Virtual sensor
2219/37538 . . . Window for signal, to detect signal at peak or zero values
2219/37539 . . . Read values twice, for correctness
2219/37541 . . . Switch off measuring, control system during test of encoder, resolver
2219/37542 . . . Curve fitting measured points, predict, extrapolate dimension in time
2219/37543 . . . Set, compare to maximum, peak, minimum value
2219/37544 . . . Compare detected signal to several references to derive several control actions
2219/37545 . . . References to be compared vary with evolution of measured signals, auto-calibrate
2219/37546 . . . Compare two positions measured with different methods, alarm if difference too high
2219/37547 . . . Ignore position information from detector during invalid intervals
2219/37548 . . . Avoid false motion condition, jitter, compare three recent values with possible values
2219/37549 . . . Limit switch protected against overload
2219/37551 . . . Select for each detector type corresponding signal processor
2219/37552 . . . Detect loss of correct excitation moment of step motor, correct excitation
2219/37553 . . . Two cameras one for coarse scanning, other for fine scanning
2219/37554 . . . Two camera, or tiltable camera to detect different surfaces of the object
2219/37555 . . . Camera detects orientation, position workpiece, points of workpiece
2219/37556 . . . Camera detects fictive contour of workpiece, by reflection
2219/37557 . . . Camera for coarse, acoustic array for fine vision
2219/37558 . . . Optical sensor, scanner
2219/37559 . . . Camera, vision of tool, compute tool center, detect tool wear
2219/37561 . . . Move camera until image corresponds to stored image of same workpiece
2219/37562 . . . Scan mark at certain angle, to avoid glare noise
2219/37563 . . . Ccd, tv camera
2219/37564 . . . Center of camera vision aligned with axis of drill
2219/37565 . . . Camera to detect precisely, crosshair, positions on workpiece by operator
2219/37566 . . . Explore autonomous, explore surface until useful measurement possible
2219/37567 . . . 3-D vision, stereo vision, with two cameras
2219/37568 . . . 3-D spectacles, glasses, left and right synchronised with images on screen
2219/37569 . . . Radiography in x and y, x-ray images
2219/37571 . . . Camera detecting reflected light from laser
2219/37572 . . . Camera, tv, vision
2219/37573 . . . In-cycle, insitu, during machining workpiece is measured continuously
2219/37574 . . . In-process, in cycle, machine part, measure part, machine same part
2219/37575 . . . Pre-process, measure workpiece before machining
2219/37576 . . . Post-process, measure worpice after machining, use results for new or same
2219/37577 . . . In-process and post-process measurement combined
2219/37578 . . . Compare images of workpiece before and after machining
2219/37579 . . . Run away measured value by differentiating measured signal, rate of change
2219/37581 . . . Measuring errors
2219/37582 . . . Position, angle of workpiece surface
2219/37583 . . . Detect separation, cutting, penetration, piercing, break through material
2219/37584 . . . Deformation of machined material
2219/37585 . . . Start, begin and end, halt, stop of machining
2219/37586 . . . Detect, discriminate cutting or non cutting machining state
2219/37587 . . . Count number of machining cycles, frequency use of tool
2219/37588 . . . Detect swarf, building up of swarf
2219/37589 . . . Measure drift of servo during positioning, not disturbing actual position
G05B

2219/37591 . . . Plant characteristics
2219/37592 . . . Detect machine, workpiece noise by operator with headphone, directional
2219/37593 . . . Measure correct setting of workpiece
2219/37594 . . . Detect discharge state between electrode and workpiece
2219/37595 . . . Detect if drill bit is in peck cycle
2219/37596 . . . Surface layer to be machined away, lowest point, minimum material to be cut
2219/37597 . . . Spectrum analyser
2219/37598 . . . Chip length
2219/37599 . . . Presence of metal
2219/37601 . . . Count number of times tool is overloaded, derived from mean and limit
2219/37602 . . . Material removal rate
2219/37603 . . . System time constant
2219/37604 . . . Hysteresis of actuator, servo
2219/37605 . . . Accuracy, repeatability of machine, robot
2219/37606 . . . Thread form, parameters
2219/37607 . . . Circular form
2219/37608 . . . Center and diameter of hole, wafer, object
2219/37609 . . . Over-travel
2219/37611 . . . Relative movement between tool and workpiece carriage
2219/37612 . . . Transfer function, kinematic identification, parameter estimation, response
2219/37613 . . . Cutter axis tilt of end mill
2219/37614 . . . Number of workpieces, counter
2219/37615 . . . Dead time, between detecting finished workpieces and feedback measured value
2219/37616 . . . Use same monitoring tools to monitor tool and workpiece
2219/37617 . . . Tolerance of form, shape or position
2219/37618 . . . Observe, monitor position, posture of tool
2219/37619 . . . Characteristics of machine, deviation of movement, gauge
2219/37621 . . . Inertia, mass of rotating, moving tool, workpiece, element
2219/37622 . . . Detect collision, blocking, stall by change, lag in position
2219/37623 . . . Detect collision, blocking by use of integrated load between two limits
2219/37624 . . . Detect collision, blocking by measuring change of velocity or torque
2219/37625 . . . By measuring changing forces in a time window
2219/37626 . . . By measuring changing forces in different position zones
2219/37627 . . . Measure elapsed time needed for positioning
2219/37628 . . . Use of special detector the output of which changes if object detected
2219/37629 . . . Detect sudden change of direction due to collision
2219/37631 . . . Means detecting object in forbidden zone
2219/37632 . . . By measuring current, load of motor
2219/37633 . . . Output modulated signal on detection of blocking instead of flat signal
2219/37634 . . . By measuring vibration
2219/39 . . . Robotics, robotics to robotics hand
2219/39001 . . . Robot, manipulator control
2219/39002 . . . Move tip of arm on straight line
2219/39003 . . . Move end effector on ellipse, circle, sphere
2219/39004 . . . Assisted by automatic control system for certain functions
2219/39005 . . . Feedback for stability of manipulator, felt as force reflection
2219/39006 . . . Move end effector in a plane, describing a raster, meander
2219/39007 . . . Calibrate by switching links to mirror position, tip remains on reference point
2219/39008 . . . Fixed camera detects reference pattern held by end effector
2219/39009 . . . Using fixture with potentiometer, wire to end effector, estimate lenght of wire
2219/39011 . . . Fixed camera detects deviation end effector from reference on workpiece, object
2219/39012 . . . Calibrate arm during scanning operation for identification of object
2219/39013 . . . Locate movable manipulator relative to object, compare to stored gridpoints
2219/39014 . . . Match virtual world with real world
2219/39015 . . . With different manipulator configurations, contact known sphere, balbar
2219/39016 . . . Simultaneous calibration of manipulator and camera
2219/39017 . . . Forward calibration, find actual pose world space for given joint configuration
2219/39018 . . . Inverse calibration, find exact joint angles for given location in world space
2219/39019 . . . Calibration by cmm coordinate measuring machine over a certain volume
2219/39021 . . . With probe, touch reference positions
2219/39022 . . . Transform between measuring and manipulator coordinate system
2219/39023 . . . Shut off, disable motor and rotate arm to reference pin
2219/39024 . . . Calibration of manipulator
2219/39025 . . . Spheric tool interrupts transmitted calibration beam, in different configurations
2219/39026 . . . Calibration of manipulator while tool is mounted
2219/39027 . . . Calibrate only some links, part of dofs, lock some links, ref pins on links
2219/39028 . . . Relative to base calibrated 6-DOF device, cmm connected between wrist and base
2219/39029 . . . Verify if calibration position is a correct, by comparing with range in rom
2219/39031 . . . Use of model for robot and for measuring device
2219/39032 . . . Touch probe senses constraint known plane, derive kinematic calibration
2219/39033 . . . Laser tracking of end effector, measure orientation of rotatable mirror
2219/39034 . . . Use of telescopic balbar
2219/39035 . . . Screw axis measurement, each joint moved in circle, cpa circle point analysis
2219/39036 . . . Screw axis measurement, jacobian estimation from wrist and joint torques, no motion
2219/39037 . . . Screw axis measurement, jacobian estimation from end effector and joint speeds
2219/39038 . . . Determine position of two cameras by using a common reference grid
2219/39039 . . . Two cameras detect same reference on workpiece to define its position in space
2219/39041 . . . Calibrate only for end position

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Interchange robot and reference pattern, measure by camera at same location
Self calibration using ANN to map robot poses to the commands, only distortions
Estimate error model from error at different attitudes and points
Camera on end effector detects reference pattern
Compare image of plate on robot with reference, move till coincidence, camera
Calibration plate mounted on robot, plate comprises sensors for measuring target
Closed loop kinematic self calibration, grip part of robot with hand
Calibration cooperating manipulators, closed kinematic chain by bolting
Calibration cooperating manipulators, closed kinematic chain by alignment
Self calibration of parallel manipulators
Probe, camera on hand scans many points on own robot body, no extra jig
From taught different attitudes for same point calculate tool tip position
Correction of end effector attachment, calculated from model and real position
On line relative position error and orientation error calibration
Hand eye calibration, eye, camera on hand, end effector
Sensor, calibration of sensor, potentiometer
Sensor adaptation for robots by software
Calculation direct dynamics
Calculate, jacobian matrix estimator
Quick calculation of coordinates by using precalculated, stored matrixes, inverses
Learn kinematics by ann mapping, map spatial directions to joint rotations
Calculate workspace for end effector, manipulator
Two stage inverse kinematics algorithm, first inner joint variables, then outer
Calculate max load a manipulator can repeatedly lift
Time needed to execute an instruction
Inverse kinematics by arm splitting, divide six link arm into two three link arms
Solve inverse kinematics by arm learning nonlinear mappings, consider smoothness
Solve inverse kinematics by linear hopfield network
Solve inverse kinematics by fuzzy algorithm
By formal substitution of two consecutive joints by a spherical joint
Solve inverse kinematics by error back propagation ebp
Learn by function division, change only one variable at a time, combine shapes
Solve inverse geometric model by iteration, no matrixes inversion
Divide workspace in sectors, lookup table for sector joint angle
Solve inverse differential kinematics in closed, feedback loop, iterate
Inexact solution for orientation or other DOF with relation to type of task
Collision, real time collision avoidance
Robot interference, between two robot arms
Parts handling, during assembly
Use of two dimensional maps and feedback of external and joint sensors
Reduce impact effect by impact configuration of redundant manipulator
Artificial field potential algorithm, force repulsion from obstacle
Inhibit movement in one axis if collision danger
On collision, lead arm around obstacle manually
Avoid collision with moving obstacles
Treat interference in hardware, circuit and also in software
On collision, ann, bam, learns path on line, used next time for same command
Interference checking between robot and fixture
Use neural geometric modeler, overlapping spheres
Self-collision, internal collision, collision between links of one robot
Estimate own stop, brake time, then verify if in safe distance
Estimate stop, brake distance in predif time, then verify if in safe distance
Interlocks inserted in movement process if necessary to avoid collision
Cooperation with one or more rotating workpiece holders, manipulators
Manipulator cooperating with conveyor
Multicooperating sensing modules
Manipulator control orders conveyor to stop, to visualize, pick up
Manipulator cooperates with moving machine, like press brake
Conveyor, pick up article, object from conveyor, bring to test unit, place it
Pick up article, object, measure, test it during motion path, place it
Regrasp object as function of impact
Dual arm, multiarm manipulation, object handled in cooperation
Use of flexibility or free joint in manipulator to avoid large forces
Force, load distribution
Select grasp pattern based on motion oriented coordinability
Hand eye cooperation, active camera on first arm follows movement of second arm
Optimal hold and moving force, torque
Constraint object handled in cooperation
Task distribution between involved manipulators
Cooperation between manipulator and vehicle with manipulator
Path constraint handling of object
Two manipulators operate on same object
Follower, slave mirrors leader, master
Manipulate, handle flexible object
Grasp common rigid object, no movement end effectors relative to object
Task is grasp object with movable parts, like pliers
Manipulate very large objects, not possible to grasp, open palm and use of links
Roll object on base by link control
Grasp tool with two manipulators, rigidity, and use tool
One manipulator holds one piece, other inserts, screws other piece, dexterity
Each of the manipulators holds one of the pieces to be welded together
Robot welds, operates on moving workpiece, moved by other robot
Convert taught program for fixed workpiece to program for moving workpiece
Teach point, move workpiece, follow point with tip, place tip on next point
For multiple manipulators operating at same time, avoid collision
Teach each manipulator independently or dependently from each other
Manual teaching, set next point when tool touches other tool, workpiece
Calculate path of robots from path of point on gripped object
Produce program of slave from path of master and desired relative position
Slave program has no taught positions, receives position from master, convert from master
Moving time between positions in slave program coordinated online with master
One program in robot controller for both robot and machine, press, mold
Scale moving time of all robots, machines to match slowest, no waiting
Slave path is the same as master path and superposed desired relative movement
Swarm, multiagent, distributed multitask fusion, cooperation multi robots
Group transport, transfer object, ant problem
To push or pull on objects, boxes
To assemble two objects, objects manipulation
Use intention inference, observe behaviour of other robots for their intention
Basic behaviour, avoid, follow, aggregate, disperse, home, wander, grasp, drop
Human supervisory control of swarm
Each robot can pick up an information carrier, read and write it, exchange it
Motion skill, relate sensor data to certain situation and motion
To machine together workpiece, desktop flexible manufacturing
Collectively grasping object to be transported
Configuration description language, to define behaviour of system
Task modelling
Search, grip object and bring to a home area, gather object, object placement
Learn social rules, greedy robots become non-greedy, adapt to other robots
Formation control, robots form a rigid formation, fixed relationship
Embodied evolution, evolutionary robots with basic ann learn by interactions with each other
Evolution, best performing control strategy is transmitted to other robots
Coordinate activity by sending pheromone messages between robots, no central control
Resources scheduling and balancing
Multiple robots searching an object
Reducant communication channels with central control
Vehicle moves towards arm if stretched arm, away from it if folded, singular point
Vehicle, coordination between manipulator arm and its moving vehicle
Dynamic interaction between vehicle and manipulator
Add DOFs of mobility to DOFs of manipulator to add user defined tasks to motion
Cooperation between fixed manipulator and manipulator on vehicle
Compensation deflection arm
Compensation position working point as function of inclination tool, hand
Compensation inertia arms
Of movement after lock stop by small movement against load, stop again
Compensation of coulomb friction in joint
Compensation for base, floor deformation
Compliance compensation
Forward compensation in robot world space, inverse in joint space
ANN as compensator
Flexible joint
Coriolis and centripetal compensation
Torque compensation
Compensate for dead weight of tool as function of inclination tool
Compensation for errors in mechanical components
Compensate thermal effects, expansion of links
Compensate movement before lock stop, by small movement against load, gravity
Compensation gravity
Control, avoid oscillation, vibration due to low rigidity
Use of passive joint, no actuator but brace, brake on or off
Passive compliance, no input of force reference, mechanical resilience, spring
Manipulator used as workpiece handler and for machining operation
Active vibration absorber
Control of joint stiffness
Invariant inertia, constant inertia matrix independent of joint positions
Fuzzy petrinet controller
Petrinet controller
Markov model
Joint space position control
Manipulator is passive, gives operator only feedback of what is currently done
Robot is active, realizes planned trajectory by itself
Switch over from free space motion to constraint motion
If operator on platform moves in certain direction, arm will follow
Select between autonomous or teleoperation control
Distributed tasks, space motion, contact, kinematic conditioning tasks
Compensate tracking error by using model, polynomial network
Adaptive control with stabilizing compensation
Motion scaling
Keep constant orientation of handled object while moving manipulator
Force tracking
Trajectory tracking
Control angular position of joint by length of linear actuator
Disturbance rejection, suppression
Resonance ratio control, between arm and motor
Jacobian transpose control of force vector in configuration and cartesian space
Rmfc resolved motion force control, apply known acceleration to payload mass
Operational space formulation, project model into cartesian coordinates
Configuration control, generate end effector forces to compensate dynamics
Computed torque method and H-compensation
Linear parameterization of robot dynamics
Parameterization of inertia, coriolis and centrifugal matrix
Fuzzy adaptation of sliding mode controller
Adaptive switching of multiple models, same model but different initial estimates, different robot model for different areas
Constraint accelerated feedback, distance dependant sampling rate
Track surface without knowing surface geometry
Hybrid integrator back-stepping control, cascaded motor and manipulator subsystems
Torque disturbance control
Trajectory feedforward and feedback to input ann, output a control function
Control additional actuator in each flexible link
Force and vibration control
Velocity blending, change in a certain time from first to second velocity
Adaptive trajectory tracking
Generic motion control operations, primitive skills each for special task
Computed torque fuzzy controller
Control position and orientation of handled object
Control speed, acceleration as function of load and rate of fatigue
Visual servoing combined with inertial measurements

Computed torque controller combined with ann compensating switch type controller
Autonomous distributed control, joint and link is a subsystem, communication intensive
Autonomous distributed control, task distributed into each subsystem, task space
Virtual arm, has end effector on any joint of real manipulator
Behaviour controller, robot have feelings, learns behaviour
Penalty invariance; distribute disturbance equally over all joints, nodes
Task space controller
Switch from task space to joint space controller when close to singularity
Three objective attitude control
GPS control robotic arm
Calculate driving torque from dynamic model, computed torque method variant
Position joint to minimize energy in previous joints, equilibrium point, attractor
Normal and overload operation modes, robot speed or torque higher than nominal
Torque control using hardware designed for position control
Cutting force disturbances compensated by accelerating a mass within tool head
Algorithm for control
Uncertainty estimation by the bounds
Layer perceptron, drive torque from state variables
Neural adaptation followed by fuzzy correction
Ann artificial neural network, ffw-nn, feedforward neural network
Course by expert rule based system to correct fine fuzzy system
Neural oscillator
CMAC cerebellar model articulation controller network
FFW and PD and ANN for compensation correct for unknown dynamics
Ann in parallel to known dynamics model to correct for unknown dynamics
FFW and PD and ANN for compensation position error
Segmented tree ANN
Ann with pd in parallel, pd corrects response of ANN
Ann parallel with p controller
Ann for compensation torque
FFW ann for torque command, adapt as function of speed and detected speed
Fwv ann to compensate torque or speed
NSC neural servo controller
From database find strategy and select corresponding neural servo controller
Forward inverse, dynamics model, relaxation neural network model firm
Position and speed error to fuzzy input, output corrected by ann as function of position
Track control with ann
Adaptive ann controller
Fuzzy neural for adaptive force control
Neural brain based controller based on simplified model of vertebrate nervous system
Adaptive force control
Fuzzy logic
Adaptive force and position control
Fuzzy pi force control
Adaptive force and position control
Switch between position and force control by fuzzy logic
Adaptive force control
Fuzzy adaptive force control and position control, hybrid

2219/39301 . . . Learn feedforward control
2219/39302 . . . Backpropagation end effector location error through the link equations
2219/39303 . . . Feedback error learn inverse dynamics, fele use position reference and error
2219/39304 . . . Feedback error learn inverse dynamics, use actual position and error
2219/39305 . . . Learn, detect kinematic contraints in a plane from displacement and force
2219/39306 . . . Three networks, data to cartesian, cartesian to joint angle, joint angle to control
2219/39307 . . . Multiple ann, trajectory control net and force control net
2219/39308 . . . Position control net, pcn combined with velocity control net, vcn
2219/39309 . . . Inverse dynamic network combined with time scaling network for trajectory plan
2219/39311 . . . Multilayer, MNN, four layer perceptron, sigmoidal neural network
2219/39312 . . . Double neural network for tracking, slave microprocessor for servo control
2219/39313 . . . Ann for joint control, ann for trajectory optimization
2219/39314 . . . Ann for identification, ann for convergence, ann for tracking control
2219/39315 . . . Art ann classifier and input selector, bam ann to retrieve collision free path
2219/39316 . . . Two ann, second ann trained with calibration data to learn error first ann
2219/39317 . . . Adapt weights MNN online, MNN as feedforward, maps inputs to joint torques
2219/39318 . . . Position loop ann and velocity loop ann and force loop ann
2219/39319 . . . Force control, force as reference, active compliance
2219/39321 . . . Force control as function of position of tool
2219/39322 . . . Force and position control
2219/39323 . . . Force and motion control
2219/39324 . . . Force as function of distance from boundary, border of grinding area
2219/39325 . . . External force control, additional loop comparing forces corrects position
2219/39326 . . . Model compensates positions as function of position to compensate force deformations
2219/39327 . . . Fuzzy adaptive force control
2219/39328 . . . Fuzzy pi force control
2219/39329 . . . Adaptive force and position control
2219/39331 . . . Switch between position and force control by fuzzy logic
2219/39332 . . . Adaptive force control
2219/39333 . . . Fuzzy adaptive force and position control, hybrid

2219/39301 . . . Learn position correction values to be added to reference values
2219/39302 . . . Learn inverse and forward model together
2219/39303 . . . First learn inverse model, then fine tune with ffw error learning
2219/39304 . . . Trajectory learning
2219/39305 . . . Learn forward dynamics
2219/39306 . . . Learn feedforward control
2219/39307 . . . Backpropagation end effector location error through the link equations
2219/39308 . . . Feedback error learn inverse dynamics, fele use position reference and error
2219/39309 . . . Feedback error learn inverse dynamics, use actual position and error
2219/39310 . . . Learn, detect kinematic contraints in a plane from displacement and force
2219/39311 . . . Three networks, data to cartesian, cartesian to joint angle, joint angle to control
2219/39312 . . . Multiple ann, trajectory control net and force control net
2219/39313 . . . Position control net, pcn combined with velocity control net, vcn
2219/39314 . . . Inverse dynamic network combined with time scaling network for trajectory plan
2219/39315 . . . Multilayer, MNN, four layer perceptron, sigmoidal neural network
2219/39316 . . . Double neural network for tracking, slave microprocessor for servo control
2219/39317 . . . Ann for joint control, ann for trajectory optimization
2219/39318 . . . Ann for identification, ann for convergence, ann for tracking control
2219/39319 . . . Force control, force as reference, active compliance
2219/39320 . . . Force control as function of position of tool
2219/39321 . . . Force and position control
2219/39322 . . . Force and motion control
2219/39323 . . . Force as function of distance from boundary, border of grinding area
2219/39324 . . . External force control, additional loop comparing forces corrects position
2219/39325 . . . Model compensates positions as function of position to compensate force deformations
2219/39326 . . . Fuzzy adaptive force control
2219/39327 . . . Fuzzy pi force control
2219/39328 . . . Adaptive force and position control
2219/39329 . . . Switch between position and force control by fuzzy logic
2219/39330 . . . Adaptive force control
2219/39331 . . . Fuzzy adaptive force and position control, hybrid

2219/39334 . . . Fuzzy reinforcement compliance control
2219/39335 . . . Independent joint control, decentralised
2219/39336 . . . Pd controller combined with disturbance rejection at joint
2219/39337 . . . Pd controller combined with joint energy based controller
2219/39338 . . . Impedance control, also mechanical
2219/39339 . . . Admittance control, admittance is tip speed-force
2219/39340 . . . Sliding mode based impedance control
2219/39341 . . . Adaptive impedance control
2219/39342 . . . Force based impedance control
2219/39343 . . . Cooperative impedance control, between fingers or arms
2219/39344 . . . Active compliance control, control tension of spring with dc motor
2219/39345 . . . Workspace impedance control
2219/39346 . . . Joint space impedance control
2219/39347 . . . Generalized impedance control
2219/39348 . . . RCC remote center compliance device inserted between wrist and gripper
2219/39349 . . . Compensation ann for uncertain trajectory in impedance control
2219/39350 . . . Feedback error learning, ffw ann compensates torque, feedback from pd to ann
2219/39351 . . . Joint space observer
2219/39352 . . . Operation, work space observer
2219/39353 . . . Observer, disturbance observer
2219/39354 . . . Fuzzy logic velocity observer, to estimate velocity in joints
2219/39355 . . . Execute motion of path in minimum of time
2219/39356 . . . Time optimal control along path for singular points, having velocity constraints
2219/39357 . . . Tracking path, priority control for component perpendicular to path
2219/39358 . . . Minimize time-energy cost
2219/39359 . . . Adapth path of gripping point as function of position of cooperating machine
2219/39360 . . . Track circular path on inclined surface
2219/39361 . . . Path, correction of path in function of load
2219/39362 . . . By using a cue, part of a stimulus to prompt an adapted reaction pattern
2219/39363 . . . SMC sensory motor coordination
2219/39364 . . . Using a motion map, association between visual position and joint position
2219/39365 . . . Sensorimotor command layer, between task space and sensor, motor space
2219/39366 . . . Host and robot controller and vision processing
2219/39367 . . . Host and robot controller
2219/39368 . . . Expert rule based system to correct parameters impedance controller
2219/39369 . . . Fuzzy for planning, fuzzy neural for adaptive force control
2219/39370 . . . Ffw and ann combined to compensate torque
2219/39371 . . . MMI to path planner to servo controller
2219/39372 . . . Hierarchical, learning, recognition and skill level and adaptation servo level
2219/39373 . . . Task level supervisor and planner, organizer and execution and path tracking
2219/39374 . . . Control panel separated from power control of articulations
2219/39375 . . . Open architecture such as nasrem, ngc, dicam, saridis, chimera, gisc, utap, nomad, robline
2219/39381 . . . Map task, application to behaviour, force tracking, singularity to motion to actuator
2219/39382 . . . Level, organization and coordination or distribution of tasks and execution level
2219/39383 . . . Supervisor communicates with several ion control agents
2219/39384 . . . Control unit near robot, control and teaching panel in safe zone
2219/39385 . . . Hybrid control system with neural brain based controller and classical ctnler
2219/39386 . . . Cell configuration, selection and connection of cell combinations
2219/39387 . . . Reflex control, follow movement, track face, work, hand, visual servoing
2219/39388 . . . Visual compliance, xz constraint is 2-D image, z position controlled
2219/39389 . . . Laparoscopic surgery, camera on center of operated part, view around, scale
2219/39391 . . . Visual servoing, track end effector with camera image feedback
2219/39392 . . . Dynamic pyramiding, change vision field to small area if high tracking speed, zoom
2219/39393 . . . Camera detects projected image, compare with reference image, position end effector
2219/39394 . . . Compensate hand position with camera detected deviation, new end effector attitude
2219/39395 . . . Expectation based visual servoing, use of model
2219/39396 . . . Manipulator action on screen depends from displayed position on screen
2219/39397 . . . Map image error directly to robot movement, position relation to world, base not needed, image based visual servoing
2219/39398 . . . Convert hand to tool coordinates, derive transform matrix
2219/39399 . . . Convert position of old, teach to new, changed, actual tool by transform matrix
2219/39401 . . . Machine tool coordinates to manipulator coordinates
2219/39402 . . . Transfer matrix for moving object and robot to absolute space, motion independent
2219/39403 . . . Method, axial rotation of tool to make tool and base coordinates parallel
2219/39404 . . . Design of manipulator
2219/39405 . . . Develop inverse model of system with ann
2219/39406 . . . Obtain optimal parameters of model of system
2219/39407 . . . Power metrics, energy efficiency
2219/39408 . . . Integrated structure and control design
2219/39409 . . . Design of gripper, hand
2219/39411 . . . Effect of scaling drive arms
2219/39412 . . . Diagnostic of robot, estimation of parameters
2219/39413 . . . Robot self diagnostics
2219/39414 . . . 7-DOF
2219/39415 . . . Hyper redundant, infinite number of DOFs
2219/39416 . . . 12-DOF
2219/39417 . . . 6-DOF
2219/39418 . . . 3-DOF
2219/39419 . . . 4-DOF
2219/39421 . . . DOF is degree of freedom, 2-DOF
2219/39422 . . . 7-DOF for arm and 6-DOF for end effector
2219/39423 . . . 5-DOF
2219/39424 . . . 16-DOF
2219/39425 . . . 9-DOF
2219/39426 . . . 10-DOF
2219/39427 . . . Panel on arm, hand of robot, controlled axis
2219/39428 . . . Panel with special keys for robot programming, like gripper, hand, wrist
2219/39429 . . . Using graphic kinematic perspective entered and represented by keys
2219/39431 . . . Keys represent function of gripper, open, close
2219/39432 . . . Direct robot control, click on mouse on variety of display command buttons
2219/39433 . . . Enter a move file, robot will follow a series of instructions
2219/39434 . . . Each function key of pc corresponds to a motor, jog each motor
2219/39435 . . . Free movable unit has push buttons for other than position, orientation control
2219/39436 . . . Joystick mimics manipulator to provide spatial correspondence
2219/39437 . . . Joystick with additional handle for wrist and gripper control
2219/39438 . . . Direct programming at the console
2219/39439 . . . Joystick, handle, lever controls manipulator directly, manually by operator
2219/39441 . . . Voice command, camera detects object, grasp, move
2219/39442 . . . Set manual a coordinate system by jog feed operation
2219/39443 . . . Portable, adapted to handheld, with joystick, function keys, display
2219/39444 . . . Display of position, of shape of robot and tool
2219/39445 . . . Select between jog modes, user, robot coordinates, tool, system feed, joint feed
2219/39446 . . . Display of manipulator and workpiece and jog directions
2219/39447 . . . Dead man switch
2219/39448 . . . Same teach pendant connects to many robot controllers over network
2219/39449 . . . Pendant, pda displaying camera images overlayed with graphics, augmented reality
2219/39451 . . . Augmented reality for robot programming
2219/39452 . . . Select with mouse button a coordinate plane for micromanipulation
2219/39453 . . . Select program as function of location of mobile manipulator
2219/39454 . . . Rubber actuator, two muscle drive, one for extension other for traction
2219/39455 . . . Flexible microactuator, fluidic controlled fibre reinforced rubber, three tubes
2219/39456 . . . Direct drive
2219/39457 . . . Tendon drive
2219/39458 . . . Vehicle levitated, arm pushes to position vehicle
2219/39459 . . . Finger actuator, ac motor and harmonic gear and encoder
2219/39461 . . . Rotate arm in one direction, forearm in other direction but double speed
2219/39462 . . . Pneumatic actuator, imitates human muscle
2219/39463 . . . Exercise treatment end effector, dexter cube with various switches for tasks
2219/39464 . . . Estimation of human hand impedance in multijoint arm movements
2219/39465 . . . Two fingers each with 2-DOF
2219/39466 . . . Hand, gripper, end effector of manipulator
2219/39467 . . . Select hand as function of geometric form of hand
2219/39468 . . . Changeable hand, tool, code carrier, detector
2219/39469 . . . Grip flexible, deformable plate, object and manipulate it
2219/39471 . . . Push workpiece in order to grip it correctly
2219/39472 . . . Braced manipulator, for fine positioning hand is resting on table
2219/39473 . . . Autonomous grasping, find, approach, grasp object, sensory motor coordination
2219/39474 . . . Coordination of reaching and grasping
2219/39475 . . . Grasp slightly, rotate object between two fingers by action of gravity
2219/39476 . . . Finger track moving light spot on object
2219/39477 . . . Control force and posture of hand
2219/39479 . . . Grip, release again to put object in correct position in tray, regrip and move
2219/39481 . . . Control distance finger from center, radius
2219/39482 . . . Control position of center of grip
2219/39483 . . . Control angle of rotation
2219/39484 . . . Locate, reach and grasp, visual guided grasping
2219/39485 . . . Lift workpiece with two fingers, then grasp it with two additional fingers
2219/39486 . . . Fingered hand, multifingered hand
2219/39487 . . . Parallel jaws, two fingered hand
2219/39488 . . . Each finger gets 1-DOF, one more movement, translation or rotation
2219/39489 . . . Soft fingertip, electro rheological controlled fluid
2219/39491 . . . Each finger controlled by a controller
2219/39492 . . . Finger impedance control
2219/39493 . . . Passive compliant finger, array of resilient rods in tip
2219/39494 . . . Each finger has 4-DOF
2219/39495 . . . Active electromechanical compliance for each finger
2219/39496 . . . 3-Fingered hand
2219/39497 . . . Each finger can be controlled independently
2219/39498 . . . Each finger has force torque sensor in tip of finger
2219/39499 . . . 4-Fingers with each 6-DOF
2219/39501 . . . 5-Fingers with each 4-DOF
2219/39502 . . . 4-Fingers with each 3-DOF
2219/39503 . . . 4-Fingers with each 4-DOF
2219/39504 . . . Grip object in gravity center
2219/39505 . . . Control of gripping, grasping, contacting force, force distribution
2219/39506 . . . Grip flexible wire at fixed base, move gripper to top of wire and grip
2219/39507 . . . Control of slip motion
2219/39508 . . . Reorientation of object, orient, regrasp object
2219/39509 . . . Gripping, grasping, links embrace, encircle, envelop object to grasp
2219/39511 . . . Reorient, rotate object in hand between fingers by action of fingers
2219/39512 . . . Whole hand manipulation, use of fingertips and hand surface
2219/39513 . . . Tip prehension grasp, grasp with tip of fingers
2219/39514 . . . Stability of grasped objects
2219/39515 . . . Grapple object, grip in compliant mode, self alignment of fingers and object
2219/39516 . . . Push align object against wall, detect each time distance from grip point to wall
2219/39517 . . . Control orientation and position of object in hand, roll between plates
2219/39518 . . . Rolling contact between fingers, robot arms and object
2219/39519 . . . Concurrent grasp, all forces converge in one point
2219/39521 . . . Pencil grasp, forces act in two points, along line of intersection of two planes
2219/39522 . . . Regulus grasp, forces do not intersect at all
2219/39523 . . . Set holding force as function of dimension, weight, shape, hardness, surface
2219/39524 . . . Power grasp, between thumb and four fingers, acting as a virtual middle finger
2219/39525 . . . Lateral grasp, between thumb and four fingers, acting as virtual index finger
2219/39526 . . . Three fingers used, thumb, index, middle finger for lateral precision
2219/39527 . . . Workpiece detector, sensor mounted in, near hand, gripper
2219/39528 . . . Measuring, gripping force sensor build into hand
2219/39529 . . . Force, torque sensor in wrist, end effector
2219/39531 . . . Several different sensors integrated into hand
2219/39532 . . . Gripping force sensor build into finger
2219/39533 . . . Measure grasping posture and pressure distribution
2219/39534 . . . By positioning fingers, dimension of object can be measured
2219/39535 . . . Measuring, test unit build into hand, end effector
2219/39536 . . . Planning of hand motion, grasping
2219/39537 . . . First slide object on table in order to be able to grasp it, grasp it
2219/39538 . . . Rotate object with one or more fingers, while sliding on table
2219/39539 . . . Plan hand shape
2219/39541 . . . Place fingers to reorient object while grasping
2219/39542 . . . Plan grasp points, grip matrix and initial grasp force
2219/39543 . . . Recognize object and plan hand shapes in grasping movements
2219/39544 . . . Fuzzy dynamic programming, generate trajectory of finger during tracking
2219/39545 . . . Trajectory generation for smoothly grasping moving object
2219/39546 . . . Map human grasps to manipulator grasps
2219/39547 . . . Program, plan gripping force, range and speed
2219/39548 . . . Enter interactively parameter for gripper, then teach movement
2219/39549 . . . Structure, hand has connector for power supply and control signals
2219/39551 . . . Pivoting gripper, so part takes always vertical orientation
2219/39552 . . . Stewart platform hand, parallel structured hand
2219/39553 . . . Dual gripper, two heads to pick up different objects
2219/39554 . . . Gripper is formed by flexible tube, embraces object like a finger
2219/39555 . . . Revolver with several grippers, hands
2219/39556 . . . Control system build into hand itself
2219/39557 . . . Vacuum gripper using mask with pattern corresponding to workpiece to be lifted
2219/39558 . . . Vacuum hand has selective gripper area
2219/39559 . . . Polyvalent gripper, to grip, assemble, manipulate
2219/39561 . . . Gripper with build in positioning device to align handled object
2219/39562 . . . Dual end effector, one as tool, the other as workhandler, revolver
2219/39563 . . . Hand has a center pin to pick up coils
2219/39564 . . . Spoon and fork, fork slides back if food delivered in mouth
2219/39565 . . . Two fingered microhand, each finger is a parallel, stewart platform
2219/39566 . . . Transparent gripper, object can always be seen by camera
2219/39567 . . . Use electromagnetic attraction to bring robot hand in contact with workpiece
2219/39568 . . . Extract, insert objects by controlling fingers, dexterous
2219/39569 . . . Twirl baton, rotate cylinder through center perpendicular to length
2219/39571 . . . Grip, grasp non rigid material, piece of cloth
2219/39572 . . . Task, tool manipulation
2219/39573 . . . Tool guidance along path
2219/39574 . . . Passive compliant hand, wrist
2219/39575 . . . Wrist, flexible wrist
2219/39576 . . . Magnetically levitated wrist
2219/39577 . . . Active electromechanical compliance for wrist
2219/39578 . . . Axis wrist
2219/40 . . . Robotics, robotics mapping to robotics vision
2219/40001 . . . Laser color indicates type of machining
2219/40002 . . . Camera, robot follows direction movement of operator head, helmet, headstick
2219/40003 . . . Move end effector so that image center is shifted to desired position
2219/40004 . . . Window function, only a specific region is analyzed
2219/40005 . . . Vision, analyse image at one station during manipulation at next station
2219/40006 . . . Placing, palletize, un palletize, paper roll placing, box stacking
2219/40007 . . . Optimize sequence of pick and place operations upon arrival of workpiece on conveyor
2219/40008 . . . Place a box, block in a corner
2219/40009 . . . Remove and replace machine part, module
2219/40011 . . . Lay down, laying non rigid material, handle flat textile material
2219/40012 . . . Pick and place by chain of three manipulators, handling part to each other
2219/40013 . . . Kitting, place parts from belt into tray, place tray on conveyor belt
2219/40014 . . . Gripping workpiece to place it in another place
2219/40015 . . . Soccer playing
2219/40016 . . . Kick a ball, leg and foot movement simulator
2219/40017 . . . Hockey playing, puck and paddle
2219/40018 . . . Ball in cup
2219/40019 . . . Placing and assembly, throw object correctly on table
2219/40021 . . . Batting, to redirect a projectile
2219/40022 . . . Snatching, dynamic pick, effector contacts object, moves with object
2219/40023 . . . Dynamic closure, remain contact by acceleration forces
2219/40024 . . . Catching
2219/40025 . . . Dynamic manipulation, throwing
2219/40026 . . . Juggling, tennis playing, throw and catch
2219/40027 . . . Preying, object capture, interception, mouse-buster
2219/40028 . . . Insert flexible rod, beam into hole
2219/40029 . . . Mount elastic ring on a cylinder
2219/40031 . . . Dual peg in hole
2219/40032 . . . Peg and hole insertion, mating and joining, remote center compliance
2219/40033 . . . Assembly, microassembly
2219/40034 . . . Disassembly, for recycling
2219/40035 . . . Shake grasped parts for dropping excess entangled parts back into pin
2219/40036 . . . Transport plates or sheets between two locations without motion inversion
2219/40037 . . . No incomplete containers allowed to exit on output conveyor
2219/40038 . . . Black list, exclude operation on workpiece when not possible, collision, error
2219/40039 . . . Robot mounted or sliding inside vehicle, on assembly line or for test, service
2219/40041 . . . Robot operates panel like car radio by pushing, turning buttons, knobs
2219/40042 . . . Control tilting angle of surface carried by robot
2219/40043 . . . Move object without swinging, no pendulum or swing motion at stop point
2219/40044 . . . Unfold flexible material
2219/40045 . . . Fill bucket, if hard rock, follow contour rock
2219/40046 . . . Fill bucket with sand, move horizontally, if resistance move up, move horizontally
2219/40047 . . . Machine overhanging sculptured surfaces
2219/40048 . . . Transport bar by two mobile robots on wavy road
2219/40049 . . . Cut material with scissors
2219/40051 . . . Manipulate flexible material fixed with one end to a wall
2219/40052 . . . Deform, bend flexible material
2219/40053 . . . Pick 3-D object from pile of objects
2219/40054 . . . Supply sheet to bending machine
2219/40055 . . . Wire stripping
2219/40056 . . . Slide an edge over an edge
2219/40057 . . . Contour tracking, edge following
2219/40058 . . . Align box, block with a surface
2219/40059 . . . Mount, couple and demount, decouple exchangeable mechanical modules
2219/40061 . . . Disconnect cable
2219/40062 . . . Door opening
2219/40063 . . . Transport dish pile and dispense material in each dish of pile
2219/40064 . . . Pierce, penetrate soft tissue
2219/40065 . . . Approach, touch and then push object
2219/40066 . . . Stack and align identical layers, laminates, electronic substrate layers
2219/40067 . . . Stack irregular packages
2219/40068 . . . Collective, group transport
2219/40069 . . . Flatening, sweeping non rigid material, take out wrinkles
2219/40071 . . . Relative positioning, grinding and polishing against rotating belt
2219/40072 . . . Exert a screwing motion
Task planning for assembly behaving autonomously
Consider each part to be assembled as an agent, function of timing and conflicts
Generating possible sequence of steps as planner controls dynamic online
Offline task learning knowledge base, static knowledge base
Feedback of online failures to offline learned world-, domain- for vision, plan base
Oop task planning, use three knowledge bases, command for action on, with object
Modify tasks due to use of different fixture configuration, environment
Modify tasks due to modular tooling, other system of that likeness
Tele-programming by graphical simulation plus extra info needed by robot
Modify tasks due to use of different manipulator
Select stations with mouse to create process steps
Show grid locations with symbols of workstations
Graphical user interface for robotics, visual robot user interface
Generate concurrent tasks
Tasks are classified in types of unit motions
Show object with laser pointer, give oral instructions
Teleassistance, operator assists, controls reach, close hand to grasp
Local intelligence for global planning, remote control remote machine
Predict locally machining forces from model to variable time delay, through internet
Telepresence, teletaction, sensor feedback from signal for operator
Force sensation of slave converted to movement of chair for operator
Force sensation of slave converted to vibration for operator
Slave force converted to shape display, actuated by fingers, surface is force image
Stereo audio and vision
Force sensation feedback from simulated tool
Scaled feedback of forces from slave to master and master to slave
Force from slave converted to a digital display like fingers and object
Pain sensation feedback, impinge air on, squeeze, vibrate, stimulate fingers
Temperature sensation, thermal feedback to operator fingers
Slip, texture sensation feedback, by vibration stimulation of fingers
Force sensation feedback from slave
Force sensation of slave converted to audio signal for operator
Variable time delay, through internet
Predict locally machining forces from model to control remote machine
Local intelligence for global planning, remote intelligence for tuning
Time delay, problems caused by time delay between local and remote
Deictic, using a sign language, point finger to reach, close hand to grasp
Teleassistance, operator assists, controls autonomous robot

2219/40091 . . . Tele-programming, transmit task as a program, plus extra info needed by robot
2219/40092 . . . Tele-programming by direct instruction on new object, using vision and force sensors
2219/40093 . . . Use known task for similar, like object, inform system of that likeness
2219/40094 . . . By changing knowledge base directly
2219/40095 . . . Modify tasks due to modular tooling, other fixture configuration, environment
2219/40096 . . . Modify tasks due to use of different manipulator
2219/40097 . . . Select stations with mouse to create process steps
2219/40098 . . . Show grid locations with symbols of workstations
2219/40099 . . . Graphical user interface for robotics, visual robot user interface
2219/40101 . . . Generate concurrent tasks
2219/40102 . . . Tasks are classified in types of unit motions
2219/40103 . . . Show object with laser pointer, give oral command for action on, with object
2219/40104 . . . Reactive planner, user is integral component of planner, interactive
2219/40105 . . . Oop task planning, use three knowledge bases, world-, domain- for vision, plan base
2219/40106 . . . Feedback of online failures to offline learned knowledge base
2219/40107 . . . Offline task learning knowledge base, static planner controls dynamic online
2219/40108 . . . Generating possible sequence of steps as function of timing and conflicts
2219/40109 . . . Consider each part to be assembled as an agent, behaving autonomously
2219/40111 . . . For assembly
2219/40112 . . . Using graph grammars and fuzzy logic
2219/40113 . . . Task planning
2219/40114 . . . From vision detected initial and user given final state, generate tasks
2219/40115 . . . Translate goal to task program, use of expert system
2219/40116 . . . Learn by operator observation, symbiosis, show, watch
2219/40117 . . . Virtual mecanism, like slider to constraint movement in task space
2219/40118 . . . Task oriented virtual tool, developed for task, assists operator in task
2219/40119 . . . Virtual internal model, derive from forces on object, motion of end effector
2219/40121 . . . Trajectory planning in virtual space
2219/40122 . . . Manipulate virtual object, for trajectory planning of real object, haptic display
2219/40123 . . . Indicate, select features on display, remote manipulator will execute
2219/40124 . . . During manipulator motion, sensor feedback to adapt model in memory
2219/40125 . . . Overlay real time stereo image of object on existing, stored memory image argos
2219/40126 . . . Virtual landmarks, reference points for operator
2219/40127 . . . Virtual tape measure, indicate distance between end effector and destination
2219/40128 . . . Virtual tether, line on display connects end effector to destination point
2219/40129 . . . Virtual graphic 3-D pointer, manipulator commands real manipulator
2219/40131 . . . Virtual reality control, programming of manipulator
2219/40132 . . . Haptic joystick with force feedback based on accelerometer included in joystick
2219/40133 . . . Force sensation of slave converted to movement of chair for operator
2219/40134 . . . Force sensation of slave converted to vibration for operator
2219/40135 . . . Slave force converted to shape display, actuated by fingers, surface is force image
2219/40136 . . . Stereo audio and vision
2219/40137 . . . Force sensation feedback from simulated tool
2219/40138 . . . Scaled feedback of forces from slave to master and master to slave
2219/40139 . . . Force from slave converted to a digital display like fingers and object
2219/40141 . . . Pain sensation feedback, impinge air on, squeeze, vibrate, stimulate fingers
2219/40142 . . . Temperature sensation, thermal feedback to operator fingers
2219/40143 . . . Slip, texture sensation feedback, by vibration stimulation of fingers
2219/40144 . . . Force sensation feedback from slave
2219/40145 . . . Force sensation of slave converted to audio signal for operator
2219/40146 . . . Telepresence, teletaction, sensor feedback from slave to operator
2219/40147 . . . Variable time delay, through internet
2219/40148 . . . Predict locally machining forces from model to control remote machine
2219/40149 . . . Local intelligence for global planning, remote intelligence for tuning
2219/40151 . . . Time delay, problems caused by time delay between local and remote
2219/40152 . . . Deictic, using a sign language, point finger to reach, close hand to grasp
2219/40153 . . . Teleassistance, operator assists, controls autonomous robot
Moving of objects
Purpose is grasping objects
Input work program as well as timing schedule
Planning, event based planning, operator changes plans during execution
Correlate actual image at angle with image presented to operator without angle
Between operator and sensor a world modeler, local intelligence
Visual display of machining, operation, remote viewing
Sound display of machining operation
Measuring, predictive information feedback to operator
Fault recovery from task execution errors
Sensor data to display depends on robot status
Surface display, virtual object translated into real surface, movable rods
Switch between simulated display of remote site, and actual display
Simulated display of remote site, driven by operator interaction
Display of actual situation at the remote site
Set a common coordinate system for all remotely controlled robots
Stop command transmission if no feedback signal received at remote site
Stop robot if no command received within interval
Robot teleoperation through internet
Inclination, tilt of operator seat, chair serves as control command, like handle
Encode operator actions into symbolic commands for transmission to remote
Nanomanipulation
Distributed top, resource availability in network
Design of controller
Operator can fine position in small area, free, but if contact, force feedback
Master has different configuration than slave manipulator
Tele-machining
Compliant teleoperation, operator controls motion, system controls contact, force
Decoupled coarse fine motion coordination
Reachability control, permits slave to reach commanded position
Indexed position control, master controls only small part of slave space
Position control with scaling, master small movement, slave large movement
Modes, coarse by rate controller, fine by position controller
Autonomous manipulation, computer assists operator during manipulation
Control modes, velocity for coarse, position for fine, hand for gripper
Micromanipulation
Force reflective, impedance shaping tele operation
Tele-operation, computer assisted manual operation
Projecting light on floor to delimit danger zone around robot
Suppress, execute command depending on physical position of control panel
Contact with human allowed if under pain tolerance limit
Soft material covers links, arms for shock and pain attenuation
Detect contact, collision with human
Human robot coexistence
Detect position of operator, create non material barrier to protect operator
Each fault condition has a different recovery procedure
Multiple arm systems
Redundant serial manipulators, kinematic fault tolerance
Parallel structured modules, more joints than DOF
Dual redundant actuators
If speed is important processors execute each different code, otherwise same code
Fault tolerant, if one joint, actuator fails, others take over, reconfiguration
Two-way clutch for joint, prevents movement in unallowable direction
Record history, log of instructions sent from task planner to path planner
Command rejection module
Limit link kinetic energy to amount another element can dissipate upon impact
Record image of working robot; display to detect errors
Individual emergency stop lines for each part of system
Check conditions before allowing unlocking of joint brake
Detect contact, proximity of other manipulators
Individual and common power cutoff switch for several robots
Lock arm if somebody is looking into the hand
If insertion force to high, alarm, stop for operator assistance
If robot gets a return signal, go to initial condition position
During start up, control robot with low speed, after a while gradually higher
Input control signals to control system and to model, compare their outputs
If one access robot fails, other pushes it out of model, compare their outputs
Fault tolerant, if one joint, actuator fails, others take over, reconfiguration
If speed is important processors execute each different code, otherwise same code
If insertion force to high, alarm, stop for operator assistance
If one access robot fails, other pushes it out of model, compare their outputs
If deviation of compliant tool is too large, stop and alarm
Analytical redundancy, use available functional redundancy of model
Safety, dual clutched freewheel for joint, if error no movement possible
Lock mechanical arm if servo, cpu error, other arms remain free
Portable robot
Snake arm, flexi-digit robotic manipulator, a hand at each end
Parallel robot, structure
2219/40236 . . . With opposing actuators on same joint, agonist, flexor, muscle
2219/40237 . . . Bus for communication with sensors
2219/40238 . . . Dual arm robot, one picks up one part from conveyor as other places other part in machine
2219/40239 . . . Common control box for several robot control boards and additional control boards
2219/40241 . . . Underactuated robot, has less actuators than number of DOF
2219/40242 . . . End effector with motor to provide a yaw, roll and pitch motion
2219/40243 . . . Global positioning robot
2219/40244 . . . Walking manipulator with integrated stewart, parallel arm
2219/40245 . . . Gripper on crawling device, smaller than two cm
2219/40246 . . . 6-DOF 3-ppsp parallel manipulator
2219/40247 . . . Series manipulator mounted on parallel manipulator
2219/40248 . . . Manipulator on slide
2219/40249 . . . Whole arm manipulator, grip object not with end effector but with all links
2219/40251 . . . Ghrs generalized high dimensional robotic system, virtual decomposition
2219/40252 . . . Robot on track, rail moves only back and forth
2219/40253 . . . Soft arm robot, light, rubber, very compliant
2219/40254 . . . Serial to parallel, branching manipulator, one macro and several parallel arms
2219/40255 . . . End effector attached to cable for gravity balance suspension
2219/40256 . . . Large, heavy manipulator
2219/40257 . . . Flexible macro manipulator with rigid attached micromanipulator
2219/40258 . . . Robot can be fixed in orientation and height to ground, plurality of such points
2219/40259 . . . Set friction in each joint to optimal value
2219/40261 . . . Self reproducing, replicating fabrication machine, tools, structure, info for this
2219/40262 . . . Two link arm with a free, attached to base, and an active joint between links
2219/40263 . . . Dual use mobile detachable manipulator
2219/40264 . . . Human like, type robot arm
2219/40265 . . . Use of inflatable links, can easily be folded, compressed air for stiffness
2219/40266 . . . Resonant manipulator, springs cooperate with latches, motor only for lost energy
2219/40267 . . . Parallel manipulator, end effector connected to at least two independent links
2219/40268 . . . Master attached to tip of macro manipulator, controls slave micromanipulator
2219/40269 . . . Naturally compliant robot arm
2219/40271 . . . Underwater, submarine movable manipulator
2219/40272 . . . Manipulator on slide, track
2219/40273 . . . Wire manipulator, crane type manipulator with three wires
2219/40274 . . . Cebot segments are mobile manipulators, connected by manipulator arm self
2219/40275 . . . Manipulator mounted on satellite, space manipulator
2219/40276 . . . Aqua robot manipulator
2219/40277 . . . Hybrid, connect parallel manipulators in series, Stewart truss
2219/40278 . . . Compact, foldable manipulator
2219/40279 . . . Flexible arm, link
2219/40281 . . . Closed kinematic loop, chain mechanisms, closed linkage systems
2219/40282 . . . Vehicle supports manipulator and other controlled devices
2219/40283 . . . Reservoir with additional material on vehicle with manipulator
2219/40284 . . . Toolrack on vehicle with manipulator, toolchanger
2219/40285 . . . Variable geometry manipulator, camlock
2219/40286 . . . End effector with offset arm, to carry hose to feed material
2219/40287 . . . Workpiece manipulator and tool manipulator cooperate
2219/40288 . . . Integrate sensor, actuator units into a virtual manipulator
2219/40289 . . . Scara for coarse movement, xy table for fine movement
2219/40290 . . . Instead of two links, two eccentrically rotating disks for full circle working
2219/40291 . . . Manipulator is positioned by a crane to cover a large workpiece, extended range
2219/40293 . . . Gantry, portal
2219/40294 . . . Portable robot can be fixed, attached to different workplaces, stations
2219/40295 . . . Sensors at the elbow to detect obstacles
2219/40296 . . . Second arm can be attached to first arm, modular
2219/40297 . . . Macro manipulator and microhand, distributed positioning
2219/40298 . . . Manipulator on vehicle, wheels, mobile
2219/40299 . . . Holonic, made of similar modules, truss manipulator
2219/40301 . . . Scara, selective compliance assembly robot arm, links, arms in a plane
2219/40302 . . . Dynamically reconfigurable robot, adapt structure to tasks, cellular robot, cebot
2219/40303 . . . Arm somersaults over grid, place one hand on grid point, release other hand
2219/40304 . . . Modular structure
2219/40305 . . . Exoskeleton, human robot interaction, extenders
2219/40306 . . . Two or more independent robots
2219/40307 . . . Two, dual arm robot, arm used synchronously, or each separately, asynchronously
2219/40308 . . . Machine, conveyor model in library contains cooperator robot path
2219/40309 . . . Simulation of human hand motion
2219/40311 . . . Real time simulation
2219/40312 . . . OOP object oriented programming for simulation
2219/40313 . . . Graphic motion simulation for ergonomic analysis
2219/40314 . . . Simulation of program locally before remote operation
2219/40315 . . . Simulation with boundary graphs
2219/40316 . . . Simulation of human-like robot joint, restricted 3-D motion
2219/40317 . . . For collision avoidance and detection
2219/40318 . . . Simulation of reaction force and moment, force simulation
2219/40319 . . . Simulate contact of object and obstacle, reduce to pairs with only one contact
Simulation of human arm trajectories
Simulation with des, discrete event system
Modeling robot environment for sensor based robot system
Simulation, modeling of muscle, musculoskeletal dynamical system
Learn inverse kinematic model by variation, perturbation
Singular value decomposition
Calculation, inverse kinematics solution using damped least squares method
If joint near singularity, restore angle to start values, adapt other joints
Semi-singularity, movement in one direction not possible, in opposite direction is possible
Joint angle change constraint, singularity between elbow up and down
Identify degenerated directions, eliminate velocity component in that direction
Singularity, at least one movement not possible, kinematic redundancy
By fuzzy logic supervisor
By probability distribution functions pdf
Optimize multiple constraints or subtasks
Maximum distance criterium
Task priority redundancy
Avoid collision
Minimize energy
Minimize sum of gravitational torques of some joints
Optimize local torque
Configuration index, control, limits of joint movement
Minor measure
Compatibility index
Optimize manipulator velocity ratio function
Optimize condition number
Optimize manipulability measure function
Cooperation of hand arm, break down into two subsystems
Combination of priority, basic task, tip position, and task for link movement
Split robot into two virtual robot, origin of second equals tip of first
Singularity detection
Geometric, task independent
Kinetic energy, content and distribution
Compliance, design and operational issues
Inertial, from dynamic models
Constraint, physical limitations
Category of performance criteria
Elbow high or low, avoid obstacle collision with redundancy control
Two independent paths planned, interpolations for same robot, e.g. wrist and TCP
Position of robot platform as additional task
Configuration control, select other tasks by configuration of link positions
Elbow reaches its target position before the end effector
Redundant manipulator
Multipoint impedance control, redundant manipulator can touch several obstacles
Generate all possible arm postures associated with end effector position
Control trajectory to avoid joint limit as well as obstacle collision
Control end effector impedance
Control of trajectory in case of a limb, joint disturbance, failure
Control trajectory in case of distortion of visual input
Control trajectory in case of changed tool length
Moving center of mass and end effector for dynamic task of lifting heavy weight
Impact force on stationary end effector, move center of mass, no reaction to base
Keep center of mass fixed, no counterweight, no reaction on base
Manipulability
Control trajectory in case of joint limit, clamping of joint
Limit allowable area where robot can be taught
Correction, modification program by detection type workpiece
Optimize taught path by data acquisition followed by genetic algorithm
Compare offline taught point with online taught point, modify rest as function of error
Search around taught point until operation has succes, correct program
Modify without repeating teaching operation
Two channels between robot and teaching panel, rs232c and video
Use robot control language also to write non robotic user, application programs
Human to robot skill transfer
Programming, visual robot programming language
Learn natural high level command, associate its language
Programming, visual robot programming
Human to robot skill transfer
Combine offline with online information to generate robot actions
Compose movement with primitive movement segments from database
Intermediate code for robots, bridge, conversion to controller
Programming language for robots, bridge, conversion to controller
Opto-electronic follow-up of movement of head, eyelids, finger to control robot
Selection of master-slave operation mode
Convert workspace of master to workspace of slave
Control button on master for quick movement, for fine slow movement
Master for walk through, slave uses data for motion control and simulation
Separate master controls macro and microslave manipulator
Master slave position control
Master slave rate control
Master slave, master is replica of slave
Intention learning
Robot brings object near operator, operator places object in correct position

Robot assists human in non-industrial environment like home or office

Sensor knowledge command fusion network, data and feature and action and constraint

Robot has multisensors surrounding operator, to understand intention of operator

Man robot interface, exchange of information between operator and robot

Semi active robot, cobot, guides surgeon, operator to planned trajectory, constraint

Planning for variable length tool, laser beam as tool

For cooperating manipulators

Presurgical planning, on screen indicate regions to be operated on

Task, motion planning of objects in contact, task level programming, not robot level

Motion planning for manipulator handling sheet metal profiles

Force controlled velocity motion planning, adaptive

Map task space to sensor space

Online motion planning, in real time, use vision to detect workspace changes

Sensing, vision based motion planning

Adaptive trajectory planning as function of force on end effector, bucket

Integrate sensing and action in planning

Using rapidly exploring random trees algorithm RRT-algorithm

Stochastic, probabilistic generation of intermediate points

Grid of preoptimised paths as function of target position, choose closest, fine adapt

Pass states by weighted transitions

Distributed, trajectory planning for each virtual arm

Decompose in motion planning for swarm of robots and motion planning for object to be transported

Extract minimum number of via points from a trajectory

Distributed search of attainable positions, parallel computed

Local, directly search robot workspace

Global, compute free configuration space, connectivity graph is then searched

Feasible map algorithm

Probabilistic backprojection

Voxel map, 3-D grid map

Conditional and iterative planning

Hierarchical, planning, in levels

Decompose n-dimension with n-links into smaller m-dimension with m-1-links

Graph based

Bitmap based

Preprocess nodes with arm configurations, c-space and planning by connecting nodes

Continuous, smooth robot motion

Closest, nearest arm, robot executes task, minimum travel time

Evaluation function derived from skilled, experimented operator data

Maximum torque for each axis

Max velocity, acceleration limit for workpiece and arm jerk rate as constraints

Proximity of obstacles

End effector orientation error

End effector position error

Grid adaptive optimization

Minimum torque change model

Plan for even distribution of motor load of joints

Constant consumed energy, regenerate acceleration energy during deceleration

Shortest distance in time, or metric, time optimal

Minimum relative velocities

Criteria is lowest cost function, minimum work path

Plan for minimum time trajectory, at least one joint maximum torque

Virtual springs, impedance method

Using polytree intersection method

Using fuzzy logic performance, distances are fuzzy, very close to very far

Using gradient method

Using exact cell decomposition

Using genetic algorithm GA

Using potential fields

In presence of moving obstacles, dynamic environment

Collision, planning for collision free path

Plan path independent from obstacles, then correction for obstacles

Graphic display of work area of robot, forbidden, permitted zone

Use graphic display, layout of robot path, obstacles to indicate interference

Search pattern according to type of assembly to be performed

Before assembly arrange parts

Find possible contacts

Using several tethered motors, attached to powersupply cable, move over surface

Generate goal regions in presence of uncertainty, interference

If physical limitation, execute regrasping steps

Sensing to task planning to assembly execution, integration, automatic

Coarse and fine motion planning combined

Assembly, polyhedra in contact

Gravity stable assembly, upper part cannot fall apart

Model manipulator by spheres for collision avoidance

Task to parameter designer, adapts parameters of impedance model as function of sensors

Neural network for object trajectory prediction, fuzzy for robot path

Inverse kinematics model controls trajectory planning and servo system

Hierarchical, learning, recognition level controls adaptation, servo level
Collision monitor controls planner in real time to replan if collision
Architecture, integration of planner and motion controller
Reinforcement learning algorithm
Using sub goal method of options for semi optimal path planning
Configuration metrics
Input design parameters of workpiece into path, trajectory planner
Simultaneous trajectory and camera planning
Adaptive posture planning as function of large forces
Self motion topology knowledge, configuration mapping
Distributed planning, offline trajectory, online motion, avoid collision
Fuzzy identification of motion plans executed by operator
Piano moving model
Trajectory optimization, coarse for arm, medium for wrist, fine for finger
Real time path planning, trajectory generation
Planning of vehicle and of its manipulator arm
Computed robot optimized configurations to train arm, output path in real time
Integration of simulation and planning
Replanning
Constraint motion planning, variational dynamic programming
Motion and task planning
Motion, trajectory planning
Alternative, allowable path substitution if arm movements not possible
Display of workpiece, workspace, locus of robot tip in different planes, xy xz yz
Path motion planning, path in space followed by tip of robot
Replace link, joint, structure by stewart platform to model flexibility
Modeling only part of links or modules
Modeling of links for each possible error or only certain error
Modeling, identification of link parameters
Ann for learning robot contact surface shape
Neural network based on distance between patterns
Ann for voice recognition
Ann for vision processing
Generate derivative, change of vibration error
Generate derivative, change of position error
Selective perception, retain only information needed for special task
Signal processing for sensors
Detect if robot has picked up more than one piece from bin; interlocked parts
Barcode reader to detect position
Edge detection from tactile information
Identification of contact formation, state from several force measurements
Object dimension
Identification and location, position of components, objects
Detect proximity of object
Relative position of wrist with respect to end effector spatial configuration
Motion of object
End effector position using accelerometers in tip
Compare measured distances to obstacle with model of environment
Acceleration of end effector
Friction estimation for grasp
Joint limit
Haptic object recognition
Object recognition to track object on conveyor
Orientation and distance
Multisensor to detect contact errors in assembly
Tracking a tool, compute 3-D position relative to camera
Derive hand position angle from sensed process variable, like waveform
Collision between hand and workpiece, operator
Contactpoint between sensor surface and the normal, geometric probing
Position and orientation of end effector, teach probe, track them
Object detection
Recognize shape, contour of object, extract position and orientation
Detect features of object, not position or orientation
Measuring, determine axis of revolution surface by tactile sensing, orientation
Purpose, workpiece slip sensing
Position and force and skin acceleration and stress rate sensors
Force and tactile and proximity sensor
Camera, vision combined with force sensor
Camera combined with position sensor
See integrated sensor, end effector, camera, proximity, gas, temperature, force
Laserscanner combined with tactile sensors
Camera combined with tactile sensors, for 3-D
Multisensor object recognition, surface reconstruction
Multisensor object recognition
Impedance, mechanical impedance measurement
Mechanical impedance, from motor current and estimated velocity
Touch sensing, arc sensing
Force sensor in robot fixture, base
Detect relative position or orientation between gripper and currently handled object
Camera, non-contact sensor mounted on wrist, indep from gripper
Chemical, biological sensors
6-DOF force sensor
Measure force indirectly by using deviation in position
Three laser scanners project beam on photodiodes on end effector
Recognize shape, contour of tool
At least three cameras, for tracking, general overview and underview
Two virtual infrared range sensors
Push object and hold, detect moved distance
Two range sensors for recognizing 3-D objects
Camera to monitor deviation of each joint, due to bending of link
Encoder in each joint
Measure, calculate angular momentum, gyro of rotating body at end effector
Measure velocity, speed of end effector
Force, torque sensor integrated in joint
Reference sensors
Robot control test platform
Infrared stimulated ultrasonic button on end effector, two fixed receivers
Two camera, global vision camera, end effector neighbourhood vision camera
Two cameras, each on a different end effector to measure relative position
Force, torque sensor in finger
Fixed camera to observe workspace, object, workpiece, global
Camera rotates around end effector, no calibration needed
Camera to monitor end effector as well as object to be handled
Camera to monitor endpoint, end effector position
6-DOF ultrasonic or infrared external measurement
Camera, laser scanner on end effector, hand eye manipulator, local
Whole arm proximity sensor WHAP
Integrate sensor placement, configuration with vision tracking
Sensor planning, sensor configuration, parameters as function of task
Agile eye, control position of camera, active vision, pan-tilt camera, follow object
Measure gripping force offline, calibrate gripper for gripping force
Haptic, combination of tactile and proprioceptive sensing
Triangulation sensor
Detect orientation of workpiece during movement of end effector
Track position of end effector by laser beam
Optical beam area sensor
Tactile sensor
Proprioceptive, detect relative link position, form object from hand contact
Tactile image sensor, matrix, array of tactile elements, tixels
Progressive constraints
Manipulation planning, consider manipulation task, path, grasping
Servomotor, servo controller till figures
Servo problems
Servo amplifier
Control power amplifier with data on data bus
Selection gain according to selection of speed or positioning mode
Update servo gain not for each microprocessor cycle, but after a certain displacement
Change gain as function of speed and position
Select gain as function of gear ratio
Speed gain high, position gain low in speed mode and inverse in position mode
Sum output of amplifiers with different gains
Adapt gain as function of followup error, model can be used
Adjust feedforward gain
Lower gain in high frequency region
Cubic raise of gain until friction overcome, then linear raise
Adjust position and speed gain of different axis
Adjust gain to maintain operating bandwidth for guaranteed servo performance
High gain in narrow band of frequencies centered around frequency of rotation
High gain for motor control during acceleration, low during deceleration
Measure time needed from first to second speed, to adapt gain to aging condition
Variable gain
Small gain for small movements, large gain for large movements
Large pd gain initially switched to smaller pd gain afterwards
High gain for low command speed, torque or position error equals or near zero
Detect oscillation, instability of servo and change gain to stabilize again
Change gain as function of speed
Control signal exponentially to error
Select gain with memory, rom table
Adjust gain as function of position error and position
Raise gain at zero speed until position error or speed is zero, then normal gain
Backlash
Constant counter torque
Two motors driven in opposite direction to take up backlash
Voltage injection
Position error in memory, lookup table for correction actual position
With computer
Compensation pulses
Change compensation slowly, gradually, smooth error with filter
Compensation pulses as function of direction movement
Switch between rapid, quick feed and cut, slow workspeed feed backlash
Memory table with motor current and corresponding correction for lost motion
For several transducers a table, select table as function of transducer
For several modes and feed speeds, a table, registers for several backlash
Fw compensation using adaptive inverse backlash model
Recirculating ballnut, ballcrew, preloaded bearing
By injection of sinusoidal signal, superposed on of value position counter
References, calibration positions for correction Alignment, zeroing, nulling, set parallel to axis
Signal represents certain movement Identification and servo correction
If error too large, switch over to signal
Determine switch point
Align, calibrate control so that one pulse or signal represents certain movement
Alignment, zeroing, nulling, set parallel to axis

References, calibration positions for correction of value position counter
By injection of sinusoidal signal, superposed on reference

Relieve backlash by stepping back a little and verify position
Block position pulses until movement detected, automatic compensation
Detect end of lost motion by detecting changing current
By detecting change of velocity
How to integrate position error, add to speed loop
Using neural network techniques
Kind of compensation such as pitch error compensation

Compensation for changing stiffness, deformation of workpiece
Stiffness, deformation of slide, drive
For deformation of screw
Play in gear, screw backlash, lost motion
Backlash for linear deviations
Compensation for two, three axis at the same time, crosscoupling
Linearly distributing pitch error over interpolated distance, add pulses, smoothing
Reference screw, simulation axis, electronic simulated axis
 Resolver or inductosyn correction
Keep nut at constant distance from screw
Correction screw
Measuring and feedback
With cam
Backlash for non orthogonal axis
Cam transmits movement to resolver
Tuning potentiometers and programming them
Learn, calibrate at start for indetermined position, drive until movement
Calibrate at start if new screw or slide has been installed, new lookup table
For each replacement of a movable part, reload pitch error correction
Self tuning, test run, detect, compute optimal backlash, deformation compensation
Backlash acceleration compensation when reversing, reversing direction
Cross coupled backlash for two other axis on reversing third axis
Approach position from same direction
Timer, speed integration to control duration of backlash correction
Upon reversing direction, lower, change gain
Compensation speed axis with changing, reversing direction, quadrant circle
Compensation pulses on inversion of direction of rotation, movement
Bang bang control
Determine switch point
If error too large, switch over to signal identification and servo correction
Align, calibrate control so that one pulse or signal represents certain movement
Alignment, zeroing, nulling, set parallel to axis
References, calibration positions for correction of value position counter
By injection of sinusoidal signal, superposed on reference

Torque compensation

Removable interferometer, store exact position, needed drive current, temperature
References, calibration positions to adapt gain of servo
For several positions store dead zone in memory
Align stepping motor with driven valve
Automatic recalibration
 Calibration by going to two extremes, limits, counting pulses, storing values
Stop, halt step, ac motor on certain excitation phase, after sensing a reference
Analog comparator
One comparator for both speed and position feedback
Start fine position after coarse position stopped
Coarse fine
Coarse fine take over, transition, switch over
Coarse by hydraulic cylinder, fine by step motor superposed on piston
Controlled parameter such as gas mass flow rate
Drilling rate, feed rate
Vertical position and orientation with respect to vertical
Control parameter such as motor controlled by a torque signal
Compensation for path radius
Compensation for gravity, counter balance gravity
Compensation periodical disturbance, like chatter, non-circular workpiece
Compensation for instability
Cancel vibration during positioning of slide
Drift-compensation for servo, anti-hunt
Servo error compensation
Eliminating oscillations, hunting motor, actuator
Mechanical vibrations in servo, antihunt also safety, stray pulses, jitter
Correction inertia of servo
Nonlinear compensation
Compensate position as function of phase lag of drive motor
Compensation for current ripple of drive or transducer
Compensation for temperature variations of servo
Compensate vibration beam, gantry, feedback of speed of non driven end
Force compensation for non linearity of system
Enter manually a compensation, correction for a better positioning
Motor ripple compensation
Compensation non linear transfer function
Ann compensates output of pd controller
Avoid stray pulses, jitter, use two d-flipflops, or integrate pulse duration
Compensation of position for slip of ac motor
Torque compensation for levitation effect of motor
Torque compensation
2219/41139 . . . Compensate dynamic deflection of slide, calculated with position, speed, torque deflection values
2219/41141 . . . Position error compensation as function of speed to compensate detection delay
2219/41142 . . . Compensation of servocontrol signals as function of changing supply voltage
2219/41143 . . . Compensation of dynamic characteristic of actuator
2219/41144 . . . Element used such as low pass filter to cut resonance at non needed regions
2219/41145 . . . Digital filter for compensation of servo loop
2219/41146 . . . Kalman filter
2219/41147 . . . Exponential filter
2219/41148 . . . Model, from position, speed, acceleration derive compensation
2219/41149 . . . Zero phase filter
2219/41151 . . . Finite impulse response filter
2219/41152 . . . Adaptive filter
2219/41153 . . . Infinite impulse response filter
2219/41154 . . . Friction, compensation for friction
2219/41155 . . . During reversing, inversing rotation, movement
2219/41156 . . . Injection of vibration anti-stick, against static friction, dither, stiction
2219/41157 . . . Compensation as function of speed and acceleration
2219/41158 . . . Use of pwm signal against friction
2219/41159 . . . Two step command, reference and dead zone value forward, then dead zone reverse
2219/41161 . . . Adaptive friction compensation
2219/41162 . . . Large gain at start to overcome friction, then low gain
2219/41163 . . . Adapt gain to friction, weight, inertia
2219/41164 . . . How to compensate, for example by injecting compensation signal in comparator of normal loop
2219/41165 . . . Compensation corrected by second servo independent from main servo
2219/41166 . . . Adaptive filter frequency as function of oscillation, rigidity, inertia load
2219/41167 . . . Control path independent of load
2219/41168 . . . Compensate position error by shifting projected image electronically
2219/41169 . . . Parallel compensation
2219/41171 . . . Different compensation for left and right movement
2219/41172 . . . Adapt coefficients of compensator to bring system into phase margin
2219/41173 . . . Delay of compensation output signal as function of sampling and computation time
2219/41174 . . . Compensator in feedback loop
2219/41175 . . . Derivative compensation for speed loop, added or subtracted to speed reference
2219/41176 . . . Compensation control, position error with data from lookup memory
2219/41177 . . . Repetitive control, adaptive, previous error during actual positioning
2219/41178 . . . Serial precompensation
2219/41179 . . . PI precompensation for speed loop
2219/41181 . . . PID precompensation for position loop
2219/41182 . . . PI precompensation for position loop
2219/41183 . . . Compensation of lag during standstill
2219/41184 . . . Compensation of lag during constant speed movement
2219/41185 . . . Send reference data in inverse order to model, filter to get inverted phase
2219/41186 . . . Lag
2219/41187 . . . Inverse, reciprocal filter, transfer function, reduce lag in contouring
2219/41188 . . . Compensate position error between two different axis as function of type of transducer
2219/41189 . . . Several axis, compensation for load for several axis at the same time
2219/41191 . . . Cancel vibration by positioning two slides, opposite acceleration
2219/41192 . . . Compensation for different response times, delay of axis
2219/41193 . . . Active damping of tool vibrations by cross coupling
2219/41194 . . . Axis error, one axis is corrected on other axis
2219/41195 . . . Cross coupled feedback, position change one axis effects control of other
2219/41196 . . . Adaptive prefiltering
2219/41197 . . . Adaptive postfiltering
2219/41198 . . . Fuzzy precompensation of pid, pd
2219/41199 . . . Feedforward compensation of pid
2219/41201 . . . Fuzzy compensation of statecontroller
2219/41202 . . . Structure, compensation circuit after comparator in loop
2219/41203 . . . Lead-phase compensation, lag-phase compensation servo
2219/41204 . . . Compensation circuit for input, reference, before comparator
2219/41205 . . . Compensation circuit in speed feedback loop
2219/41206 . . . Lookup table, memory with certain relationships
2219/41207 . . . Lookup table with position command, deviation and correction value
2219/41208 . . . Lookup table for load, motor torque as function of actual position error
2219/41209 . . . Lookup table with compensation as function of reference and feedback value
2219/41211 . . . For surface deviations from reference surface
2219/41212 . . . Gains for pid compensator as function of xy position
2219/41213 . . . Lookup table for load, motor torque as function of actual position
2219/41214 . . . Lookup table for current as function of actual position
2219/41215 . . . Lookup table for speed as function of actual position error
2219/41216 . . . Two lookup tables, for forward and reverse movement
2219/41217 . . . Command preshape, guidance, reference for better dynamic response, forcing feedforward
2219/41218 . . . Pocast, break reference into two parts, better settling time
2219/41219 . . . To compensate path, track error, calculate, use compensated reference
2219/41221 . . . Fuzzy shaping
2219/41222 . . . Modified command filtering
2219/41223 . . . Ann shaping, objective position, trajectory is shaped by ann
2219/41224 . . . Shaping a bang-bang input
G05B

2219/41225 . . . Profile generator for reference and for feedforward torque

2219/41226 . . . Zero vibration and zero derivative input shaper ZVD

2219/41227 . . . Extra insensitive input shaper, some vibration allowed

2219/41228 . . . Frequency of commutation updates depends on motor speed

2219/41229 . . . Adding a vibration, noise signal to reference signal of position, speed or acceleration

2219/41231 . . . Using impulse shaping filter

2219/41232 . . . Notch filter

2219/41233 . . . Feedforward simulation filter, with model

2219/41234 . . . Design, modeling of position controller

2219/41235 . . . Design, modeling of motion controller

2219/41236 . . . Use of sfc sequential function charts for specification

2219/41237 . . . Use of petrinets for verification, simulation

2219/41238 . . . Design with control bandwidth beyond lowest natural frequency

2219/41239 . . . Lyapunov direct controller design

2219/41241 . . . Anti-coincidence, synchronizer

2219/41242 . . . Pulse height modulation PHM

2219/41243 . . . Prevent, detect overflow of counter

2219/41244 . . . Dead band, zone

2219/41245 . . . Discrimination of direction

2219/41246 . . . Modulate command according to hystereris so that ideal curve is followed

2219/41247 . . . Servo lock

2219/41248 . . . Adapting characteristics of servo

2219/41249 . . . Several slides along one axis

2219/41251 . . . Servo with spring, resilient, elastic element, twist

2219/41252 . . . Avoid housing vibration, slide and auxiliary slide controlled with opposite phase

2219/41253 . . . From measured signature, select in database corresponding servo valve type

2219/41254 . . . Avoid cumulative measuring, calculation errors, sum remainder

2219/41255 . . . Mode switch, select independent or dependent control of axis

2219/41256 . . . Chattering control

2219/41257 . . . Display of gain

2219/41258 . . . Single position detector for plural motors driving a single load

2219/41259 . . . Coupling, clutch

2219/41261 . . . Flexible coupling between carriage, slide and actuator, motor

2219/41262 . . . Binary summing of motions, by stacking or using levers

2219/41263 . . . Switch control mode of spindle drive as function of contouring, spindle orientation

2219/41264 . . . Driven by two motors

2219/41265 . . . To avoid backlash

2219/41266 . . . Coupling, clutch and brake unit

2219/41267 . . . Servo loop with stepping motor, see figure SE-twelve

2219/41268 . . . Two cascade slides controlled in opposite direction to avoid local wear

2219/41269 . . . Ballscrew and ball spline nut driven synchronously or independently

2219/41271 . . . Drive in two directions

2219/41272 . . . Driven by two stepmotors with different resonance frequency

2219/41273 . . . Hydraulic

2219/41274 . . . Flywheel as power buffer

2219/41275 . . . Two axis, x y motors controlled simultaneously, no contouring, quick move at 45-degrees

2219/41276 . . . Displacement as function of width, amplitude pulse to motor

2219/41277 . . . Separation of position drive controller and motor amplifiers

2219/41279 . . . Brake

2219/41281 . . . Hydraulic actuated brake

2219/41282 . . . Magnetic brake

2219/41283 . . . Brake force does not load index axis, better positioning

2219/41284 . . . Brake by applying dc to ac motor

2219/41285 . . . Dynamic brake of ac, dc motor

2219/41286 . . . Brake motor before reversing motor

2219/41287 . . . Mechanical self braking

2219/41288 . . . Two brakes, one on motor axis, other on drive axis

2219/41289 . . . Motor direction controlled by relays

2219/41290 . . . Before switching relay, series semiconductor diminishes current to zero

2219/41292 . . . H-bridge, diagonal pairs of semiconductors

2219/41293 . . . Inverter, dc-to-ac

2219/41294 . . . Ac-to-ac converter

2219/41295 . . . Ac-to-ac converter frequency controlled

2219/41296 . . . Two data lines; one for drive controllers, other to communicate with central unit

2219/41297 . . . For cancelling magnetic field leakage generated by, e.g. voice coil motor

2219/41298 . . . Stepping motor and control valve and power cylinder and mechanical feedback

2219/41299 . . . Pneumatic drive, pressure controlled bellow extension

2219/41301 . . . Pilot valve, linear fluid control valve and power cylinder

2219/41302 . . . On off fluid valve and power cylinder

2219/41303 . . . Flow rate valve controls speed

2219/41304 . . . Pneumatic

2219/41305 . . . Bypass fluid flow, block it from motor

2219/41306 . . . Control valve with counteracting control pulses

2219/41307 . . . Motor drives hydraulic pump in direction needed for power cylinder

2219/41308 . . . Bellow formed by for linear actuators, each pressure controlled by motor

2219/41309 . . . Hydraulic or pneumatic drive

2219/41311 . . . Pilot valve with feedback of position

2219/41312 . . . Metering piston between switch to fluid supply and switch to power cylinder

2219/41313 . . . Electro rheological fluid actuator

2219/41314 . . . Electro rheological valve controls cylinder

2219/41315 . . . Feedback of position of pilot valve and of power cylinder

2219/41316 . . . Piezo valve

2219/41317 . . . Stepping motor and control valve and power cylinder

2219/41318 . . . Electro hydraulic drive, electric motor drives hydraulic actuator

2219/41319 . . . Ac, induction motor
G05B

2219/41321 . . . Brushless dc motor
2219/41322 . . . Vector, field oriented controlled motor
2219/41323 . . . Permanent magnetic synchronous actuator, motor
2219/41324 . . . Modular servo drive, simo drive
2219/41325 . . . Linear electric actuator for position combined with pneumatic actuator for force
2219/41326 . . . Step motor
2219/41327 . . . Linear induction motor
2219/41328 . . . Direct motor drive
2219/41329 . . . Dc motor
2219/41331 . . . Galvano driver
2219/41332 . . . Electromagnet driven core, position of core controlled
2219/41333 . . . Non linear solenoid actuator
2219/41334 . . . Electrostatic levitator
2219/41335 . . . Reluctance motor
2219/41336 . . . Voltage and frequency controlled ac motor
2219/41337 . . . Linear drive motor, voice coil
2219/41338 . . . High torque, low inertia motor, printed circuit motor
2219/41339 . . . Using, switch reluctance or asynchronous motor in, to stepping mode motor
2219/41341 . . . Ultrasonic motor
2219/41342 . . . Shape memory metal actuator
2219/41343 . . . Magnetoresistive motor
2219/41344 . . . Piezo, electrostrictive linear drive
2219/41345 . . . Micropositioner
2219/41346 . . . Micropositioner in x, y and theta
2219/41347 . . . Piezo cycloid motor
2219/41348 . . . Hydraulic pressure block
2219/41349 . . . 6-Dof combined magnetic fluidic floating motion stage 100-micrometer cube range
2219/41351 . . . Piezo impact force, rapid extension of small mass moves object a bit
2219/41352 . . . Alternative clamping dilation of piezo, caterpillar motion, inchworm
2219/41353 . . . Optical piezo electric element, light converted in movement
2219/41354 . . . Magnetic, thermal, bimetal peltier effect displacement, positioning
2219/41355 . . . Electro magnetic coil actuator, voice coil
2219/41356 . . . Variable speed transmission, Van Doorne, Reeves
2219/41357 . . . Belt
2219/41358 . . . Transmission, variable gear ratio
2219/41359 . . . Gearbox
2219/41361 . . . Differential
2219/41362 . . . Registration, display of servo error
2219/41363 . . . Excess in error, error too large, follow up error
2219/41364 . . . Excess in error for speed, follow up error for speed
2219/41365 . . . Servo error converted to frequency
2219/41366 . . . Linearization of embedded position signals
2219/41367 . . . Estimator, state observer, space state controller
2219/41368 . . . Disturbance observer, inject disturbance, adapt controller to resulting effect
2219/41369 . . . Two estimators
2219/41371 . . . Force estimation using velocity observer
2219/41372 . . . Force estimator using disturbance estimator observer
2219/41373 . . . Observe position and driving signal, estimate disturbance and speed
2219/41374 . . . Observe position and driving signal, predict, estimate disturbance signal
2219/41375 . . . Observe speed and select torque as function of position reference, to compensate torque
2219/41376 . . . Tool wear, flank and crater, estimation from cutting force
2219/41377 . . . Estimate cutting torque in real time
2219/41378 . . . Estimate torque as function of speed, voltage and current
2219/41379 . . . Estimate torque from command torque and measured speed
2219/41381 . . . Torque disturbance observer to estimate inertia
2219/41382 . . . Observe position from encoder, estimate speed with ann
2219/41383 . . . Observe current, voltage, derive position
2219/41384 . . . Force estimation using position observer
2219/41385 . . . Observe position from encoder, estimate speed, position with kalman filter
2219/41386 . . . System identifier adapts coefficients tables for state and observer controller
2219/41387 . . . Observe reference torque, position and feedback position, estimate contact force
2219/41388 . . . Observe input torque and feedback position, estimate reaction torque
2219/41389 . . . Estimate torque from command torque and feedback acceleration
2219/41391 . . . Flux observer, flux estimated from current and voltage
2219/41392 . . . Observer for each axis, link, freedom, gives greater speed
2219/41393 . . . Synchronize observer with pulse from encoder
2219/41394 . . . Estimate speed and position error from motor current, torque
2219/41395 . . . Observe actual position to estimate compensation torque
2219/41396 . . . Estimate acceleration from three phase current values
2219/41397 . . . Estimate voltage control signal as function of voltage control signal and position error
2219/41398 . . . Estimate twist between motor and load, observe motor position and speed
2219/41399 . . . Reduced order estimator
2219/41401 . . . Estimate position from max and min speeds in open loop
2219/41402 . . . Observe speed and driving signal, estimate speed
2219/41403 . . . Machine deformation estimator as function of commanded position
2219/41404 . . . Hysteresis, bang bang feedback of velocity
2219/41405 . . . Inverse kinematic, dynamic
2219/41406 . . . LQR linear quadratic regulator to calculate gain for several known variables
2219/41407 . . . Master changes resistor, slave restores value in order to follow master
2219/41408 . . . Control of jerk, change of acceleration
2219/41409 . . . Update position feedback during speed control
2219/41411 . . . Avoid integrator wind-up, saturation actuator by dead zone feedback for integral
2219/41412 . . . Bandwidth of velocity loop is just below natural frequency of drive support
2219/41413 . . . Forward kinematics
2219/41414 . . . Time delay control, estimate non linear dynamics, correct with time delayed input
Superposition of movement

figure SE-two

counter or absolute digital comparator, see
Servo loop with switch between difference of
Servo loop with position and reference counter,
see figure SE-seven

Zero phase error tracking controller zpec
Servo loop with absolute digital comparator,
see figure SE-one

Inverse, feedforward controller is inverse of
closed loop system

Servo loop with switch between difference of
counter OR absolute digital comparator, see
figure SE-two

Non linear pi

Servo loop with phase counter and phase
discriminator, see figure SE-four

Time counter and phase discriminator

Phase counter and phase discriminator, phase
locked motion

Servo loop with phase comparator, see figure
SE-ten

Servo loop with oscillator, see figure SE-eleven

Servo loop with coincidence detector, see
figure SE-thirteen

Servo loop with adder, see figure SE-fourteen

Servo loop with counter, see figure SE-fifteen

Servo loop with u-down counter, see figure SE-
sixteen

Servo loop with position error indicates speed
step value

Servo loop with position and speed loop,
problems of speed loop

Servo loop with absolute digital position sensor

Servo loop with absolute digital position sensor
for continuous path control

Servo loop with analog position sensor

Servo loop with analog position sensor for
continuous path control

Servo loop with combination of analog and
digital sensor

Servo loop with position loop

Divide command, block in subcommands,
subblocks

Servomotor, servo controller kind till VSS

Statistical process control spc

Proportional

Three point, hysteresis comparator, controller

PD proportional derivative

Disturbance decoupling, rejection, suppression

Digital event dynamic system control

Nonlinear PD

P regulator for position loop

I regulator for speed loop

PI regulator for speed loop

H-infinite controller

Two pd controllers, one for coarse, one for fine
motion

Pseudo derivative control with feedforward of
gain

P integrator, look at past periodic errors, fading
memory, repetitive controller

Dynamic impedance control, load does not
influence speed, force, position

Mimo controller with many inputs and outputs

Pid learning controller, gains adapted as
function of previous error

Pi for position controller

Pi for current loop

Three point, hysteresis controller with variable
hysteresis as function of error

Non linear pi
Stage controller, zpec and fuzzy smc and compensation controller

Pidaf, pid with acceleration and friction compensation

Pi position controller and fuzzy logic speed controller

Flsp frequency locked steeping position control servo

Five point, hysteresis controller

Cron controller, fractional or fractal or non integer order robust controller

All denominator model, the model form is expanded in denominator taylor series

Differential feedback pd

Kind of servo controller

Pi regulator

I regulator

Adaptive control, adaptive nonlinear control

Adaptive pi

Real time adaptive control

Select servo parameter set from table for fixed linear working points

Adaptive pd

Adaptive robust controller

Adapt regulator as function of its output

Adapt model as function of difference between real and calculated position

Ann, error to pd, output pd to plant and also sets weights in ann

Fuzzy pd controller, with position and velocity inputs

Pid like fuzzy controller with position and velocity inputs

Fuzzy pi control

Fuzzy p

Fuzzy position controller

Fuzzy pi and d control

Dynamic fuzzy position controller

Loop, p control for position loop

Pi control for speed

Pi current controller

Predictive fuzzy controller

General predictive controller GPC

Delta gpc, using derivative in time, predict over finite horizon

Stochastic predictive controller spc

Position and speed and current

Position and speed and current and force, moment, torque

Position, speed and acceleration

Feedforward combined with pid feedback

Position and speed and acceleration and current feedback

Position and current

Quasi smc, smc combined with other regulators

Observer combined with pd and zero phase error tracking flywheel controller

Two clocks for each of the two loops

Position feedback and speed feedback, speed from data of tape

Position and speed feedback, speed derived from position reference

Position feedback and speed feedback, speed measured with tacho

Hybrid loops

Position, speed or current, combined with vibration feedback

Observer combined with pd

P position loop, fuzzy speed loop

Fuzzy position controller and smc for motor voltage control

Force control in one axis, velocity control in other axis

Position, speed and force feedback

Hybrid, analog loop, reference compensated by digital loop

Error between reference model and controller compensated with fuzzy controller

Position, speed and deflection feedback

Speed and force loop

I parallel to non linear controller

Quick but coarse loop and slow but fine loop, dexterity

Loop combinations, add a second loop, cascade control

Position and force control loop together

Position and current, torque control loop

Speed then pressure or force loop

First closed loop, then open loop

Add, subtract i part of speed feedback as function of sign speed error

Dual mode servo, slow and precise, quick and coarse movement

First open, then closed loop to correct setpoint of open loop

Slow coarse loop followed by fine quick loop

Coarse position with microprocessor, fine with hardware centering, tracking

Coarse 8-bit positioning in closed loop, fine 10-bit in open loop

Switch from pi, if large error to disturbance bit in open loop

Loop switch, speed loop then position loop, mode switch

Switch from pid to bang-bang to energy dissipation as function of speed, error

Speed regulation starts only in braking range, less processor time needed

Always position loop, first open loop for speed, then also closed loop speed

Open loop for positioning, closed loop for calibration

Coarse is speed loop, fine is position loop

Change from pd, if small error, to bangbang if large error

Switch between motion and stall mode, if speed is below certain value

Position closed loop or open loop pressure control

Loop mode, dual mode incremental coarse, analog fine

Switch from continuous drive to pwm, near stop or out of acceleration period
Reference model uses only output and input.

Model loop.

Model itself controlled by position and speed loop.

Inverse dynamics model idm, computed torque.

During learning relation between control and controlled signal, open loop.

Learn dynamics of servomotor system by ann.

Learn, self, auto tuning, calibrating, environment adaptation, repetition.

Inverse dynamics model idm, computed torque method.

Model itself controlled by position and speed loop.

Reference model uses only output and input measurements.

Fuzzy model of cutting process of milling machine.

ARMA, AR autoregressive for poles, MA moving average model for zeros, in combination.

One model for load, one model for motor inertia.

Model reference adaptive control MRAC, correction fictive-real error, position.

Simulator.

Compensation of integration time of model.

Compensation of gain of speed control circuit for model.

Criterium is minimum jerk.

Minimum torque change.

Measuring of needed force for servo.

Decoder.

Velocity profile, variable gain, multiplication factors, rom ram.

Special code.

Acceleration deceleration.

Memory with position profile and force limits.

Velocity, speed points, profile and corresponding acceleration, delta v.

Motion profile.

Configuration memory for step motor.

Reduce cable connection by pre-memorized positions.

Normalize velocity profile, calculate real velocity from additional parameters.

Rom contains sin and cos table to drive step motor.

Memory is Rom for servo control.

Memory is Ram.

Master slave with feedforward for compensation of contour error.

Master slave with contour controller.

Master slave, motion proportional to axis.

Position mirror, axis, display, back of seat as function of position of seat, other axis.

Slave controlled as function of reference and actual position and derived speed of master.

Motion look up table as function of cam angle.

Adjust proportionality factor to optimize slave axis movement.

Each axis drive has own queue of commands, executed in synchronism.

Select between limit switches as function of current position and destination.

Derive position from command speed, integrate speed.

Position a stop, move workpiece against stop to cut stock, bar.

Follow dynamically contour warped surface with tool.

Brake as function of machining load, to keep total load on tool constant, avoid oscillation.

Step motor driven by step size and step duration data.

Fine position with gauge, coarse with limit switch, transducer.

Deriving speed from commanded position.

Square of distance.

Switch from pid to pd or pd to pid.

Speed mode then stepping mode.

Breaking of control loop, closing open control loop.

Switch between motion and stall mode if actuator voltage current below limit.

Switch from bang-bang control to dead beat, finite time settling control.

First open loop, then closed loop.

Position loop then force, current loop.

Change over between two controllers, transfer error signal.

Switch from pi to p or to pd-controller.

Bumpless, smooth transfer between two control modes.

Timing, switch over on detection of marker on spindle.

Servo characteristics, drive parameters, during test move.

Teach, learn position table, model, for each reference a motor control output.

Speed model created by entering estimated speed at references.

Correct, modify position table, model if detected error too large.

Position references as function of time, correlated speed, acceleration in memory, signature.

Fuzzy logic tuning of controller as function of error.

Fuzzy model reference learning controller, synthesis, tune rule base automatically.

Fuzzy feedback adapts parameters model.

Automatic tune fuzzy controller.

Network tunes controller.

Tune fuzzy controller by three attributes: rise time, overshoot, settling time.

Filter error learning.

Fuzzy control learning of starting friction coefficient.

offline optimization of fuzzy controller.

Online tuning of fuzzy controller by ann.

Coarse tune with genetic algorithm, fine with gradient descent, hill climbing.

In each position, upper, lower drive current needed to move more, less, store mean.

Tune with genetic algorithm.

Position references as function of time, correlated noise, temperature in memory.

During learning relation between control and controlled signal, open loop.

Learn dynamics of servomotor system by ann.

Learn, self, auto tuning, calibrating, environment adaptation, repetition.

Inverse dynamics model idm, computed torque method.

Model itself controlled by position and speed loop.

Model.

Forward dynamics model fdm.

Reference model uses only output and input measurements.
Using a counter and a limit switch

Absolute positions

With potentiometer

Block, stop pulses in one axis, not in other axis

Generate points between start and end position, linear interpolation

Set position of proximity switch

Two slides, fine and quick, coarse and slow, piggyback, multirate positioner

Command position by time value, proportional to total displacement

Rotation over, selection of smallest, shortest angle, distance

Position overshoot, axis still moves after stop

Near desired position, control actuator by pulse in each clock, otherwise continuously

Stop machine in a predetermined position

Changing position range, stroke, between closed and fully open

Time optimal position control

Coarse and fine position control combined, each by ann

Slow positioning with low pass, concurrent quick with high pass part of command

Control position by equilibrium between spring and actuator force

Compare reflected image from object with reference image, adjust object

Number and frequency of pwm signals define mean position in time

Process received reference to adapt it to range of servo

Coarse and fine position control combined, added, superposed

If deviation, return to desired position after a delay if within position range

Using incremental control actuator

Stop motor where torque will be maximum

Detent, stop lock, current through motor in stop, locked, hold, blocked position

Select, switch between long, extended and short range to position

Pwm signal to low pass filter, compared to feedback position, if equal stop motor

Regression ann to map position error to pulse width

Adaptive pulsing, augment time duration until movement detected

Use of a certain number of ac periods

Pwm pulse width modulation, pulse to position modulation ppm

Control motor position with direction signal and pwm signal for position

Adaptive pulsing, take into account next cycle, command

Select minimum value of two reference values

Reference generator for position

Enter velocity in reference generator, delivers position signals

Enter acceleration, jerk, generator outputs acceleration, speed, position by integration

Reference generates upper and lower range value at both sides of reference

Add compensation to reference value

Remote reference transmitted to servo

Command reference limited, clipped, only between upper and lower values

Relative positioning

Control position of beam in coordination with xy slide

Position beam to keep centerline

Double resolution for one pulse of computer

Resolution one axis different from resolution other axis

Acceleration, deceleration time is a multiple of sampling time

Sampling the signal

Sampling time in fixed relation to timer interrupt

Two sampling frequencies, for online measurements, for offline calculations

Variable sampling rate as function of thermal displacement

Two sampling frequencies, one for motion, one for stillstand

Variable sampling rate as function of position error

Different sample rates, multiple sample rates for the different loops

Slow down sampling if power down is detected

Sampling rate for sending reference values equals interpolation rate

Variable sampling rate, slow at low velocity

Stability analysis

Safety, excess in error

Inject, superpose test signal on reference, monitor functionality servo

Monitor parameters, conditions servo for maintenance, lubrication, repair purposes

Total movement is divided in several zones with different protection parameters

On restart, power up, overload replace reference with feedback signal, free rotate

On power failure keep last servoposition by reference with feedback signal, free rotate

On power failure, close pilot valve

Alarm if working cycle fraction with values cutting off air supply

On restart, power up, overload replace reference with feedback signal, free rotate

Total movement is divided in several zones with different protection parameters

Alarm if working cycle fraction with values exceeding nominal exceeds threshold

Action, on power failure, close pilot valve entirely by return spring

If no position command in a period, servo to rest position, shut off power

If direction bad, change direction sign or phase sequence automatically

Allow temporary motor overload if temperature still under maximum, heat inertia

If estimated temperature rise of motor is too high, inhibit motor

If displacement rate of actuator exceeds limit, lower it

Motor only actuated if hardware and software permission and control signal together

Stop and brake motor

Stop axis contour controlled

Speed, contour controlled slow down of motor
Detect bearing, clamp wear
Detect ballscrew wear
Stalling of drive motor, overload
Axis breaking, between motor and slide, table
Detect wire break, short circuit of feedback
feedback failure, wire brake, short
Emit dummy pulses, detect loss of pulses,
eventually stop
What kind of actuator failure
scales to detect bad function
Using two, more, redundant measurements or
Redundant, two actuators
feedback is defect, failed
Additional hardware to detect which part of
Two, double counter to check measurement
Warning signals are send when excess in error
position and speed feedback
Excess in error for speed and different sign of
store result as 0-1 if in tolerance
Compare feedback with upper and lower limit,
time, position, compare with real torque
Excess in speed
Excess in speed
Excess in speed
Excess in speed
Excess in speed
Excess in speed
Excess in error, compare reference with feedback
Compare actual feedback with predicted,
simulated value to detect run away
Watchdog or integrator to detect no change or
excess in feedback
Store working torque profiles as function of
time, position, compare with real torque
Compare feedback with upper and lower limit,
store result as 0-1 if in tolerance
Excess in error for speed and different sign of
position and speed feedback
Warning signals are send when excess in error
for speed, acceleration, amplitude
Two, double counter to check measurement
Additional hardware to detect which part of
feedback is defect, failed
Redundant, two actuators
Using two, more, redundant measurements or
scales to detect bad function
What kind of actuator failure
Wrong direction or sign of measured value,
eventually stop
 Emit dummy pulses, detect loss of pulses,
feedback failure, wire brake, short
Detect wire break, short circuit of feedback
Axis breaking, between motor and slide, table
Stalling of drive motor, overload
Protection servo for saturation of amplifier
Detect ball screw wear
Detect bearing, clamp wear
Defective measurement, sensor failure
Bad parameter configuration for spindle, gear
to ratio, encoder resolution
Detect failure of servo controller
Synchronization by opposite correction for both
axis
Synchronous tracking servo for biaxial
positioning tables, contouring
If one slave axis out of synchronisation,
synchronise all other axes to that one
To synchronize axis, adapt gain of each axis as
function of max, min, average gain
Tracking control
Position tracking control
Speed tracking control
Force tracking control
Path, trajectory tracking control
Optimum, adaptive sliding mode controller
Chattering alleviation control, chattering about
switching surface
VSTC variable structure tracking control
Fuzzy sliding mode control fsmc
Switch to a saturation control signal if
deviation from switch line is too large
Sliding mode control with perturbation
estimation smce
PIVSC proportional integral compensated vsc
Sliding mode controller SMC, select other gain
Variable structure system, control VSS VSC
Speed, acceleration, deceleration control
Speed, feed, infeed, acceleration, stopping
problems
Acceleration, deceleration for forward,
backward reciprocating movement
Acceleration deceleration in presence of
backlash, dynamic backlash
Decelerate to follow desired velocity
Corner distance variables to keep path when
programmed speed changes
Acceleration, deceleration control
Acceleration from rest
Deceleration and stopping
Acceleration deceleration for each block of
data, segment
Shorter time by adjusting corner speed, avoid
zero speed when engage corner
Profile is defined by series of bits, for each
actuator, sensor
Ramp signal from division of sum of registers
Calculate inertia ratio from full acceleration
and full deceleration trial
Calculate square root x
Acceleration, deceleration as function of feed
rate override
Acceleration is larger than deceleration to
compensate for friction
Compensation, correction of acceleration,
deceleration time
Compensate acceleration for sudden change in
load, shockless
At several positions detect acceleration error,
compensate for it
Compensate for friction as function of position
2219/43023 . . . Switch from acceleration to deceleration if mid stroke speed not reached
2219/43024 . . . Parabolic velocity profile, linear acceleration, keep energy dissipation minimal
2219/43025 . . . Acceleration, deceleration is polynomial, derivative is zero on stop position
2219/43026 . . . Predict deceleration start from measured characteristics and actual performance
2219/43027 . . . Parabolic acceleration, deceleration trajectory at start, stop
2219/43028 . . . Switching points for trapezoidal form are stored in memory
2219/43029 . . . Acceleration larger than deceleration for safe stopping at slow speed
2219/43031 . . . Feed speed reduction dependent on tool surface
2219/43032 . . . Non symmetric acceleration profile
2219/43033 . . . Sinusoidal acceleration profile
2219/43034 . . . Form of profile, ramp, trapezoid, S-curve, exponential
2219/43035 . . . Vertical start and stop phase
2219/43036 . . . Velocity profile with given starting and stopping speed vector
2219/43037 . . . Position, speed as function of position is trapezoid
2219/43038 . . . Parabolic acceleration, constant speed, parabolic deceleration as function of position
2219/43039 . . . Time, exponential acceleration, constant speed, exponential deceleration as function of time
2219/43041 . . . Prediction, look ahead deceleration control, calculate start deceleration
2219/43042 . . . Convolution of speed curve with torque curve
2219/43043 . . . Normal and maximum deceleration mode, switch as function of position deviation, error
2219/43044 . . . Drive and brake alternative to decelerate and stop
2219/43045 . . . Max torque, acceleration, then variable, then reverse, variable then max deceleration
2219/43046 . . . Determine time constant from command speed and needed max acceleration torque
2219/43047 . . . If speed below reference, small acceleration, if above, large deceleration
2219/43048 . . . Step change in reference, soft start, smoothing reference
2219/43049 . . . Digital convolution for velocity profile, also successive convolution
2219/43051 . . . Translate generic motion description into acceleration profiles
2219/43052 . . . Set for each block time constant and speed target
2219/43053 . . . Slow acceleration, rapid deceleration
2219/43054 . . . Take up gear backlash during deceleration
2219/43055 . . . Same acceleration deceleration pattern for position and velocity loop
2219/43056 . . . Asynchronous acceleration between slow, fast axes, rotational, linear axes
2219/43057 . . . Adjust acceleration, speed until maximum allowable moment for axis
2219/43058 . . . Limitation of acceleration, permissible, tolerable acceleration
2219/43059 . . . Accelerate, decelerate all axis as function of max, min, average speed axis
2219/43061 . . . Maximum acceleration deceleration lookup table as function of distance
2219/43062 . . . Maximum acceleration, limit
2219/43063 . . . Acceleration deceleration as function of maximum allowable speed
2219/43064 . . . Brake, decelerate at least one axis at maximum
2219/43065 . . . Limitation of jerk
2219/43066 . . . Max centrifugal acceleration, especially for cm mm
2219/43067 . . . Reach maximum speed at zero acceleration
2219/43068 . . . Adapt acceleration as function of load, developed heat in motor
2219/43069 . . . Measure acceleration, derive limit torque, adapt acceleration
2219/43071 . . . Open closing acceleration deceleration control
2219/43072 . . . Position controlled opening profile
2219/43073 . . . Time controlled opening profile
2219/43074 . . . Control speed, acceleration so as to follow desired speed profile
2219/43075 . . . Two modes, one normal and one for obstruction by objects
2219/43076 . . . Switch from acceleration to constant speed as function of detected speed limit
2219/43077 . . . Limit switch starts braking, stop, no braking, low torque movement until end
2219/43078 . . . Near end position limit switch, brake by reversing, then slow until end limit
2219/43079 . . . Acceleration, deceleration controlled by switches along path
2219/43081 . . . Set parameters of profile generator, creep distance and speed, flight time
2219/43082 . . . Near end position limit switch, lower speed and brake
2219/43083 . . . Structure, step motor
2219/43084 . . . Acceleration deceleration circuit implemented in software, algorithm
2219/43085 . . . Acceleration-deceleration circuit before interpolator
2219/43086 . . . Acceleration-deceleration circuit after interpolator
2219/43087 . . . Stop valves to stop fluid flow of hydraulic drive cylinder
2219/43088 . . . Select out of plurality of acceleration profiles
2219/43089 . . . Rom, ram with speed and acceleration
2219/43091 . . . Ram with optimum motion curve
2219/43092 . . . Torque curve, wave stored in rom, ram
2219/43093 . . . Speed pattern, table together with timing data in ram
2219/43094 . . . Acceleration and deceleration together with their respective time
2219/43095 . . . Maximum speed and acceleration deceleration time constant as function of position
2219/43096 . . . Position, trajectory and speed stored in ram
2219/43097 . . . Table, rom, ram speed table
2219/43098 . . . Change ADC time constant during start and end of interpolation
2219/43099 . . . Select acceleration deceleration time constants as function of weight, load, position
2219/43101 . . . Change time constants acceleration, deceleration as function of feed rate override
2219/43102 . . . Time constant acceleration, deceleration as function of machining conditions
2219/43103 . . . Switch adc time constants as function of type of axis, spindle feed or position axis
2219/43104 . . . Minimize time constant based on operation program
2219/43105 . . .  ADC time constants as function of type of axis rotational or linear
2219/43106 . . .  Time constant acceleration, deceleration as function of temperature of motor
2219/43107 . . .  Correction acceleration and deceleration as function of speed, time constants in rpm
2219/43108 . . .  Delay stop command as function of error between reference and multiple of increments
2219/43109 . . .  Adaptive stopping with correction for both directions
2219/43111 . . .  Measure time needed from first to second speed, to adapt position command
2219/43112 . . .  Using feedforward prediction of position
2219/43113 . . .  Give stop order a certain number of motor rotations before end stop
2219/43114 . . .  Detect position, speed or time of object between begin and end, adapt motion
2219/43115 . . .  Adaptive stopping
2219/43116 . . .  Calculate overshoot from supply voltage change, adapt motion
2219/43117 . . .  Torque compensation as function of position reference, feedback of speed and position
2219/43118 . . .  Adjust position reference as function of position reference, feedback of speed and position
2219/43119 . . .  Adapt robot motion to machine speed as function of error from programmed speed
2219/43121 . . .  Axis speed as function of probing signal during probing of workpiece
2219/43122 . . .  Adapt speed, feed as function of duration of transmission of instruction
2219/43123 . . .  Speed of cutter as function of position of feeler, probe
2219/43124 . . .  Adapt speed as function of material, thickness, depth, volume, width, uniform surface quality
2219/43125 . . .  Speed as function of size of chuck, diameter tool
2219/43126 . . .  Pivoting speed of workpiece as function of inverse of work, machining time needed
2219/43127 . . .  As a function of, select reference velocity as function of gear ratio
2219/43128 . . .  Feed as function of number of press operations
2219/43129 . . .  Speed as function of curvature, in curves, corners smaller than in straight line
2219/43131 . . .  Adapt speed as function of lag, follow up error
2219/43132 . . .  Rotation speed as function of minimum wave energy, toolwear, first learn for different speeds
2219/43133 . . .  Delay movement start as function of lag, follow up error
2219/43134 . . .  Feed or speed as function of magnetic characteristic, code, form of tool
2219/43135 . . .  Reduce path speed near centre of axis
2219/43136 . . .  Lower speed of indexing motor if door to turret lathe is open
2219/43137 . . .  Constant path speed for combined rotational and linear movement
2219/43138 . . .  Set speed by controlling position of pulley of variable transmission
2219/43139 . . .  VCO variable frequency oscillator or two oscillators with different frequency
2219/43141 . . .  Surface, path, tangential speed
2219/43142 . . .  Control relative speed between two spindles
2219/43143 . . .  ADC ramp and velocities are set by potentiometers which control digital valve
2219/43144 . . .  Accelerate one slide and decelerate other slide to keep speed constant
2219/43145 . . .  Machine first with low spindle speed, then with high speed, avoid chatter
2219/43146 . . .  Control of speed, velocity of movement of tool as function of power of tool
2219/43147 . . .  Control power of tool as function of speed, velocity of movement
2219/43148 . . .  Rapid return, retract stroke
2219/43149 . . .  Rapid approach, then slow, then pressure for clamping, bonding
2219/43151 . . .  Rapid feed in, slow workspeed during entering material, then high work speed
2219/43152 . . .  Feed in, transfer line, rapid traverse to work, grip speed
2219/43153 . . .  Control depth of feed in by timer
2219/43154 . . .  Quick feed in to workpiece without gauging, then normal feed with gauging
2219/43155 . . .  Rapid speed for approach then slow speed for working
2219/43156 . . .  Feed rate
2219/43157 . . .  Feed rate
2219/43158 . . .  Feedrate override
2219/43159 . . .  Feedrate override only for x y, not for z or only for z and not for x y
2219/43161 . . .  Second, independent feedrate override
2219/43162 . . .  Motion control, movement speed combined with position
2219/43163 . . .  Based on unit motions, primitive b-spline motions, time shifted and weighted
2219/43164 . . .  Independent, uncoordinated motion control of several motors to initialise
2219/43165 . . .  Superposition of special effects motion on normal motion
2219/43166 . . .  Simulation of mechanical gear
2219/43167 . . .  Distributed motion control
2219/43168 . . .  Motion profile planning for point to point control
2219/43169 . . .  Motor drives a mechanical cam
2219/43171 . . .  Correction servo and constant velocity motor as input to differential, sum motion
2219/43172 . . .  Change velocities on the fly during a motion
2219/43173 . . .  Synchronize motion with scenery, sound
2219/43174 . . .  Simulating cam motion mechanism
2219/43175 . . .  Motion in several blocks, for each part in open and part in closed loop
2219/43176 . . .  Scale velocity profile
2219/43177 . . .  Single cycle positioning, start, move, stop for single rotation
2219/43178 . . .  Filter resonance frequency from acceleration pattern, derive new speed pattern
2219/43179 . . .  Speed changes gradually from constant value to zero
2219/43181 . . .  Reaching reference position by spiraling speed reference
2219/43182 . . .  Speed control with feedback and as reference the programmed value
2219/43183 . . .  Speed control, input is the reference, but no feedback
2219/43184 . . .  From desired speed, derive delta positions during equal intervals
2219/43185 . . .  Speed invariant motions, path accuracy independent of speed
2219/43186 . . . Pulses from handle, knob, hand wheel control speed
2219/43187 . . . Vector speed, ratio between axis, without feedback
2219/43188 . . . Vector speed with feedback
2219/43189 . . . Sum of squares
2219/43191 . . . Approximation
2219/43192 . . . Brake while driving to obtain very low speed, step wise movement, then stop
2219/43193 . . . Variable slope speed steps as function of position, pulse pump controller
2219/43194 . . . Speed steps, switch over as function of position
2219/43195 . . . Using a tri-phase motor and a step motor
2219/43196 . . . Using two motors
2219/43197 . . . Two axis at the same time
2219/43198 . . . Coupling and step motor
2219/43199 . . . Safety, limitation of feedrate
2219/43201 . . . Limit speed to allowable speed for all axis
2219/43202 . . . If collision danger, speed is low, slow motion
2219/43203 . . . Limitation of speed, permissible, allowable, maximum speed
2219/43204 . . . Different, dynamic current limits as function of speed
2219/43205 . . . General tape speed controls speed of axis
2219/43206 . . . Tape speed controls speed of axis
2219/45 . . . Nc applications
2219/45001 . . . Antenna orientation
2219/45002 . . . To application field of control
2219/45003 . . . Harvester
2219/45004 . . . Mining
2219/45005 . . . Registration machine, chart recorder
2219/45006 . . . Valves
2219/45007 . . . Toy
2219/45008 . . . Theatre
2219/45009 . . . Glassforming
2219/45011 . . . To be assigned
2219/45012 . . . Excavator
2219/45013 . . . Spraying, coating, painting
2219/45014 . . . Elevator, lift
2219/45015 . . . Roller blind, shutter
2219/45016 . . . Radar
2219/45017 . . . Agriculture machine, tractor
2219/45018 . . . Car, auto, vehicle
2219/45019 . . . Balancing wheels
2219/45021 . . . Wheel mounting
2219/45022 . . . Auto seat, dentist chair, roll wheel chair
2219/45023 . . . Align head lamps of car
2219/45024 . . . Simulation car ride
2219/45025 . . . Position, mount glass window, sunroof in car body
2219/45026 . . . Circuit board, pcb
2219/45027 . . . Masking, project image on wafer semiconductor, photo tracer
2219/45028 . . . Lithography
2219/45029 . . . Mount and solder parts on board
2219/45031 . . . Manufacturing semiconductor wafers
2219/45032 . . . Wafer manufacture; interlock, load-lock module
2219/45033 . . . Wire bonding, wire wrap
2219/45034 . . . Adjusting, trimming circuits on printed boards
2219/45035 . . . Printed circuit boards, also holes to be drilled in a plate
2219/45036 . . . Waterjet cutting
2219/45037 . . . Veneer cutting
2219/45038 . . . Cutting plotter
2219/45039 . . . Slitter, scoring
2219/45041 . . . Laser cutting
2219/45042 . . . Hot wire cutting, use of polystyrene or similar material
2219/45043 . . . EDM machine, wire cutting
2219/45044 . . . Cutting
2219/45045 . . . Maintenance, automatic storage and retrieval system
2219/45046 . . . Crane
2219/45047 . . . Sorting
2219/45048 . . . Packaging
2219/45049 . . . Forklift
2219/45051 . . . Transfer line
2219/45052 . . . Filling vehicle with material
2219/45053 . . . Coil, bobbin handling
2219/45054 . . . Handling, conveyor
2219/45055 . . . Assembly
2219/45056 . . . Handling cases, boxes
2219/45057 . . . Storage handling for disks or material
2219/45058 . . . Grinding, polishing robot
2219/45059 . . . Drilling robot
2219/45061 . . . Measuring robot
2219/45062 . . . Surface finishing robot
2219/45063 . . . Pick and place manipulator
2219/45064 . . . Assembly robot
2219/45065 . . . Sealing, painting robot
2219/45066 . . . Inspection robot
2219/45067 . . . Assembly
2219/45068 . . . Cutting robot
2219/45069 . . . Computer controlled automata, doll
2219/45071 . . . Aircraft, airplane, ship cleaning manipulator, paint stripping
2219/45072 . . . Sewer cleaning manipulator
2219/45073 . . . Microrobot
2219/45074 . . . Edge treating robot, machine
2219/45075 . . . Sewer repair
2219/45076 . . . Gas, fuel refilling
2219/45077 . . . Sculpturing manipulator
2219/45078 . . . Window cleaning, end effector contains detection and cleaning means
2219/45079 . . . Stripping robot, strip pieces of garments from table
2219/45081 . . . Tuning robot for amplifiers
2219/45082 . . . Sanding robot, to clean surfaces
2219/45083 . . . Manipulators, robot
2219/45084 . . . Service robot
2219/45085 . . . Space robot
2219/45086 . . . Brick laying, masonry robot
2219/45087 . . . Gymnast robot, acrobat
2219/45088 . . . Riveting robot
2219/45089 . . . Testing robot
2219/45091 . . . Screwing robot, tighten or loose bolt
2219/45092 . . . Analysing or chemical synthesis robot, moving samples from station to station
2219/45093 . . . Tacker robot, to join panels with nails, staples
2219/45094 . . . Milling robot
2219/45095 . . . Office messenger
2219/45096 . . . Polishing manipulator
2219/45097 . . . Cable harnessing robot
2219/45098 . . .
Electroforming, original form is covered with laser forming
Metal on model

Forming workpiece by pressing tool against Deburring
Micromachining to micrometer precision

Inertia friction welding
Milling
Saw
Press-line
Laser drilling
Laser welding
Punch, stamp, also with use die, mould
Turning, lathe
Lapping
Forging press, combined with furnace
Lapping
Marking
Welding
Turning, lathe
Punch, stamp, also with use die, mould
Laser welding
Laser drilling
Turret lathe
Press-line
Press-brake, bending machine
Saw
Milling
Inertia friction welding
Machining blade, airfoil
Boring
Micromachining to micrometer precision
Deburring
Forming workpiece by pressing tool against metal on model
Carton forming
Forming workpiece by using thermal energy, laser forming
Electroforming, original form is covered with metal
2219/45219 . . . Making intermeshing helical rotors, for pump, compressor
2219/45221 . . . Edm, electrical discharge machining, electroerosion, ecml, chemical
2219/45222 . . . Cloth making
2219/45223 . . . Making mirror, mirror segment
2219/45224 . . . Electrode making
2219/45225 . . . Making impellers, propellers
2219/45226 . . . Process control
2219/45227 . . . Stamp making
2219/45228 . . . Making spheres
2219/45229 . . . Woodworking
2219/45231 . . . Stoneworking
2219/45232 . . . CMP chemical mechanical polishing of wafer
2219/45233 . . . Repairing pipelines, tubes
2219/45234 . . . Thin flat workpiece, sheet metal machining
2219/45235 . . . Dispensing adhesive, solder paste, for pcb
2219/45236 . . . Facing, polygon working, polyhedron machining
2219/45237 . . . Honing machine
2219/45238 . . . Tape, fiber, glue, material dispensing in layers, beads, filling, sealing
2219/45239 . . . Filament, coil winding
2219/45241 . . . Coke oven
2219/45242 . . . Door, panel, window operation, opening, closing
2219/45243 . . . Shoe, footwear making
2219/45244 . . . Injection molding
2219/45245 . . . Making key
2219/45246 . . . Turn cylindrical workpiece, crowned
2219/45247 . . . Diamond turning, tool is diamond point
2219/45248 . . . Turning
2219/47 . . . Tracing, tracking
2219/4701 . . . Edge detector, project line, inclined camera detects discontinuity
2219/4702 . . . Project several lines on surface, to detect discontinuity by camera
2219/4703 . . . View whole surface before edge detection, coarse scan then fine tracking
2219/4704 . . . Store actual edge, seam in memory before machining, compare with detected
2219/4705 . . . Detect edge during machining, welding, sewing
2219/4706 . . . Edge detector is incorporated into machine
2219/4707 . . . Trace groove always at bottom of groove
2219/4708 . . . Command codes, marks along line to control operation, velocity
2219/4709 . . . Command code in form of a sticker
2219/4711 . . . Using a pantograph
2219/4712 . . . Using photocell sensitive to different colours
2219/4713 . . . Limit scanning surface by marks, stored limit, limit switches
2219/4714 . . . Use of help paths to go to different workpiece paths to be followed
2219/4715 . . . Second photocell in advance of first, to control speed or other operation
2219/4716 . . . Trace electric potential lines to control z motion
2219/4717 . . . Machine 3-D model by tracing two 2-D models
2219/4718 . . . Two mode switch over tracking as function of predetermined cmm probe angle
2219/4719 . . . Line detector with laser beam, adjustable optical axis
2219/49 . . . Nc machine tool, till multiple
Support help, grid between support and prototype, separate easily
Build layer of different, weaker material between support and prototype
Workpiece is surrounded by softer support material during machining
Remove chips from probe, tool by blowing them away
Control of lubrication
Control preload of spindle bearing
Relieve stress of workpiece after machining by vibration table
Control flatness of deformable workpiece table
Remove chips by tool up down movement, pecking
Control of damping of vibration of machine base
Coolant serves as lubrication and also to take away swarf, chips
Heat treatment of workpiece, tempering
Accessory, coolant
Break chips, spiral chips, interrupt momentarily in feed during two or more rotations
Active damping of tool vibration
Remove chips from probe, tool by vibration
Control of flow of fluid or temperature as function of speed for uniform coating
Controlling temperature of workpiece, tool, probe holder
Division algorithm, calculate inverse ratio of cutting process from parameters
Machine with constant volume in time
Calculate optimum operating, machining conditions and adjust, adapt them
Adaptive control AC
Adaptive control constraint ACC
Fuzzy adaptive control
Execute learning mode first for determining adaptive control parameters
Geometric adaptive control
Find optimum between production rate and quality, number of points and speed
Minimum cost adaptive
Adaptive control optimisation ACO
Cycle time reduction
Action, withdraw, stop feed tool to prevent breakage or lower load
Adapt machining parameters so as to keep temperature constant
Control cutting speed
Control depth of cut
Reduce cutting speed if feed force below minimum level
Control of feed and spindle, cutting speed
Control of feed only
Control cutting torque, force
If obstruction, bad joint, move head aside and retry operation
Maintain constant material removal rate
If number of feed retractions exceeds a limit, repeat same instruction block
Control roughness of surface
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Variable clamping force as function of movement, force on workpiece
Determine maximum clamping force as function of allowable displacement workpiece
Clamps are movable along rod to desired positions
High force clamping along periphery
Control fixed clamping force
Variable chuck clamping force as function of spindle speed
Clamp, keep positioned slide, workpiece stationary during machining
Active clamping, use servo to keep in position
Vacuum pads hold workpiece during machining
Store working envelop, limit, allowed zone to speed of tool
Alarm if outside zone
Shut off power, stop if outside working zone
Obstacle, collision avoiding control, move so that no collision occurs
Limit movement on an axis by setting limits
Spheres replace object, check first collision for large spheres, then small
Tool changing registers geometry of tool to avoid collision
Retract on collision with moving object, tool follows, yields to object
Adapt working envelop, limit to size workpiece
Ball end cutter interference, caused by tool shape, overcut part surface
Axis related interference, remove hidden surfaces
Feedhold, stop motion if machine door is open, if operator in forbidden zone
Avoid collision, interference between tools moving along same axis
Detect position of slide to change hover height of tool to avoid collision
On collision, reverse motor over certain angle, then stop to avoid bending
On collision, cut off motor, delay, again motor on, repeat to avoid bending
Limitation, collision, interference, forbidden zones, avoid obstacles
On near collision reduce speed
Avoid pinching of persons between moving and fixed part
Near end of position, lower power or speed of motor to safe value, at end normal
On collision, obstruction reverse drive, accelerate, cancel inertia
Stop, dwell in corner edge, allow for cooling, go on machining, better surface
Corner, making corner
Compensation relative movement between two commonly driven slides
Compensation for measured deviation of tool path, as function of length of path
Execute compensation only if workhead, module is connected
Compensation feed as function of measured values and manual introduced values
Compensation for temperature, bending of tool
Compensation for dressing amount
Compensate slide position as function of indexed workpiece spindle position error
Compensation for sidewise deviation of machined workpiece
Compensate position by use of separate cmm
Compensate for errors in cmm, especially mirror errors, not flat enough
Compensation of vibration of machine base due to slide movement
Runout, eccentricity, unbalance of tool or workpiece
Compensation of tool position as function of square of rotating speed of spindle
Compensation for reluctance of axis motors causing surface ondulation
Calculation, estimation, creation of error model using measured error values
Tapping, overshoot after reversal, elasticity compensation
Compensation height of tool as function of horizontal position of spindle head, bending
Compensation for bending of workpiece, flexible workpiece
Position error compensation as function of position of slide, control bearing pressure
Deflection, bending of tool
Control position of steady rest to compensate bending
Proportional compensation from middle to end of elongated workpiece
Bending of driven table, lag between real and commanded position
Bending, tilt spindle in bearings to compensate for bending
Create optical reference axis always kept parallel to reference optical block
Orthogonality of axis, deviation from 90-degree correction
Structure error, in slide or screw
Slide, guideway, robot arm deviation
Screw
Gear
Using lookup table, map, position and corresponding quasi static error
For non linear interpolation movement
Variable load, slide friction, irregular machine guides
For point to point positioning
For linear movement
Control of heat to compensate for dilatation, thermal displacement
Compensate with stored values as function of machining time
Compensation temperature, thermal displacement, use measured temperature
Compensate thermal displacement using measured distance
Preheat spindle by powering polyphase motor with monophas
High speed AC, induction spindle motor

Compensation by using temperature feelers on slide, base, workhead
Compensation dilatation using calculated temperature from velocity
Using lookup table, map, position error, temperature and position
Active thermal preload regulation for spindle
Estimate error from heat distribution model and drive current, correct error
Regulate temperature of coolant
Control of temperature of processor
Compensation of temperature increase by the measurement
Compensation of workpiece dilatation
Compensation temperature, thermal displacement
Control of scale
Rough cut at high speed
Remove workpiece portions left uncut, unmachined by tool with suitable shape
Identify and calculate uncut portions
Adapt machining conditions as function of workpiece cutting resistance
Cut, up or down cutting, cutting direction right, left
Cutting with trailing or leading edge of tool
Unidirectional or multidirectional cutting
Cutter, axis change over
Keep tool, probe at constant distance from workpiece surface
Limit penetration of drill into backup material, support
Machining depth relative to surface, constant depth
Keep constant distance even if hole present, avoid collision tool with hole
Control depth as function of grey level of scanned object, map of thickness
Translate thickness to be removed in dwell delay, then to corresponding speed
Depth, tool depth control
Surface tracking, following
Dimensions
2-5-D lace cutting, work in xy and increment in z, repeat
4-D
5-D
6-D
2-5-D pocket machining
3-D printing, layer of powder, add drops of binder in layer, new powder
Dressing started after number of workpieces machined
Dressing started if sparking out time to get correct surface is too long
Dressing as function of load of grinding wheel
Dress by conductive fluid between conductive grindstone and electrode
Two spindle drives for common workpiece
Position in space by controlling length of two, more cables, wires
High speed AC, induction spindle motor

Gear meshing, synchronize both with relative phase, then shift
Epicyclic movement of tool
Six or more linear drives to position x y z table
Two y axis to control also rotation
Endless belt with coupling, position tools simultaneously in both directions
Direct drive, without gear
Two drives at both sides of long tool
Separate, auxiliary indexing motor
Several x-y slides on single surface
X motor moves x and y axis, y motor only y axis
Two xy tables, on top and below workpiece, in between a cutting wire
Three linear actuators to position vertically and rotate horizontally
Four bar mechanism
Single motor for different drives, switch, change gears
Air bearing slide, hydraulic, electromagnetic bearing
Electromagnetic bearing also used as feed in one axis or positioning in two axis
Switch between continuous drive and index or stop mode
Four linear actuators to position x y table
Linear actuators on x y to position x y table, ball screw drive on y to rotate
Floating, air, magnetic suspension xy table, sawyer motor, xenetics
Oscillating, swinging feed drive, for grinding
Parallel link mechanism
Nanometric xy table
X y table positioned by vibration
Same control for double drive or slide
Frictionless rolling element
Two cascaded slides, large range sits on small range, piggyback
Linear control rotating movement kept constant
Two rotations gives cartesian coordinates, compact construction
Motor drives cam for very fine linear displacement, movement
Three linear actuators to position x y table
Large transmission ratio
Torque, moment, drive power amplifier, movement follower
Harmonic gear, transmission, strain wave gear
Switch between dual, double slide or double spindle mode
Motor and brake actuated together
Drive spindle motor at maximum, limit torque for rapid machining time
Identification workpiece by dimension, height, resistance value, but no code
Spindle identification in multip spindle station
Probe identification
Identify workpiece and align, center workpiece at the same time
Identify material to be used, select between several
Part, workpiece, code, tool identification
2219/49303 . . . Tool identification and tool offset, compensation data together
2219/49304 . . . Tool identification, code
2219/49305 . . . Store, memory on tool with control and maintenance data
2219/49306 . . . Derive kind of cutter from null load
2219/49307 . . . Learn, learn operational zone, feed, speed to avoid tool breakage
2219/49308 . . . Fuzzy classification of tool wear states
2219/49309 . . . Main and secondary machining area, main spindle and satellite spindle
2219/49311 . . . Select machining portion of workpiece, pivoting workpiece as function of correction needed
2219/49312 . . . Fixture free machining
2219/49313 . . . Machining about eccentric center different from rotational center of workpiece
2219/49314 . . . Machine with oscillating workpiece, no full rotation
2219/49315 . . . Machine first contour slowly, then remaining surface quickly, fast
2219/49316 . . . Back-off grinding, during wheel retract, by deflection workpiece, after plunge
2219/49317 . . . Traverse grinding, move along workpiece
2219/49318 . . . Grind and simultaneous gauging, dwell, measure and final feed without gauging
2219/49319 . . . Centerless machining, grinding, cutting
2219/49321 . . . Reverse movement of tool to deburr
2219/49322 . . . Cool to solidify material before machining it
2219/49323 . . . Machine long, slender workpiece
2219/49324 . . . Different starting point for each machining pass, to prevent dent formation
2219/49325 . . . Combine punching and laser machining
2219/49326 . . . Drill on laser machine, transfer to edm for operation on hole, adjust position
2219/49327 . . . Combine punch and marker, engraving for workpiece
2219/49328 . . . Laser machining and milling combined
2219/49329 . . . Combine edm and milling
2219/49331 . . . Laser drilling followed by laser cutting
2219/49332 . . . First saw rough contours in workpiece then mill rest
2219/49333 . . . Drilling and thread cutting by same machine
2219/49334 . . . Combine turning, milling, grinding or other in one setup
2219/49335 . . . Part, workpiece, inner, internal outer, external machining
2219/49336 . . . Machine two mating, matching parts, at opposite ends of spindle, simultaneously
2219/49337 . . . Machine holes in spherical nodes
2219/49338 . . . Micromachining, workpieces small, around 1-mm or less
2219/49339 . . . Machine simultaneous left and right, mirror part
2219/49341 . . . Manual pocket machining, multipasses
2219/49342 . . . Select between concentric and eccentric regions of a workpiece
2219/49343 . . . Machining point symmetrical surfaces, revolving surfaces
2219/49344 . . . Surface, 5-axis surface machining
2219/49345 . . . Smooth and polish surface at the same time
2219/49346 . . . 3-Axis surface machining
2219/49347 . . . Machine cover, first scan surface on which cover is to be placed
2219/49348 . . . Mill surface from underneath workpiece, easy chips, cutout material evacuation
2219/49349 . . . Drill both sides of workpiece at the same time, under and over workpiece
2219/49351 . . . 4-Axis surface machining
2219/49352 . . . 7-Axis surface machining
2219/49353 . . . Control of output power of tool, laser beam
2219/49354 . . . High speed cutting
2219/49355 . . . Machine flat surface on rotating workpiece, rotate tool inverse direction
2219/49356 . . . Tool with constant force against workpiece during machining
2219/49357 . . . Tool perpendicular to surface with varying force
2219/49358 . . . Facing milling, tool perpendicular to surface
2219/49359 . . . Cylindrical or side milling, tool tangential to surface
2219/49361 . . . Workpiece and tool have each own rotation speed
2219/49362 . . . Tool, probe at constant height to surface during machining
2219/49363 . . . Minimize time for tool movement between different positions, holes
2219/49364 . . . Minimize number of punch strokes
2219/49365 . . . Minimise noncutting area, tool travel, eliminate air cutting
2219/49366 . . . Machine several small pieces on one sheet, break off pieces
2219/49367 . . . Group machines into cells to minimise intercellular travel
2219/49368 . . . Vision calculates errors while table already moves, result corrects movement
2219/49369 . . . Minimize machining time by maximizing feed, speed
2219/49371 . . . Variable laser spot width, small for boundary, large for rest
2219/49372 . . . Optimize toolpath pattern for a given cutting layer, mounting sequence
2219/49373 . . . Flying operation, while tool and workpiece have same speed
2219/49374 . . . Speed up each conveyor between two stations, at stations synchronize in phase
2219/49375 . . . Minimalizing machining time, number of tool change
2219/49376 . . . Select two machining types, milling or turning, complete machining with one tool
2219/49377 . . . Eliminate double cutting
2219/49378 . . . Tool path finding, select minimal distance
2219/49379 . . . Key input path, move one axis manually, other axis slave controlled by program
2219/49381 . . . Raster, line servo, area machining, cutting, facing
2219/49382 . . . Movement reciprocating
2219/49383 . . . Using pick feed with non reciprocating machining direction
2219/49384 . . . Control of oscillatory movement like filling a weld, weaving
2219/49385 . . . Using pick feed when machining a surface
2219/49386 . . . Automatic seam, weld line, finding
2219/49387 . . . Limiting scanning region
work handling

Machine tool, machine tool null till machine tool

Zero point floating

related to moving origin of first

Turret with multiple workpiece holders,

Twin tools contact at same time

Several, multi workpieces

other for tool, second tool on slide

Machine non circular, non-round cross section,

Orienting workpiece relative to tool

Multi cutting, twin tools contact at same time

workpiece, balance cutting

During machining, measure previous part to

piece, post or pre process

Compensation error by probing test, machined

elongated profiles

Profile, for operation on I-, T-profiles or other

Compensation by probing test, machined

piece, post or pre process

During machining, measure previous part to

compensate errors

Record profile error, used for next machining

pass

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2219/50069 . . . Reject workpiece if not machinable, material to be machined too large
2219/50071 . . . Store actual surface in memory before machining, compare with reference surface
2219/50072 . . . Machine workpiece again to correct previous errors
2219/50073 . . . Signature analysis, store forces during test, compare with real ones during assembly
2219/50074 . . . Purpose, workpiece measurement to control, adapt feed of tool
2219/50075 . . . To adapt, control force level at which machining will be considered as finished
2219/50076 . . . To derive from state of surface, the need to change used, worn tool
2219/50077 . . . Keep position by switching over to auxiliary power supply for resolver, encoder
2219/50078 . . . Single battery backup for all axis, encoders, resolvers
2219/50079 . . . Battery backup supplied over data, signal lines, to save cable
2219/50081 . . . On power loss, shut down axis using generated power from one braked axis
2219/50082 . . . UPS, no break to power actuator and move into safe condition
2219/50083 . . . Power loss, measures again loss of power
2219/50084 . . . Keep position, setup parameters in memory
2219/50085 . . . Realignment, search reference to reestablish position
2219/50086 . . . Microprocessor
2219/50087 . . . Rough, coarse and finish, fine machining
2219/50088 . . . Rough and finish machining simultaneously
2219/50089 . . . Finish allowance equals offset rough finish tool and bending work under rough
2219/50091 . . . Rough machining
2219/50092 . . . Sculptured part rough machining with the offset approach
2219/50093 . . . Sculptured rough machining with the contour map approach, make slices
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Measure new tool inserted by operator, detect if old tool back in storage
Before motor start of spindle with new tool, minimize machining time
Change spare, used tool during machining, workpiece without moving it
Select second tool if first tool cannot machine fixture
Insert tool and workpiece simultaneously, block, workability, then stop
If tool life over, continue machining only actual machining
Change tool and workpiece simultaneously, replace and search simultaneously
Two tool holders to eliminate tool change time, Flat bed magazine, Chain magazine, Kind of revolver magazine
Workpiece exchange
Select tools, slides, spindles to work synchronized, independent
Tool editor for actual used tools and needed next, missing, unused tools
Detect wear by comparing coded value on tool with real value, grind tool
Search empty place in changer to place tool
Select tool manual from tool store, with permission from NC to deblock tool
Chuck, gripper, spindle changer
Tool changer and revolver fixed on spindle
Small buffer tool magazine, ordered tools, filled from large magazine, change time
Machine integrated tool cassette
Change tools, like laser head and drill having different driving needs
Workpiece exchange
Change to finer, more adapted tools to machine complex surface
Control position of coolant nozzle as function of selected tool
Tool, probe, pen changer
Mobile tool magazine to replace spare or rarely used tool
Replace, change tool with tracer head, probe, feeler
Selection tool
Change feeler or tool on different curvature of workpiece, model
Tool selection sets speed machining, kind of cooling, other parameter
Orienting selected tool with respect to workpiece
Kind of revolver magazine
Chain magazine
Flat bed magazine
Two tool holders to eliminate tool change time, replace and search simultaneously
Change tool at minimum distance from workpiece
Standby tool, tool ready for next machining step, change tool while machining
Change tool during positioning movement
If tool life over, continue machining only actual block, workability, then stop
During tool change, workpiece immobile, then execute backward operation sequence
Change tool and workpiece simultaneously, except if collision possible
Measure diameter only if new tool has been inserted
Minimize tool change by selecting appropriate fixture
Select second tool if first tool cannot machine workpiece without moving it
Change spare, used tool during machining, minimize machining time
Before motor start of spindle with new tool, detect if old tool back in storage
Measure new tool inserted by operator, compare with diameter needed to accept

Safety, verify correct code of chosen tool, probe
Detect wear or defect tool, breakage and change tool
Detection tool presence in tool holder, spindle before starting motor
Send offset values from tool changer before machining
Adjust displacement amount of tracer as function of rough, finish machining
Adjust tool for tool offset by using an axis parallel to feed axis
Tool offset as function of cutting depth
Tool offset for two different diameters, smoothing
Tool nose correction
Tool geometry compensation, keep contact of tool on desired curve
Fine adjustment tool head, adjustment with respect to toolholder
Tool offset as function of diameter of saw, for begin and end point of path
Compensate tool offset as function of speed, needed when tool is not mounted correctly in spindle
Tool offset general
Multi-tool, several tools
Tool offset based on two cutter contact points, admitting some overcut
Radial setting of tool
Tool offset length by going to a reference and recording distance
Tool offset by manual input by switches
Tool offset by verifying piece and registering errors
Compensation of positioning error due to a-axis, b-axis tool rotation
Trace with feelers of different diameter, from the two loci calculate offset
Correction data stored in memory attached to the two loci calculate offset
Correction stored on tape, together with tool or tool holder
Correction stored on tape, together with tool identification
Remachine same workpiece with same tool but diminished tool offset
Resolver
Correction from tape, file
For every diameter a tape
Tool height, axial displacement from center of circular workpiece, surface
Correction by probing dimension of machined workpiece
Estimate wear from machining data and conditions
Correction of wear as function of dressing
Compensate tool wear by grinding tool to a known position
Compensation of tool wear by adapting program to profile of tool
Tool offset, tool wear
Search for reference, go to reference
Selfcorrecting by measurement during machining
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