GLOSSARY

This glossary is an attempt to start a glossary for the experimental machine controls field. It is the result of the input from a number of people and this help is acknowledged. Suggestions for new entries are welcome. Revision as of 1st September, 1992.

AA: Anti-proton production, collection and Accumulation complex at CERN. This operates at 3.5 GeV/c and uses a production target and two rings, AC and AA.

AAC: Anti-proton Accumulator at CERN.

AC: Anti-proton Collector Ring at CERN, Accumulates anti-protons at 3.5 GeV/c prior to injection into AA

ACOL: Anti-proton Collector Project at CERN (Completed July 1987)

Action: A control operation that is performed when a state transition occurs.

Ada: A real-time, embedded systems computer language developed by the US Department of Defense.

Adaptive learning: Learning in which a system programs itself by adjusting weights or strengths until it produces the desired output.

AGOR: Accelerator Groningen Orsay, a cyclotron project - Groningen, Netherlands.

AGS: Alternating Gradient Synchrotron at Brookhaven National Laboratory.

AI: Artificial Intelligence; the subfield of computer science concerned with the concepts and methods of symbolic inference by computer and the symbolic representation of the knowledge to be used in making inferences.

AIP: Artificial Intelligence Processor.

Algorithm: A systematic procedure guaranteed to produce a solution.

Aladdin: A synchrotron light source for UV research - Madison, WI, USA.

ANL: Argonne National Laboratory - Chicago, IL, USA.

APS: Advanced Photon Source at ANL, A 7.5 GeV storage ring for synchrotron radiation under construction.

Archiving: Long term data storage.

ATP: Acquisition, Tracking and Pointing.

ATS: Accelerator Test Stand.

Autocad: A computer-aided mechanical design package.

BNL: Brookhaven National Laboratory, Long Island, NY, USA.

BLM: Beam Loss Monitor.

BPM: Beam Position Monitor.

C: A high-level assembler developed at Bell Laboratories.

CAMAC: Computer-Automated Measurement and Control; a standard module, crate and highway system (IEEE 583, 595, 596, 675, 683, 726, 758)

CAD/CAM: Computer Aided Design/Computer Aided Manufacturing.

CAE: Computer Aided Engineering.

CEBAF: Continuous Electron Beam Accelerator Facility - Newport News, VA, USA.

CEN: Commissariat d'Energie Nucleaire - France.

CERN: European Organization for Nuclear Research.

CIM: Computer Integrated Manufacturing.

CRN: Centre de Recherche Nucleaire - Strasbourg, France.

CNRS: Centre National de la Recherche Scientifique, French National Institution.

Continuous Control:
The set points of the control loops are available to the operator through the control system and the maintenance of the set points is performed by the control system. Steady state operation is accomplished through this mechanism.

Continuous Control Tool:
A graphical tool that allows a user to establish, monitor and adjust continuous control loops in the system in an easy, intuitive way.

CRPP: Centre de Recherches en Physique des Plasmas - Lausanne, Switzerland.

CSMA/CD: Carrier Sense Multiple Access / Collision Detection, a network arbitration scheme used on Ethernet where a station with a message to send simply starts sending if there is no carrier detected on the transmission medium. Should a collision occur, transmission is stopped and a delay algorithm is used to determine when to retry the transmission.

CTU: Czech Technical University - Prague, Czechoslovakia.

DARPA: Defense Advanced Research Project Agency of the US Government.

Data Acquisition:
All process data is collected through the control system. This data is used to monitor and study the operation of the process as well as develop the control algorithms.

Data Element: Used to describe a single (atomic) scalar describing part of the system state. It is intended to include data available from hardware devices, as well as computed or simulated data, and data describing control algorithms and their parameters. The phrases "control element" and "element" are used similarly.

DECnet: Digital Equipment Corporation network.

DESY: Deutsches Electronen-Synchrotron Laboratory - Hamburg, Germany.

DORIS: 3-10 GeV center of mass electron-positron storage ring/collider at DESY.

DSP: Digital Signal Processing.

DTL: Drift Tube Linac (Linear Accelerator).

EMI: Electromagnetic Interference.

EPA: Electron Positron Accumulator.

EPCS: Experimental Physics Control Systems.

EPS: European Physical Society.

ESA: European Space Agency.

ESO: European Southern Observatory - Munich, Germany.

ESRF: European Synchrotron Radiation Facility - Grenoble, France.

Ethernet: IEEE standard (802.3) computer network defining the hardware and transport layers of a computer network.

Event: A change in a process variable that causes a state transition. The transition may be conditional based on other process variables or modes. An event may also be based on a time delay.

Exception: An exception is best defined by example. Examples of exceptions would be following:
State Related:
- Occurrence of a specified state
- Any change from a specified state
- Transition from state A to state B
- Existence of a specified state for a specified time
- Deviations from tolerance
- Execution of a specified sequence

Non-State Related:
- Software and hardware errors
- Operator Errors
- Request for message broadcast

A suggested definition for exception was an event that requires some action.

Expert system: An intelligent computer program that contains a knowledge base, specialized software, and a set of algorithms or rules that infer new facts from knowledge and from incoming data.

Fault Recovery: Sequential Control is applied to automate fault recovery. These sequences restore the operation of the process, perhaps in a degraded mode.

Fermilab: **Fermi** National Accelerator Laboratory.

GANIL: Grand Accelerateur National D'Ions Lourds - Caen, France.

GPIB: General Purpose Interface Bus, an 8-bit parallel bus equivalent to the IEEE 488 standard.

GRS: Gessellschaft-fuer-Reactorsicherheit, Company to study reactor safety, Garching-bei- München, Germany.

GSI: Geselschaft fuer Schwerionenforschung Institut - Darmstadt, Germany.

HBL: High Brightness Lattice, upgraded SRS at Daresbury.

HCTS: High Current Test Stand.

HERA: an electron-proton collider at DESY, Germany.

Heuristic: A rule of thumb, simplification or educated guess that reduces or limits the search for a solutions in domains that are difficult and poorly understood. Unlike algorithms, heuristics do not guarantee solutions.

HMI: Hahn-Meitner Institute - Berlin Germany.

ICP: Integrated Control Processor.

IEE: Institute of Electrical Engineering (UK).

IEEE: Institute of Electrical and Electronics Engineers (USA).

Inference: The logical process by which new facts are derived from known facts.

Inference engine: A program that infers facts from a set of knowledge or inputs.

Interleaf: A documentation system available on the SUN, VAX, APOLLO and other workstations.

IOC: Input Output Controller.

IPP: Institut fuer PlasmaPhysik, Garching-bei-Muenchen, Germany.

IPNS: Intense Pulsed Nuetron Source at ANL.

ISIS: Pulsed neutron source at RAL based on a 50 Hz 800 MeV proton synchrotron.

ISR: Intersecting Storage Rings (now dismantled) - CERN.

ITER: International Thermonuclear Experimental Reactor, Tokomak Machine being designed by an international team from Europe, Russia, Japan and America.

IUCF: Indiana University Cyclotron Facility, USA.

JAERI: Japan Atomic Energy Research Institute - Japan

JET: Joint European Torus - Abingdon, UK.

KAON Factory: A Proposal to extend the TRIUMF facilities.

KEK: National Laboratory for High Energy Physics - Tsukuba, Japan

KFA: Kern-ForschungsAnlage - Juelich, Germany.

KSL: Knowledge Systems Laboratory - Stanford, CA and Los Alamos, NM, USA.

LANL: Los Alamos National Laboratory - Los Alamos, NM USA.

LAMPF: Los Alamos Meson Physics Facility (An 800 MeV proton and negative H ion high-current LINAC, 1 mA average, 12 mA peak).

LANSCE: Los Alamos Neutron Scattering Center.

LaTeX: A documentation system developed at Stanford.

LBL: Lawrence Berkeley Laboratory - Berkeley, CA, USA.

LCR: Local Control Room.

LEBT: Low Energy Beam Transport.

LEP: Large Electron Positron storage ring at CERN, 27 Km in circumference.

LHC: Large Hadron Collider, proposed to be built in the LEP tunnel at CERN.

LIL: LEP Injector Linac.

LINAC: Linear Accelerator.

LISP: A List Processing language suitable for symblic and logical programming.

LLNL: Lawrence Livermore National Laboratory - Livermore, CA, USA.

LNF: Instituto Nazionale Fisica Nucleare, Labratori Nazionale Frascati - Frascati, Italy.

Logging: Short term realtime data storage.

LPI: LEP Pre-Injector, a combination of LIL and EPA.

MAP: Manufacturing Automation Protocol, a token-passing bus network protocol.

MCR: Main Control Room.

MPV: Extension of the VRTX real-time operating system to support multi-processing.

Model (for both design phase and control phase):
Mathematical descriptionof an existing or conceptual machine. It can be a Partial representation.

Model in terms of control systems:
Computational or mathematical representation of how selected properties of the real or imagined system will respond or react.

Model Support: The control system incorporates modeling programs that allow the operator to test proposed changes against the model. The model is also used to suggest corrective changes. The operator still controls the process manually.

Model support tool:
The important common glue that will allow models to be interfaced to the control system during both the design and operation phases.

NC: Network Compiler.

NET: Next European Torus: Successor to JET< design term based at IPP, Graching Germany.

NeWS: Network/extensible Window System from SUN Microsystems.

NFS: Network File System from SUN Microsystems.

NPB: Neutral Particle Beam.

NPSS: Nuclear and Plasma Sciences Society of the IEEE.

NSF: Nuclear Structure Facility, a 30 MV Van de Graff - Daresbury, Warrington, UK.

NSF: National Science Foundation, a research funding agency of the US Government.

NSLS: National Synchrotron Light Source, BNL, Long Island, NY, USA.

OPI: Operator Interface.

Optimization: The operation of the process is optimized by set point adjustment and possibly state changes to achieve optimum performance. This level requires extensive study of the process parameter space. The solutions which are algorithmic may be described through continuous control mechanisms. The solutions which require some sequence of steps may be described through the sequential control mechanism. The solutions requiring adaptive learning will require some AI mechanism to implement.

Optimization tool: A facility that allows the user to establish, monitor and change control optimization algorithms in the system in an easy, intuitive way.

ORACLE: A relational database.

ORNL: Oak Ridge National Laboratory - Oak Ridge, TN, USA.

PAC: Particle Accelerator Conference organized by the NPSS of the IEEE.

PEP: Positron Electron Project, an 8-36 GeV storage ring and collider at SLAC.

PETRA: 10-38 GeV center of mass energy positron-electron storage ring/collider at DESY.

PID: Proportional, Integral and Differential controller.

Process Variable: A data element, control element, set of data elements or control elements, structured set of data or control elements or mathematical and/or logical combination of other process variables.

PPM: Pulse-to-Pulse Modulation of beam characteristics (used at CERN).

PS: Proton Synchrotron - CERN, Geneva, Switzerland.

PSI: Paul Scherrer Institute fuer Nuklearforschung (previously named SIN) - Villigen, Switzerland.

PSR: Proton Storage Ring.

PU: Pick Up, a probe to electrical signals.

RAL: Rutherford and Appleton Laboratory, Didcot, UK.

RF: Radio Frequency.

RFQ: Radio Frequency Quadrupole.

RGDTL: Ramped Gradient Drift Tube Linac.

RIKEN: An accelerator complex consisting of a heavy-ion, a cyclotron and a ring cyclotron, Saitama, Japan.

RPC: Remote Procedure Call.

RT: Real-Time, definable and controllable response to a synchronous external events.

Rule-based: Having to do with systems that infer or use "rules" (i.e. logical statements).

SASD: Structured Analysis, Structured Design.

Saturne: A synchrotron near Paris for nuclear research which can accelerate protons to 3 GeV and helium 3 to 5.2 GeV - Saclay, France.

Sequence: A control operation based on finite states of the system under control. The Sequnce is represented by "states" and "transitions" between these states.

Sequential control:
Computer control based upon a predefined chain of events.

Set: a collection of elements. A structured set is a collection of elements having an implict relation among them (e.g., a matrix or a vector representing a waveform).

Set point: Desired process value.

Sequential Control:
The transitions required to change the state of the process are defined in the computer. The operator, the state of the other subsystems, the state of the components in this subsystem, or a master sequence can initiate these changes. Automatic startup, operation and shutdown are accomplished through this mechanism.

Sequential Control Tool:
A facility that allows the user to establish, monitor and change sequences in the system in an easy, intuitive way.

SIN: See PSI

SLAC: Stanford Linear Accelerator Center - Stanford, CA, USA.

SLC: Stanford Linear Collider at SLAC.

SPEAR: Stanford Positron Electron Accumulator Ring at SLAC.

SPS: Super Proton Synchrotron, a 400 GeV proton synchrotron at CERN now converted to also be a proton-anti-proton collider and an electron/positron accelerator for LEP.

SQL: Standard Query Language used to program relational database systems.

SRS: Synchrotron Radiation Source, a 2 GeV electron storage ring - Daresbury, Warrington, UK.

SSC: Superconducting Supercollider, a proposed 20 TeV on 20 TeV proton collider 90 km in circumference to be built south of Dallas, TX, USA.

State: A characterization of a system or subsystem at a given time.

State Diagram: A diagram consisting of circles to represent states and directed line segments to represent transitions between the states. One or more actions may be associated with each transition.

State Program: One or more related state diagrams or sequences. These may interact through events that are created by the sequences.

State programs:
A program defined by a collection of state sets.

Structured set: A set is a collection of elements. A structured set is a collection of elements having an implict relation among them (e.g., a matrix or a vector representing a waveform).

Supervisory Control:
Manual remote control of the process is available to the operator through the control system.

System state: Consists of all data describing the machine and its present status as well as the currently active control algorithms and their parameters.

Teamwork: A SASD tool from CADRE Technologies.

Tevatron: 1 TeV on 1 TeV proton-anti-proton collider in operation at Fermilab.

TCP/IP: Transmission Control Protocol/Internet Protocol, a DARPA Standard.

Token-ring: A computer network arbitration scheme that involves passing a token representing permission to transmit a message from station to station on the network. A station keeps the token while transmitting a message, if it has a message to transmit, and then passes it on to the next station.

TRISTAN: 30 GeV on 30 GeV electron-positron colliding accelerator in operation at KEK.

TRIUMF: Tri-Universities Meson Facility: A research Laboratory operated by the University of British Columbia in Vancouver, BC, Canada. The laboratory operates a 600 MeV cyclotron.

UNIX: A "portable" operating system developed at Bell Labs in the early '70s.

VECC: Variable Energy Cyclotron Centre, Bhabha Atomic Research Centre, Calcutta, India

Visualization: The method by which the system presents data to the user.

VIVITRON: 35 MV Tandem Van de Graff Accelerator project at CRN.

VME: Versa Module European - a widely accepted micro-processor bus, now standardized as IEEE 1014-1987.

VMS: Virtual Memory System - an operating system from Digital Equipment Corporation.

VRTX: Virtual Real-Time Executive - a real-time operating system from Ready Systems for the 68000 family of microprocessors.

VSB: VME Secondary Bus.

VXI: VME bus Extension for Instrumentation.

VxWorks: A real-time software development environment and multiasking operating system from Wind River Systems that uses the VRTX kernel.

XNET: Los Alamos National Laboratory distributed network based on DECnet.

X Window: An accelerated standard computer-graphics windowing system written at MIT in collaboration with a number of computer vendors.