Glossary

The Glossary is a joint effort of the chapter authors. The initials in the square brackets indicate the names of the contributing authors as listed at the end of this glossary. If multiple authors contributed to the same entry, then the different contributions were combined by the editor. The glossary overviews relevant terms in the field of multiagent systems and DAI. References to related literature can be found for most entries via the subject index. A list of DAI systems and tools is presented in the *Readings in Distributed Artificial Intelligence*, ed. by Alan H. Bond and Les Gasser, Morgan Kaufmann Publ., pp. 41–42, 1988. A list of agent-specific key terms and systems is provided in *Intelligent Agents*, ed. by Wooldridge and Jennings, Springer-Verlag, Lecture Notes in Artificial Intelligence, Vol. 890, pp. 22–28, 1995.

AAIS – An expert system which predicts organizational performance from a set of rules about the interaction among various organizational design features. [KMC,LG]

Accessible Environment – An environment in which an agent can obtain complete, accurate, up to date information about the environment's state. [MW]

ACL – Agent Communication Language. *See also* KQML, KIF.

ACT – A plan content language structured to be shared between independent plan generation and plan execution subsystems. [EHD]

ACTION – The successor to (*see*) HITOP-A: a highly detailed, industry-used analysis and design system for exploring interactions between managerial strategy and TOP-integrated organizational configuration, developed with a $10M 5-year investment from major industrial sponsors. *See also* TOP-MODELER. [KMC,LG]

Actors – Autonomous, interacting computing elements, which encapsulate a behavior (data and procedures) and a process, and communicate by message-passing. Sometimes "actor" and (*see*) "agent" are used synonymously. [GAA,NJ]

ActorSpace – A naming model for abstract specification of groups of (*see*) actors. ActorSpace allows communication between actors who do not know previously know each other. [GAA,NJ]

Adaptation – Broadly speaking, the change in the behavior of a system so that it becomes suitable to a new situation. *See* learning. [SS,GW]

Agent – An *autonomous*, *reactive*, *pro-active* computer system, typically with a central locus of control, that is at least able to communicate with other agents via some kind of communication language. Another common view of an agent is that of

an active object or a bounded process with the ability to perceive, reason, and act. Various attributes are discussed in the context of agent-based systems: *see*, e.g., autonomy, benevolence, introspection, mobility, pro-active, rational, reactive, situatedness, social ability, veracity. *See also* actor, agent architecture, body, head, information agent, interface agent, software agent. [MNH,LNS,MW]

Agent0 – A prototype agent-oriented programming language, developed by Yoav Shoham. [MW]

Agent Architecture – A particular methodology for building agents. More generally, the term is used to denote a particular arrangement of data structures, algorithms, and control flows, which an agent uses in order to decide what to do. Agent architectures can be characterized by the nature of their decision making. Example types of agent architecture include logical-based architectures (in which decision making is achieved via logical deduction), reactive architectures (in which decision making is achieved via simple mapping from perception to action), belief-desire-intention architectures (in which decision making is viewed as practical reasoning of the type that we perform every day in furtherance of our goals), and layered architectures (in which decision making is realized via the interaction of a number of task accomplishing layers). *See also* BDI architecture, deliberative architecture, INTERRAP, IRMA, layered architecture, reactive architecture, subsumption architecture. [MW]

Agent Oriented Programming – An approach to building agents, which proposes programming them in terms of mentalistic notions such as belief, desire, and intention. *See also* Agent0, behavior language, mental attitude. [MW]

All-Pay Auction – Auction protocol where all bidders have to pay some amount even if they do not win the item. [TS]

Architecture – *See* agent architecture, organizational structure.

Arrow's Impossibility Theorem – A result regarding truthful voting that states that no social choice rule has a particular set of intuitively desirable features. [TS]

Asynchronous Search Algorithm – An algorithm for solving a search problem represented by a graph. An asynchronous search algorithm solves a problem by accumulating local computations for each node in the graph. The execution order of these local computations can be arbitrary or highly flexible, and can be executed asynchronously and concurrently. [TI,MY]

Auction – *See* all-pay auction, common values auction, correlated values auction, descending (Dutch) auction, first-price open-cry (English) auction, first-price sealed-bid auction, private values auction, revenue equivalence, second-price sealed-bid (Vickrey) auction.

Autonomy – Generally, autonomy means "under self-control." More specifically, the assumption that, although we generally intend agents to act on our behalf, they nevertheless act without direct human or other intervention, and have control over their internal state and actions. [MW]

Axiomatic Bargaining – An approach to solving bargaining problems by postulating desiderata, and proving that a particular solution (uniquely) satisfies them. [TS]

Bargaining – *See* axiomatic bargaining, Nash bargaining solution, Rubinstein bargaining model, strategic bargaining.

BDI Agent – An agent with a (*see*) BDI architecture.

BDI Architecture – A type of (*see*) agent architecture containing explicit representations of beliefs, desires, and intentions. Beliefs are the information an agent has about its environment, which may be false; desires are those things that the agent would like to see achieved, and intentions are those things the agent is either committed to doing (intending *to*) or committed to bringing about (intending *that*). The architecture addresses how the beliefs, desires, and intentions of the agents are represented, updated, and processed to determine the agent's actions. In BDI architectures, decision-making mirrors the practical reasoning that we each carry out every day in furtherance of our goals. *See also* belief, desires, intentions. [MW]

BDI Concepts – The concepts of (*see*) belief, (*see*) desire, and (*see*) intention, as applied in the modeling of agents in DAI. *See also* BDI architecture, hybrid approaches, modal approaches, sentential approaches. [MPS,ASR,MPG]

Behavior Language – Generally, a language for specifying an agent in terms of its (desired) behavior. An example is the BEHAVIOR LANGUAGE developed at MIT in the context of the (*see*) subsumption architecture. [GW]

Belief – A concept describing the states of the world that the agent cannot discriminate among. *See also* BDI architecture, mutual belief. [MPS,ASR,MPG]

Benevolence – The assumption that an agent always does, or tries to do, what is asked of it by other agents or humans. [GW]

Binary Protocol – Voting protocol where the candidates are voted on pairwise, and the loser is always eliminated. [TS]

Blackboard – An information processing structure composed of several cooperating knowledge sources (each containing any kind of algorithm, rules, data, and so forth), a separate control element (determining the order in which the knowledge sources are executed), and the blackboard itself (the locus of communication and global memory). [GW]

Blackboard Architecture – Specifically, an agent architecture built according to the blackboard paradigm; *see* blackboard. Generally, an agent architecture whose centerpiece is a shared repository called a blackboard, which permits undirected information exchanges between independent knowledge sources. [EHD]

Block Pushing – An application involving multiple agents (typically two robots) which must push a box from a starting to a goal location. The box is assumed to be large enough so that none of the individual agents can solve this task.

Body – The portion of an agent not responsible for communication. *See also* head. [HVDP]

Borda Protocol – Voting protocol where each voter can give $|O|$ votes to one candidate, $|O| - 1$ votes to another, and so on. The candidate with the highest sum of votes gets chosen. [TS]

Broadcast/Convergecast – Technique to exercise control in a network where a spanning tree is available. The root of the tree initiates sending request messages down all branches of the tree (broadcast). Each reply message summarizes the information of the entire subtree of the sender. Before replying, each node awaits the replies from all of its children. [GT]

Case Theory – A linguistic model of sentence structure that focuses on the roles supported by each verb and the nouns that can fill those roles. [HVDP]

CFG – (*See*) Characteristic Function Game.

Characteristic Function Game (CFG) – An abstract, common setting for studying (*see*) coalition formation. Each potential coalition has a value associated with it. That value is assumed independent of the actions of nonmembers. [TS]

Cluster (C) Contract – Contract where more than one item is moved atomically from an agent to another. *See also* OCSM-contract. [TS]

Coalition – A set of agents that work together to solve a joint problem. Often used as a synonym for (*see*) ensemble, (*see*) group, and (*see*) team. *See also* coalition formation. [GW]

Coalition Formation – The process where agents form (*see*) coalitions that work together to solve a joint problem via coordinating their actions within each coalition. Each agent belongs to exactly one coalition. Coalition formation includes three activities: (*see*) coalition structure generation, optimization within each coalition, and payoff division among agents. Forming a coalition has much to do with finding an appropriate (*see*) organizational structure. *See also* characteristic function game, coalition structure generation, COALITION-STRUCTURE-SEARCH-1, core, merging algorithm, Shapley value, splitting algorithm. [TS]

Coalition Structure Generation – The process of partitioning agents into exhaustive, disjoint (*see*) coalitions. [TS]

COALITION-STRUCTURE-SEARCH-1 – A particular anytime algorithm for (*see*) coalition structure generation. Motivated by the goal of minimizing the worst case ratio bound from optimum. [TS]

Cognitive Concepts – Concepts applied in DAI that are inspired from folk psychology. These include the three (*see*) BDI concepts, but also others such as know-how and (*see*) commitments. [MPS,ASR,MPG]

Cognitive Primitives – Any of the concepts borrowed from psychology. [MPS,ASR, MPG]

Coherence – The property or state of acting as a unit. A measure of how well a system behaves as a unit. Evaluation criteria for coherence are, e.g., efficiency, solution quality, and graceful degradation in the presence of failure. *See also* competence. [MNH,LNS,GW]

Collaboration – Generally, "working together." Collaboration often refers to forms of high-level (*see*) cooperation that require (the development of) a mutual understanding and a shared view of the task being solved by several interacting entities.

Sometimes the terms collaboration and cooperation are used in the same sense. *See also* competition, coordination, interaction. [GW]

Collaborative Technology – *See* groupware.

Commitments – Pledges by an agent to undertake a specified course of action. Commitments may be (*see*) psychological or (*see*) social. *See also* conventions. [MNH]

Common Knowledge – Same as (*see*) mutual belief, but where it is (*see*) knowledge that is nested all the way. [MPS,ASR,MPG]

Common Object Request Broker Architecture (CORBA) – Interoperable architecture promoted and standardized by the OMG (Object Management Group) consortium. This architecture defines client/server middleware that allows objects to interoperate. [GW]

Common Values Auction – Auction setting where each agent's valuation is completely determined by (same as) the others' valuations. [TS]

Communication – How information is exchanged among agents but discount incidental interactions through the environment. The intentional exchange of information on the basis of a shared system of signs. *See also* head, ontology. [MPS,ASR,MPG,GW]

Communication Complexity – Amount of communication necessary to execute an application, or to solve a problem; usually expressed as the number of messages exchanged (message complexity). To give long messages a higher weight than short messages, the communication can be expressed in terms of the overall number of bits or words in the messages (bit complexity). [GT]

Communityware – The methodologies and tools for creating, maintaining, and evolving social interaction in communities. Communityware supports diverse and amorphous groups of people. Compared with (*see*) groupware, communityware focuses on an earlier stage of collaboration: group formation from a wide variety of people. *See also* computer supported collaborative work. [TI]

Competence – The ability to do a task well. Contrasted with (*see*) coherence which is the ability to work together well, regardless of whether the work is useful. [EHD]

Competition – A variety of (*see*) coordination in which the success of one participant implies the failure of others. *See also* cooperation, interaction. [HVDP]

Computer Supported Cooperative Work (CSCW) – Research area that studies the use of computing and communications technologies to support group activities. This area concerns both software development and social factors in group work. *See also* communityware, groupware. [CSE,JW]

Computational Economics (Agent-Based) – The computational study of economies. Often it is assumed that the economies are modelled as evolving distributed systems of interacting (*see*) agents. [GW]

Computational Organization Theory (COT) – Computational theorizing about organizations or organizing. *See also* organizational structure. [KMC,LG]

Concordia – A commercial Java-based mobile agent platform from Mitsubishi. *See also* Odyssey, Voyager. [TS]

Concurrent METATEM – A logic-based agent programming language, in which agents are programmed by giving them a temporal logic specification of the behaviour that it is intended they should exhibit; agents directly execute their specification in order to generate their behaviour. [MW]

Connection Problem – The problem of finding an appropriate assignment between available agents and tasks to be executed. [GW]

Constraint Propagation – May be viewed as a mechanism for coordination that involves the passing of symbolic information among entities. [HVDP]

Constraint Satisfaction Problem (CSP) – The problem of finding an assignment of values (taken from finite, discrete domains) to variables such that constraints among the variables are satisfied. Backtracking algorithms and consistency algorithms can be used for solving constraint satisfaction problems. *See also* distributed constraint satisfaction problem, search. [TI,MY]

Content Language – The language in which the contents of message structures are encoded. [EHD]

Contingency Contract – Contract where the obligations are made conditional on future events. Enables contracts and improves their Pareto efficiency. Requires an event verification mechanism and knowledge of possible future events. [TS]

Contingency Planning – The development of conditional plans in which responses to possible contingencies have been accounted for and included. *See* planning. [EHD]

Contract – An agreement between several agents on carrying out or refraining from specific activities. Usually contracts are task-oriented, and imply (*see*) commitments. *See* contract net protocol, leveled commitment contract. [GW]

Contract Net Protocol – An influential protocol for supporting the search for connecting tasks to be done with agents (contractors) that are willing and able to do them. "Contract net" usually refers to a negotiation-based task allocation algorithm. *See also* contingency contract, leveled commitment contract, mutual selection, OCSM-contract. [EHD,TS]

Conventions – Mechanisms for managing (*see*) commitments in changing circumstances. [MNH]

Conversation – A series of (*see*) communications among different agents; typically following a (*see*) protocol and with some purpose. [MPS,ASR,MPG]

Cooperation – (*See*) coordination among nonantagonistic agents. A variety of coordination in which the participants succeed or fail together. *See also* competition, interaction. [MNH]

Cooperative Planning – The formation of a plan through the cooperative efforts of multiple planning specialists, each of whom contributes to the overall plan. *See* planning. [EHD]

Cooperative Protocol – A (*see*) protocol that specifies how agents have to cooperate in order to achieve a common goal. *See* cooperation. [GW]

Cooperative State-Changing Rules – Rules of "good citizenship" that guide agents into taking actions that contribute to the collective rather than to self-interest. [EHD]

Coordination – Refers to the state of a community of agents in which actions of some agents fit in well with each other, as well as to the process of achieving this state. The degree of coordination is the extent to which they avoid extraneous activity by reducing resource contention, avoiding livelock and deadlock, and maintaining applicable safety conditions. Much work in DAI is concerned with coordination as a specific form of (*see*) interaction. Two manifestations of coordination that play particularly important roles in DAI are (*see*) competition and (*see*) cooperation. *See also* collaboration, constraint propagation, dissipative field, heterarchy, hierarchy, negotiation, synchronization. [MNH,LNS,GW]

CORBA – (*See*) Common Object Request Broker Architecture.

Core – A criterion of dividing payoff among agents in (*see*) coalition formation (CFGs) in a way that the resulting payoff configuration is stable. Guarantees that no subgroup of agents is motivated to move out of the coalition structure. In some games the core is empty, i.e. no stable payoff division exists. [TS]

CORP – A simple intellective model of organizational performance in which each agent can learn through experience or follow standard operating procedures, are organized into either a team or hierarchical structure, and and in which the set of agents are working in a distributed fashion on a classification task. [KMC,LG]

Correlated Values Auction – Auction setting that has both private value and common value features. [TS]

COT – (*See*) Computational Organization Theory.

Credit-Assignment Problem – Also known as the fundamental learning problem. The problem of determining the degree to which each activity in a set of activities (carried out by a single or several agents in sequence or in parallel) deserves credit or blame for the final outcome. In the context of DAI systems, this problem can be decomposed into the (*see*) inter-agent credit-assignment problem and the (*see*) intra-agent credit-assignment problem. *See* learning. [GW]

CSCW – (*See*) Computer Supported Cooperative Work.

CSP – (*See*) Constraint Satisfaction Problem.

Cultural Transmission – An intellective model of organizational performance which explores the relation between knowledge, culture, and organizational design. [KMC,LG]

DAI – (*See*) Distributed Artificial Intelligence.

DARES – A distributed theorem proving system.

DCHS – (*See*) Distributed Constrained Heuristic Search.

DCSP – (*See*) Distributed Constraint Satisfaction Problem.

DD – (*See*) Distributed Delivery.

Decision Making (Distributed, Rational) – Distributed decision making is the process of making decisions by, and usually for, multiple agents. This is difficult because agents often have different preferences and incomplete information. Distributed decision making is useful because many situations are not zero-sum games, and the social welfare can be increased by joint decision making that leads to more desirably coordinated actions. Key techniques include voting, auctions, bargaining, market mechanisms, contracting, and coalition formation. [TS]

Decision Support System (DSS) – A decision support system provides an information environment that assists the decison-making of personnel in control of complex natural or artificial systems such as installations or organizations, with the aim of maximizing efficiency and minimizing the negative impact of faults. Knowledge-based decision support systems use symbolic representations of expert knowledge to (i) analyze a given situation by identifying its advantageous and problematic aspects; (ii) predict the short-term behavior of the system in different scenarios; and (iii) recommend and justify plans of control actions. [JC,SO]

Deliberative – Based on or requiring the manipulation of symbols. Usually contrasted with (*see*) reactive. [GW]

Deliberative Architecture – An (*see*) agent architecture that requires an agent to manipulate symbols. Usually contrasted with (*see*) reactive architectures. [GW]

Descending (Dutch) Auction – Auction protocol where the price starts high, and is lowered by the auctioneer. The auction stops when some bidder takes the item at the current price. [TS]

Design-To-Time Algorithm – An algorithm that is tailored to the execution time that is at its disposal. [TS]

Desires – The states of affairs toward which the agent has a positive disposition. *See also* BDI architecture [MPS,ASR,MPG]

Deterministic Environment – An environment in which there is no uncertainty about the effect an action will have. Few real-world environments are deterministic. [MW]

Dialogue – Same as (*see*) conversation.

Discrete Environment – An environment in which percepts and actions are discrete, as opposed to continuous. [MW]

Dissipative Field – A mechanism for coordination in which agents sense the gradient or flow of a scalar value and orient themselves accordingly. [HVDP]

Distraction – The phenomenon of changing the course of an agents search due to received messages. Usually considered undesirable (negative distraction), although positive distraction also can occur. [EHD]

Distributed Artificial Intelligence (DAI) – Most broadly construed, the study and construction of systems composed of interacting, intelligent entities. DAI is much concerned with (*see*) agents and (*see*) coordination. [HVDP,GW]

Distributed Constrained Heuristic Search (DCHS) – A combination of distributed constraint satisfaction and heuristic search, where heuristics guide the variable and value ordering decisions. Applied to distributed scheduling. *See* distributed constraint satisfaction problem. [EHD]

Distributed Constraint Satisfaction Problem (DCSP) – A (*see*) constraint satisfaction problem where variables and constraints are distributed among agents. Solving such a problem can be considered as achieving (*see*) coherence among the agents. [TI,MY]

Distributed Delivery (DD) – An application involving multiple delivery robots which must make timely deliveries without excess travel and without colliding.

Distributed Hierachical Planning – An extension of hierarchical planning (i.e., planning at different levels of abstraction) into a distributed environment. *See* planning. [EHD]

Distributed Meeting Scheduling – An application involving multiple calendar managers that must cooperatively search for a meeting time.

Distributed Sensor Network Establishment (DSNE) – An application in which a selection of geographically-distributed sensors is chosen in order to monitor an overall region.

Distributed Vehicle Monitoring (DVM) – An application in which geographically-distributed sensors cooperatively map the movements of vehicles across their sensed regions.

Dominant Strategy – An agent's (*see*) strategy that is best for the agent no matter what others do. [TS]

DSNE – (*See*) Distributed Sensor Network Establishment.

DSS – (*See*) Decision Support System.

DVM – (*See*) Distributed Vehicle Monitoring.

Dynamic Logic – Propositional logic enhanced with a regular expression language of actions or programs, which can be used to model the necessary and possible results of performing different programs. [MPS,ASR,MPG]

Echo Algorithm – Technique to construct an arbitrary spanning tree in a network by flooding messages through all edges. Each node acknowledges the first message it received, but only after receipt of a message through each other channel. Information can be dispersed and collected as in the (*see*) broadcast/convergecast technique. [GT]

EDI – Electronic Data Interchange. A set of (*see*) protocols for exhanging business data electronically among trading partners. [HVDP]

Ensemble – A multiagent system, especially one whose agents pursuing a collective goal. Often used as a synonym for (*see*) coalition, (*see*) group, and (*see*) team. [GAA,NJ]

Environment – *See* accessible environment, deterministic environment, discrete environment, episodic environment, static environment. *See also* reactive, situatedness.

Episodic Environment – An environment in which an agent's tasks are divided into a number of discrete episodes, with the performance of the agent in one episode having no effect on other episodes. Episodic environments simplify an agent's decision making process, as they relieve the agent of the need to reason about the interaction between current and future behaviour. [MW]

ESPRIT – The joint R&D program of the European Community.

Favor Relations – Opportunities in which one agent can accomplish a goal that another agent desires. [EHD]

Feedback (Learning Feedback) – A measure indicating the level of performance achieved so far by a learning system. *See* learning. [SS,GW]

FIPA – Foundation for Intelligent Physical Agents; a consortium that is developing standards for agents.

First-Price Open-Cry (English) Auction – Auction protocol where each bidder is allowed to keep raising his bid based on others' bids. The auction ends when no one wants to raise, and the highest bidder gets the item at the price of his bid. [TS]

First-Price Sealed-Bid Auction – Auction protocol where each bidder is allowed to send in a bid without seeing the others' bids. The highest bidder gets the item at the price of his bid. [TS]

Focal Points – Landmarks in a solution space that stand out as candidate solutions that are more likely to be mutually chosen. [EHD]

Functionally Accurate Cooperation – In contrast to completely accurate, independent problem solving, functionally-accurate cooperation assumes agents might make mistakes when solving their tasks and need to engage in a cooperative exchange of results to overcome their individual errors and converge on an acceptable solution. [EHD]

Garbage Can – An intellective model of organizational behavior in which problems, choices, and solutions flow through the system. [KMC,LG]

General Equilibrium – A solution for a market where supply meets demand on each commodity, consumers maximize their preferences within their budget, and producers maximize profits within their production possibilities. Not a game theoretic solution concept. *See* Newtonian price tâtonnement algorithm, price-taking assumption, price tâtonnement algorithm, quantity-based algorithms. [TS]

Gibbard-Satterthwaite Impossibility Theorem – A result regarding insincere (strategic) voting. It basically states that with unrestricted preferences, each deterministic protocol that has truth-telling as the dominant strategy, is dictatorial. [TS]

Goals – A mutually consistent set of (*see*) desires. [MPS,ASR,MPG]

Grafcet – A graphical language for describing the control of a distributed system, based on Petri nets. [HVDP]

Group – A multiagent system, especially one that is viewed (or acts or is intended to act) as a single agent. Often used as a synonym for (*see*) coalition, (*see*) ensemble, and (*see*) team. [MPS,ASR,MPG]

Group Intention – An intention that is shared by a group of agents. [MPS,ASR,MPG]

Groupware – Computing and communications technology based systems that assist groups of participants, and help to support a shared environment. The term *collaborative technology* is of used in this sense. *See also* communityware, computer supported cooperative work. [CSE,JW]

Head – That portion of an agent that enbles it to communicate with other agents. *See also* body. [HVDP]

Heterarchy – A structure of (*see*) coordination in which an agent may constrain the same other agents by which it is itself constrained. *See also* hierarchy. [HVDP]

Hierarchical Behavior-Space Search – A coordination strategy where agents represent themselves to each other in terms of how they will behave at an abstract level, and then iteratively exchange more details only in relevant parts of their behavior descriptions. Coordination can occur at any level of behavioral abstraction. [EHD]

Hierarchy – A structure of (*see*) coordination in which an agent does not constrain those agents by which it is itself constrained *See also* heterachy. [HVDP]

HITOP-A – A detailed industry-funded organizational design and analysis tool focusing on tight integration of technology, organizational and people (TOP) perspectives. *See* ACTION. [KMC,LG]

Host – A physically or economically distinct boundary (e.g., a processor) on which an entity (e.g., a (*see*) software agent) may reside and execute. [GAA,NJ]

Hybrid Approaches to the BDI Concepts. – Semantical approaches that are based on a combination of modal logics and explicit representation of sentences of a formal language. *See* BDI concepts. [MPS,ASR,MPG]

IBIS – (*See*) Issue Based Information System.

Illocution – The aspect of a (*see*) speech act that deals with its core meaning; in between its locution and perlocution. [MPS,ASR,MPG]

Information Agent – Information agents are (*see*) that have access to multiple, potentially heterogeneous and geographically distributed information sources. Information agents have to cope with the increasing complexity of modern information environments, ranging from relatively simple in-house information systems, through large-scale multidatabase systems, to the visionary Infosphere in the Internet. One of the main tasks of the agents is an active search for relevant information in non-local domains on behalf of their users or other agents. This includes retrieving, analyzing, manipulating, and integrating information available from different information sources. [GW]

Insincere Voting – Voting where agents lie about their preferences if that increases their expected utility. [TS]

Intentions – (*See*) goals that the agent is currently working on, i.e., those leading to the agent's actions. *See also* BDI architecture, group intention. [MPS,ASR,MPG]

Interaction – Generally, everything that occurs "between" agents (agent-agent interaction) and "between" agents and their environment (agent-environment interaction). Agents can interact directly via—verbal—(*see*) communication (by exchanging information) and indirectly via their (*see*) environment (by passively observing one another or by actively carrying out actions that modify the environmental state). Interaction may result in changes in the (*see*) internal state and the future course of activity of an agent. Interaction can be characterized according to its frequency, persistence, pattern, purpose, and so forth. A common distinction is that between deliberative and reactive interaction (*see* deliberative, reactive). Much work in DAI is concerned with interaction between agents. Forms of interaction that play an important role in DAI are (*see*) cooperation and (*see*) competition. A type of interaction that plays an important role in human contexts, but not in technical systems, is para- and non-verbal communication (e.g., by intonation and gesture). [GW]

Interaction Analysis – During plan merging, the process of identifying conflicting interactions among the plan steps of different agents. *See* planning. [EHD]

Interaction Protocol – *See* protocol.

Inter-Agent Credit-Assignment Problem – The problem of assigning credit or blame for overall system performance to the external actions carried out by the system components. *See* credit-assignment problem. [GW]

Interface Agent – An agent, typically a (*see*) software agent, that supports its user(s) in fulfilling certain tasks. For instance, an interface agent may hide the complexity of a difficult task, train and teach a human user, and perform sub-tasks on a user's behalf. The terms *software assistant* and *personal assistant* are often used in this sense. Interface agents also play an important role in (*see*) computer supported cooperative work. [GW]

Internal State – *See* mental attitude.

Internet – The collection of computers, networks, and routers that use the TCP/IP suite and function as a single large internetwork. In the groupware context, the Internet can be described in terms of the hardware that supports it, the software that facilitates it, and the demographics of the people that populate it. [CSE,JW]

INTERRAP – A vertically layered two-pass (*see*) agent architecture. [MW]

Intra-Agent Credit-Assignment Problem – The problem of assigning credit or blame for a particular action carried out by a system component to the component's internal inferences and decisions leading to this action. *See* credit-assignment problem. [GW]

Introspection – The ability of an agent to examine and reflect its own thoughts, ideas, plans, goals, and so forth. [GW]

IRMA – An influential (*see*) BDI agent architecture. [MW]

Issue Based Information System (IBIS) – A model and methodology for system design and decision making in which strict argumentation categories are utilized. The decision making methodology consists of three phases, divergence, convergence, and decision. The model supports argumentation via a clear separation between issues, positions, and arguments. [CSE,JW]

JAAPI – Java Aglet API. An object framework developed by IBM that is built on top of Java and that supports the construction of mobile (*see*) software agents. [GW]

Job Shop – A manufacturing facility in which the routing of a part from one machine to another is not physically fixed. [HVDP]

KIF – Knowledge Interchange Format. A computer-oriented language for the interchange of knowledge among disparate programs. It has declarative semantics and is logically comprehensive. Moreover, it provides for (i) the representation of knowledge about the representation of knowledge, (ii) the representation of non-monotonic reasoning rules, and (iii) the definition of objects, relations, and functions. KIF is part of the (*see*) Knowledge Sharing Effort. [GW]

Know-How – The ability of an agent to knowingly achieve some (typically intended) state of affairs. [MPS,ASR,MPG]

Knowledge – From the point of view of logics, knowledge is often defined as true (*see*) belief or, more specifically, true justified belief. *See also* common knowledge. [MPS,ASR,MPG]

Knowledge Level – A level of describing the knowledge and reasoning of an individual agent that abstracts away from the form and mechanisms used to represent this knowledge; the level below the (*see*) social level. [HVDP]

Knowledge Sharing Effort (KSE) – Sponsored by the Advanced Research Projects Agency (ARPA). A consortium and initiative to develop methodology and software for the sharing and reuse of knowledge. Examples of major outcomes of the Knowledge Sharing Effort are (*see*) KIF, (*see*) KQML, and (*see*) Ontolingua. [GW]

KQML – Knowledge Query and Manipulation Language. A language and protocol for exchanging information and knowledge. KQML can be thought of as consisting of three layers. The content layer bears the actual content of the message. The communication layer encodes message features which describe low-level communication parameters (e.g., identity of sender). The message layer determines the kind of interactions one can have with a KQML-speaking agent, and its primary function is to identify the (*see*) protocol to be used for message delivery and to supply the (*see*) speech act attached to the content. KQML is part of the (*see*) Knowledge Sharing Effort. [GW]

Layered Architecture – An (*see*) agent architecture that is structured into a number of layers, each of which typically represents an increased level of abstraction from the layer beneath it. Two types of layered architectures can be distinguished: horizontally layered (i.e., each layer is directly connected to the sensory input and action output), and vertically layered (i.e., sensory input and action output are dealt with by at most one layer each). Examples include (*see*) TOURINGMACHINES and (*see*) INTERRAP. [MW]

Learning (Distributed) – Broadly speaking, learning refers to self-improvement of future behavior based on past experience. "Distributed" means that several entities (agents) are involved in the same learning process, where each entity contributes to the solution of the overall learning task according to its individual abilities or preferences. The distribution may concern the identification of sub-tasks of the overall learning task, their execution, or both. *See also* adaptation, credit-assignment problem, feedback, multiagent learning, organizational adaptation. [GW]

Legacy System – A existing system that is not included within the scope of a new system development effort, but that must interoperate with the new system. [HVDP]

Leveled Commitment Contract – Contract where each party can decommit by paying a prenegotiated penalty. Enables contracts and improves their Pareto efficiency. Does not require an event verification mechanism or knowledge of possible future events. *See* contract. [TS]

Life Cycle – A series of stages through which an industrial project passes, from the time it is first considered until it has been retired from service. [HVDP]

Linkages (in an Organization) – The set of relations among nodes in a (*see*) network. For example, if the nodes are people the linkages might be friendship, advice, or works with. Such linkages are often called ties by organizational theorists and arcs by mathematicians. [KMC,LG]

Locution – The surface form of a (*see*) speech act; that which is actually transmitted. [MPS,ASR,MPG]

Logic – *See* dynamic logic, modal logic, predicate logic, propositional logic, temporal logic. [MPS,ASR,MPG]

MACE – A domain-independent modeling and simulation testbed for multiagent systems. MACE embodies a high-level social theory and uses concurrent agents for all phases of system construction and simulation. [KMC,LG]

Mental Attitude – A property ascribed to an agent describing its internal state. It is usually distinguished between information or cognitive states (e.g., belief and knowledge), deliberative or conative states (e.g., intention and commitment), and motivational or affective states (e.g., desire, choice, preference, and goal). [GW]

Merging Algorithm – A particular anytime algorithm for (*see*) coalition structure generation. Starts from agents operating individually, and constructively builds coalitions. *See also* splitting algorithm. [TS]

Message – Generally, a piece of data, the elementary unit of communication. More specifically, a piece of data which possibly includes the representation of an (*see*) actor behavior, that is sent from one actor to another. *See also* communication complexity, space-time diagram. [GAA,NJ]

Message-Passing – A communication paradigm where entities interact by sending explicit messages to each other. *See also* communication, interaction. [GAA,NJ]

Meta-Level Organization – An organizational structure specifying agents' (*see*) roles in the coordination process. *See also* coordination. [EHD]

Migration – Transfering a possibly active computation from one processing unit (e.g., a computer or agent) to another. [GAA,NJ]

Mobility – An agent's ability to change its physical position. [GW]

Modal Approaches to the BDI concepts – Semantical approaches that are based on (*see*) modal logics. *See* BDI concepts. [MPS,ASR,MPG]

Modal Logic – The logic of necessity and possibility. This forms the basis of a number of the logics of (*see*) BDI concepts. [MPS,ASR,MPG]

MRP – Manufacturing Resource Planning; a widely-used process for planning the availability of parts and machines in manufacturing. [HVDP]

Multiagent (M) Contract – Contract where tasks are atomically reallocated among more than two agents. *See also* OCSM-contract. [TS]

Multiagent Foraging – An application involving multiple agents which have to collect food in a confined area and take it to a predefined region.

Multiagent Learning – In its stronger meaning, this term refers to situations in which several agents collectively pursue a common learning goal. In its weaker meaning, this term broadly refers to situations in which an agent pursues its own learning goal, but is affected in its learning by other agents (e.g., their knowledge, beliefs, intentions, and so forth). *See* learning. [GW]

Multiagent Soar – Any of the models of organizational behavior in which each of the agents is modeled as a Soar agent. *See also* Soar. [KMC,LG]

Multiagent System – A system composed of multiple, interacting (*see*) agents. *See also* interaction. [GW]

Multistage Negotiation – Negotiation-based cooperative resolution of conflicts, where several cycles or "rounds" take place in which the participants e.g. send requests, locally examine solutions, and generate alternative views. An advanced form of distributed problem solving and planning. *See* negotiation. [GW]

Murmuring – To counter possible message losses, murmuring means that agents periodically repeat themselves until they receive evidence that the message has been received. [EHD]

Mutual Belief – A (*see*) belief about a proposition that is shared by a set of agents in such a way that the agents (i) belief the same proposition, (ii) believe that each of the others believes it, and (iii) have similar nested beliefs about each other's beliefs to an arbitrary level of nesting. [MPS,ASR,MPG]

Mutual Selection – When an agent that passes a task to another, and the other that is accepting the task, each chooses to engage in this transaction. Usually used to describe the (*see*) contract net protocol. [EHD]

Nash Bargaining Solution – A particular solution in the family of axiomatic bargaining solutions. The product maximizing solution. [TS]

Nash Equilibrium – A profile of (*see*) strategies (one for each agent) such that no agent is motivated to change its strategy given that others do not change. *See also* strong Nash equilibrium. [TS]

Negotiated Search – An approach in which multiple agents can propose partial or complete solutions, from which agents engage in iterative elaboration and critiquing. In overconstrained situations, agents can compromise by relaxing their solution requirements. *See* negotiation. [EHD]

Negotiation – (*See*) interaction among agents based on (*see*) communication for the purpose of coming to an agreement. Negotation has much to do with distributed conflict resolution and decision making, and requires that the agents use a common language (*see* agent communication language). In the course of negotiation an agent makes a proposal which then is commented (e.g., refined, criticized, or refuted) by other agents. Negotiation may be interpreted as (*see*) coordination among competitive or simply self-interested agents. Another common interpretation of negotiation is that of a distributed, communication-based (*see*) search through a space of possible solutions. *See also* multistage negotiation, negotiated search. [MNH,LNS,GW]

Network (Organizational) – A collection of nodes and the relations among them. Within the organization there are many networks, including the social network (who likes or communicates with whom) and the task network (which subtasks must be done before or simultaneously with which other subtasks). *See* linkages. [KMC,LG]

Newtonian Price Tâtonnement Algorithm – A variable step size (*see*) price tâtonnement algorithm. [TS]

NII – National Information Infrastructure (US).

NIIIP – National Industrial Information Infrastructure Project (US).

Observation-Based Plan Coordination – The use of observations about others actions, rather than explicit (*see*) communication, to sychronize and otherwise coordinate plans. [EHD]

OCSM-Contract – Powerful complex contract type that allows moving from any task allocation to any other. *See* cluster (C) contract, multiagent (M) contract, original (O) contract, swap (S) contract. *See also* contract net protocol. [TS]

Odyssey – A commercial Java-based mobile agent platform from General Magic. *See also* Concordia, Voyager. [TS]

OEM – Original Equipment Manufacturer; the company at the top of a supply chain, which manufactures the finished product. [HVDP]

Ontolingua – A set of tools, written in Common Lisp, for analyzing and translating ontologies (*see* ontology). It uses (*see*) KIF as the interlingua and is portable over several representation systems. It includes a KIF parser and syntax checker, a cross reference utility, a set of translators from KIF into implemented representation systems, and a HTML report generator. Ontolingua is part of the (*see*) Knowledge Sharing Effort. [GW]

Ontology – Generally, A specification of the objects, concepts, classes, functions and relationships in an area of interest. For a given area, the ontology may be explicitly represented or implicitly encoded in an agent. More specifically, to support the

sharing and reuse of formally represented knowledge among AI systems, it is useful to define the common vocabulary in which shared knowledge is represented; a specification of such a common vocabulary for a shared domain of discourse is called an ontology. *See also* ontolingua, ontology sharing problem. [GW]

Ontology Sharing Problem – The problem that agents need a shared (*see*) ontology to be able to communicate meaningful. [GW]

Open System – A system composed of a variable number of parts that interact although typically they are developed independently, that act concurrently and asynchronsously, that have a decentralized control, that possess limited knowledge, and that have limited and potentially inconsistent views of the overall system. [GW]

ORGAHEAD – An intellective model in which the agents learn from experience as they work in distributed fashion on an classification or assessment task, and the chief executive officer (modeled as an annealer) also learns how to alter the organization's structure as the set of tasks potentially changes. [KMC,LG]

Organization – A system composed of interacting agents, together with the relationships that exist between them. *See also* organizational structure. [GW]

Organizational Adaptation – A change in the organization or its personnel that results in the maintenance of or improvements in performance regardless of whether or not there are changes in the environment. *See* learning. [KMC,LG]

Organizational Consultant – A detailed expert system for exploring the potential impact of different organizational designs and tasks on various aspects of performance from a management choice perspective. [KMC,LG]

Organizational Design – The organization's design is the set of processes and (*see*) networks that comprise the organization. [KMC,LG]

Organizational Structure – Generally, the "architecture" of a multiagent system, the pattern of information and control relationships between agents. Specifically, a specification and assignment of (*see*) roles and responsibilities to participants in a cooperative planning and/or problem- solving endeavor. The set of (*see*) networks that comprise the organization. *See also* coalition formation. [KMC,EHD,LG,GW]

Original (O) Contract – Contract where one item is moved from an agent to another. See also OCSM-contract. [TS]

OSI – Open Systems Interconnection; a standard layered architecture for computer communications. [HVDP]

PACT – Palo Alto Collaboration Testbed. PACT is a laboratory for joint experiments in computer-aided concurrent engineering being pursued by research groups at Stanford University, Lockheed, Hewlett-Packard, and Enterprise Integration Technologies.

Pareto Efficiency – A criterion for evaluating outcomes. A solution is Pareto efficient (Pareto optimal) if there exists no other solution where no agent is worse off and some agent is better off. [TS]

Parallel Search for Insincere Agents – A method for motivating self-interested agents to follow a particular global search strategy. [TS]

Partial Global Planning (PGP) – A coordination approach in which agents iteratively form, coordinate, and execute their plans, which allows changing goals and plans, tolerates inconsistent views of collective effort, and supports task passing. *See* planning. [EHD]

Partial Order Planner – A planner that constructs a partial order plan, in which the temporal ordering of plan steps is only committed to to the minimal extent needed to ensure proper performance. *See* planning. [EHD]

Path-Finding Problem – The problem of finding a path from a start node to a goal node in a graph. A graph consists of a set of nodes, each of which represents a state, and a set of directed links between nodes, each of which represents an operator available to a problem solving agent. *See* search. [TI,MY]

Perlocution – The aspect of a (*see*) speech act dealing with its effect upon a recipient. [MPS,ASR,MPG]

Personal Assistant – A (*see*) software agent that acts for and on behalf of one or several users. To be able to do so, personal assistants often are intended to model their users' interests, intentions, goals, and so forth. *See* interface agent. [GW]

Petri Net – A modeling technique for distributed systems. [HVDP]

PGP – (*See*) partial global planning.

Plan Combination Search – A distributed planning approach in which agents individually formulate feasible sets of plans for their goals, and then engage in distributed search to prune these sets to converge on an acceptable combination of their individual plans. *See* planning. [EHD]

Plan Merging – A distributed planning approach in which each agent formulates is desired plan, and then these plans are merged into a collective plan. *See also* planning. [EHD]

Plan Synchronization – The insertion of synchronization actions into plans to avoid conflicting actions. *See also* planning. [EHD]

Planning (Distributed) – Generally, the formulation of a scheme (plan) for the attainment of a goal. Planning can be thought of as a specialization of (*see*) problem solving, where the problem to be solved is to find an appropriate plan. "Distributed" planning means that several entities are involved in plan formulation, plan execution, or both. *See also* ACT, contingency planning, cooperative planning, distributed hierachical planning, interaction analysis, multistage negotiation, observation-based plan coordination, partial global planning, partial order planner, plan combination search, plan merging, plan synchronization, team plan. [EHD,GW]

Plural-Soar – An intellective model of organizational performance in which each agent is a Soar agent and the agents are working collectively to fill orders from the goods in a warehouse. *See also* Soar. [KMC,LG]

Plurality Protocol – Voting protocol where the candidates are voted on all at once, and the one with the most votes wins. [TS]

Pragmatics – How the symbols of communication are interpreted. [MNH,LNS,LNS]

Predicate Logic – (*See*) propositional logic enhanced with variables and quantifiers to make statements about all or some objects in a given domain of discourse. [MPS,ASR,MPG]

Price-Taking Assumption – Assumption made in general equilibrium theory. Agents are assumed to act as if their supply and demand decisions did not affect the market prices. Becomes approximately valid as the agent's size in the market becomes negligible. [TS]

Private Values Auction – Auction setting where each agent's valuation is independent of others' valuations. [TS]

Price Tâtonnement Algorithm – An iterative search algorithm for finding a general equilibrium. At every iteration, the auctioneer increases the price of goods that were over-demanded, and decreases the price of goods that were under-demanded. [TS]

Pro-Active – Capable of taking the initiative; not driven solely by events, but capable of generating goals and acting rationally to achieve them. [MW]

Problem Solving (Distributed) – Generally, the identification and execution of a sequence of activities that transform a start state into a desirable state. "Distributed" means that the identification, the execution, or both, are distributed over several entities. *See* result sharing, result synthesis, task accomplishment, task allocation, task decomposition, task sharing. *See also* multistage negotiation, planning, search. [EHD,GW]

Propositional Logic – The simplest form of logic dealing with elementary facts and boolean combinations of them. [MPS,ASR,MPG]

Protocol – A structured exchange of messages leading to some defined outcome. The rules of the interaction that describe what actions each agent can take at each time. A protocol prescribes how (*see*) communication and (*see*) synchronization between a group of agents takes place. *See also* Borda protocol, binary protocol, cooperation protocol, interaction, plurality protocol, strategy. [GAA,EHD,TS,NJ]

Psychological Commitments – The extent to which an agent will not reconsider its beliefs or intentions. These appear suboptimal in the narrow sense, but give stability to the agent's actions, and are essential for agents of limited reasoning power. *See* commitments. [MPS,ASR,MPG]

Quantity-Based Algorithms – Search algorithms for finding a general equilibrium. They can be constructed to operate as anytime algorithms where feasibility is maintained at every iteration. *See also* search. [TS]

QuestMap – A commercial (*see*) groupware product implementing a version of (*see*) IBIS as a graphical shared hypertext map. Each graphical map, constructed and edited in an ongoing fashion by end users, contains nodes representing issues,

positions, and arguments which are variously connected by colored graph links. [CSE,JW]

Rational – To behave in a way that is suitable or even optimal for goal attainment. [GW]

Reactive – (Of agent behaviour) Capable of maintaining an ongoing interaction with the environment, and responding *in a timely fashion* to changes that occur in it. (Of agent architectures.) An architecture that includes no symbolic representations and does no symbolic reasoning. [MW]

Reactive Architecture – A (*see*) agent architecture that does not rely on symbol manipulation. Usually contrasted with (*see*) deliberative architectures. [GW]

Remote Creation – Creating a new actor or agent at a remote (*see*) host. [GAA,NJ]

Resources – Physical resources (processor, memory, etc.) and logical resources (channels, threads) that are used in the course of a computation. [GAA,NJ]

Result Sharing – Cooperative problem solving through iterative exchange of partial results in the search for an overall result to a problem. [EHD]

Result Synthesis – The stage in distributed problem solving where agents are combining partial results of others (and themselves) into more comprehensive results. [EHD]

Revelation Principle – A central principle in mechanism design. It says that any outcome that can be supported in equilibrium with a complex protocol, can be supported in (truth-telling) equilibrium via a single-shot protocol. [TS]

Revenue Equivalence – Theorem regarding auctions. It says that with risk neutral bidders in private value auctions, a large number of auction protocols surprisingly have the same expected revenue to the auctioneer, despite the fact that the bidding strategies are different. [TS]

Role – The functional or social part which an agent, embedded in a multiagent environment, plays in a (joint) process like problem solving, planning, or learning. Typically roles include permissions and responsibilities, and are associated with specific behavioral patterns. Roles are often thought of as being defined through (*see*) social laws or (*see*) strategies. *See also* meta-level organization, organizational structure, team. [GW]

Rubinstein Bargaining Model – An alternating offers bargaining protocol used in conjunction with subgame perfect equilibrium analysis. [TS]

SDML – Strictly Declarative Modeling Language, can be used with multiple agent models and has facilities for examining team interaction. [KMC,LG]

Search – An umbrella term for various problem solving techniques in AI, where the sequence of actions required for solving a problem is not known in advance but must be determined by a trial-and-error exploration of alternatives. Search problems may be divided into three classes: (*see*) path-finding problems, (*see*) constraint satisfaction problems, and (*see*) two-player games. *See also* asynchronous search algorithm, problem solving, quantity-based algorithms. [TI,MY]

Second-Price Sealed-Bid (Vickrey) Auction – Auction protocol where each bidder is allowed to send in a bid without seeing the others' bids. The highest bidder gets the item at the price of the second highest bid. [TS]

Semantics – What the symbols of communication denote. [MNH]

Sentential Approaches to the BDI Concepts – Semantical approaches that are based on the explicit representation by the agent of sentences of a formal language. *See* BDI concepts. [MPS,ASR,MPG]

Shapley Value – A way of dividing payoff among agents in coalition formation (CFGs). The Shapley value exists for every characteristic function game, but does not guarantee as strong stability as the core. [TS]

Sincere Voting – Voting where agents reveal their true preferences. [TS]

Situatedness – An agent's ability to continuously interact with, or to be embedded in, its environment. [GW]

Soar – A general, rule-based problem solving architecture. [GW]

Social Ability – The ability to interact with other agents, typically by exchanging information via some language. [GW]

Social Commitments – The broad class of (*see*) commitments referring to the obligation of an agent to another agent. They may involve witnesses or context groups. [MPS,ASR,MPG]

Social Concepts – Concepts applied in DAI that are inspired from sociology. for instance, (*see*) group, (*see*) role. [GW]

Social Laws – Generally, behavior-prescribing specifications. Rules that specify how an agent embedded in a society of agents should behave. More specifically, a set of constraints on individual actions in particular contexts such that, if all agents follow the laws, the agent system will avoid undesirable states. *See also* role, strategy. [EHD,GW]

Social Level – A level of describing the interactions of multiple agents that abstracts away from their individual cognitive processes; one level higher than the (*see*) knowledge level. [HVDP]

Social Primitives – Any of the concepts borrowed from sociology. [MPS,ASR,MPG]

Software Agent – An agent that is implemented in software. *See also* interface agent. [GW]

Software Assistant – *See* interface agent.

Softbot – SOFTware roBOT.

Space-Time Diagram – Graphical representation of the interaction between several nodes by the exchange of messages. The diagram shows the execution of each involved node as a straight line and the exchanged messages as arrows. [GT]

Spawn – A distributed operating system where computation is allocated based on a repeated Vickrey auction (*see* second-price sealed-bid auction). [TS]

Speech Act – A communication viewed as a combination of its (*see*) locution, (*see*) illocution, and (*see*) perlocution. [MPS,ASR,MPG]

Speech Act Theory – The view of natural language as actions. The basic claim is that utterances are actions that result in (or are intended by the speaker to result in) changes in the internal state (*see* mental attitudes) of a hearer. "Verbal actions" of this kind are called (*see*) speech acts. [MNH,LNS,GW]

Splitting Algorithm – A particular anytime algorithm for (*see*) coalition structure generation. Starts from all agents operating together, and splits off coalitions. *See also* merging algorithm. [TS]

Static Environment – An environment that is guaranteed to change only via the action of the agent in it. [MW]

Strategic Bargaining – An approach to solving bargaining problems by defining the protocol and carrying out game theoretic equilibrium analysis. [TS]

Strategy – Agent's mapping from state history to action; a way to use the (*see*) protocol. *See also* dominant strategy, Nash equilibrium, role, social law. [TS]

STRIPS Operator – A specification of an action in terms of the preconditions that must hold for the action to apply, and the effects the action has on the state of the world once it is executed. [EHD]

Strong Nash Equilibrium – A solution concept for games that requires that no subgroup is motivated to change their strategies in a coordinated manner. *See* Nash equilibrium. [TS]

Subsumption Architecture – Developed by Rodney Brooks, a reactive (*see*) agent architecture in which agent decision making is achieved through the interaction of a number of task accomplishing "behaviors," each of which is an independent activity-producing system in its own right. Layers typically interract by "inhibition" and "suppression," and are extremely economical in computational terms, making no use of symbolic representation or reasoning mechanisms. [MW]

Sugarscape – An artificial life model in which very simple agents consume resources, migrate, and reproduce. [KMC,LG]

Swap (S) Contract – Contract where agents swap a pair of tasks atomically. *See also* OCSM-contract. [TS]

SWARM – A multiagent simulation language for modeling collections of concurrently interacting agents in a dynamic environment. [KMC,LG]

Synchronization – A specification of the constraints on the order of events occuring in a system. Synchronization may be viewed as an elementary (*see*) coordination mechanism. [GAA,NJ,GW]

Syntax – How the symbols of comunication are structured. [MNH,LNS]

TAC Air Soar – A model of distributed teamwork in which each of the agents are modeled in (*see*) Soar and the organizational structure is embedded as a set of predefined procedures in the knowledge base. [KMC,LG]

TAEMS – A system for modeling, analyzing, and simulating multiagent systems based on the structure of the multiagent tasks and the relationships between the distributed subtasks. [EHD]

Task Accomplishment – The stage in distributed (*see*) problem solving where agents are accomplishing their own local tasks. [EHD]

Task Allocation – The stage in distributed (*see*) problem solving where agents are deciding where tasks will be done. [EHD]

Task Decomposition – The stage in distributed (*see*) problem solving where agents are breaking large tasks into smaller tasks to be distributed to others. [EHD]

Task Sharing – Cooperative (*see*) problem solving through the decomposition of large tasks and the enlistment of other agents to accomplish the subtasks. [EHD]

Team – A multiagent system, especially one whose members play different (*see*) roles and work together to achieve some common goals. Often used as a synonym for (*see*) coaliltion, (*see*) ensemble, and (*see*) group. [MPS,ASR,MPG]

Team Plan – An explicit representation of how multiple agents should work together in accomplishing a goal. [EHD]

Telescript – A commercial development environment for agent-based applications from General Magic. [GW]

Temporal Logic – (*See*) propositional logic augmented with operators to make claims about the truth of different conditions at different times. [MPS,ASR,MPG]

Termination Detection – The determination that a distributed computation has come to a halt. The issue is not always trivial because termination could be a property of the global state, while each node only observes its own local state. Detection then requires a mechanism to ensure that communication channels are empty, and exchange of information about the local states. [GT]

ToH – (*See*) Tower of Hanoi.

TOP-MODELER – The commercial, PC-based tool developed from (*see*) ACTION. [KMC,LG]

TOURINGMACHINES – A horizontally layered (*see*) agent architecture. *See* layered architecture. [MW]

Tower of Hanoi (ToH) – A classic AI problem involving moving a stack of disks from one peg to another under constraints on actions. The space of possible plans is exponential. [EHD]

TRACONET – TRAnsportation COoperation NEt. The system that introduced a sound marginal cost-based decision making criterion into the contract net protocol. A distributed implementation that was tested on a real world multienterprise vehicle routing problem with 771 tasks and 77 vehicles. [TS]

Two-Player Game – For instance, chess and checkers. A two-player game can be represented by a tree called a game tree, which represents the sequence of possible moves. The minimax procedure is a method for finding a good move by creating only a reasonable portion of a game tree, and the alpha-beta pruning method can be used to speed up the minimax procedure without any loss of information. *See* search, asynchronous search algorithm. [TI,MY]

Vacuum Cleaning World Application – An application involving multiple agents which have to clean up a predefined region (e.g., a house).

VDT – An emulation model of performance for teams dealing with routine design tasks. [KMC,LG]

Veracity – The assumption that an agent is truthful and does not provide information of which it thinks that it is false. [GW]

Voting – *See* Arrow's impossibility theorem, Gibbard-Satterthwaite impossibility theorem, sincere voting, Insincere (strategic) voting, protocol.

Voyager – A commercial Java-based mobile agent platform from ObjectSpace. *See also* Concordia, Odyssey. [TS]

Walras – (1.) L. Walras, economist. Forefather of general equilibrium theory. (2.) A simulated computational market economy based on general equilibrium theory, and a variant of the price tâtonnement algorithm. [TS]

Watchdog – An agent whose sensory scope is wider than that of most other agents in the community, but whose only action is raising signals to which other agents respond. [HVDP]

Whiteboard – Shared writing and drawing surface that allows multiple participants to view and work upon an information artifact simultaneously, without inhibiting each other. *See also* blackboard. [CSE,JW]

Workflow Management System – Networked control system that assists in analyzing, coordinating, and executing business processes. It typically consists of two sub-systems:(1) A modelling subsystem which allows organizational administrators and analysts to construct procedural models of the flow of work among people and tasks; and (2) An enactment subsystem which uses the model to coordinate task executions by various participants at various workstations connected to a network. [CSE,JW]

Wrapper – Software (and possibly dedicated hardware) that enables a system constructed according to one architecture to interoperate with a system of a different architecture. [HVDP]

WWW – The World Wide Web.

W3C – The World Wide Web consortium hosted at MIT.

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