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ture, which in turn represents a *graph. If A is the adjacency matrix corresponding to a given graph G , then

$$a_{ij} = 1$$

if there is an edge from vertex i to vertex j in G ; otherwise

$$a_{ij} = 0$$

If G is a directed *graph then

$$a_{ij} = 1$$

if there is an edge directed from vertex i to vertex j ; otherwise

$$a_{ij} = 0$$

If the vertices of the graph are numbered $1, 2, \dots, m$, the adjacency matrix is of a type $m \times m$. If

$$A \times A \times \dots \times A \text{ (} p \text{ terms, } p \leq m \text{)}$$

is evaluated, the nonzero entries indicate those vertices that are joined by a *path of length p ; indeed the value of the (i, j) th entry of A^p gives the number of paths of length p from the vertex i to vertex j . By examining the set of such matrices,

$$p = 1, 2, \dots, m-1$$

it can be determined whether two vertices are connected.

It is also possible for adjacency matrices to be formed from *Boolean matrices.

adjacency structure (adjacency list) A means of representing a *graph. The adjacency structure corresponding to a *path G is the set

$$\{\text{Adj}(v) \mid v \text{ is a vertex in } G\}$$

If G is an undirected graph, then a vertex m is in $\text{Adj}(v)$ if and only if there is an edge in G between v and m ; if G is a directed graph, then m is in $\text{Adj}(v)$ if and only if there is an edge in G directed from v to m .

ADP *Abbrev. for automatic data processing. See data processing.*

affine mapping (affine transformation) A mapping from one coordinate system to another under which parallel lines remain parallel and ratios of collinear points are preserved. An affine mapping can be decomposed into linear transformations (rotation, scaling, and shear) and translation.

AFIPS American Federation of Information Processing Societies, founded in 1961 to provide a structure for professional societies with a primary interest in information pro-

cessing to join together in order to advance the state of the art. AFIPS was dissolved in 1990. In 1991 its two principal members, the *ACM and the *IEEE Computer Society, formed a joint committee known as *FOCUS* (Focus on Computing in the US), which represents the US in *IFIP.

AFL *Abbrev. for abstract family of languages.*

agenda mechanism A control scheme often used in *knowledge-based systems and *blackboard systems to order the sequence of action execution. While the system is running, inference processes may examine the agenda and manipulate it by the dynamic addition, removal, and reordering of items.

agent An autonomous system that receives information from its environment, processes it, and performs actions on that environment. Agents may have different degrees of intelligence or rationality, and may be software, hardware, or both.

Software agents operate in symbolic environments, and perceive and act upon strings of symbols; examples include personal assistant agents that enhance and customize facilities for computer users, and *data mining agents that search for interesting patterns in large databases. In a *distributed system, the agent for a *remote procedure call is in a different computer from the caller; its environment is the network and the procedure body. A robot (*see robotics*) is an example of an agent that perceives its physical environment through sensors and acts through effectors.

AGV *Abbrev. for autonomous guided vehicle.*

AI *Abbrev. for artificial intelligence.*

Aitken's Δ^2 process A method to convert any convergent sequence $\{x_n\}$ into a more rapidly convergent sequence $\{x'_n\}$. For linearly converging sequences the formula is:

$$x'_n = x_n - (x_{n+1} - x_n)^2 / (x_{n+2} - 2x_{n+1} + x_n)$$

AIX An IBM version of *UNIX.

ALARP principle A principle that is associated with the design and development of safety systems, and captures the notion that the risk to individuals, society, and the environment should be *As Low As Reasonably Possible*. *See also* safety-critical system, safety-related system.