H

HERTZ

Named after scientist Heinrich Hertz (1857-94) the *hertz* is a unit of measurement for frequency. When a repetitive event recurs once every second, it has a frequency of one hertz. This measurement is applied to sound generation, as in the frequency of a tone; in electronics, when an electrical pulse is repeated; and in video scanning, where the hertz value refers to the frequency with which lines of resolution are traced by a beam of light.

The abbreviation for hertz is Hz; *kilohertz*, or kHz, which stands for thousands of cycles per second; and *megahertz*, or MHz, for millions of cycles per second.

HEURISTIC

A *heuristic* system is one that relies on a self-learning, or trial and error, approach to problem-solving. This is only one of two basic ways of solving problems. The other method involves creating a system that applies a specific set of rules or instructions, using existing knowledge of the nature of the problem. For example, solving simple equations for an unknown value is accomplished by following a specific set of mathematical operations on the equation. The set of instructions or operations needed to solve the problem is called an *algorithm*. When an algorithm is known, or can be determined by synthesising known data into an original approach, the system is said to be 'non-heuristic'.

A heuristic system, on the other hand, is one that follows a specific course of action up to a point, but then proceeds to 'learn' the best way of finding a solution. This is usually done through trial and error, via some form of feedback system. Heuristic techniques are employed when a decision is required for which the computer has no clear-cut procedure to enable it to make a choice. One example of a heuristic system is the micromouse (see page 721), designed to explore and solve a maze that it has never experienced before. The programmer of a micromouse can give it some very specific instructions, but the mouse must rely on feedback from its sensors to 'learn' the structure of the maze.

Algorithms can be applied to the search at many points along the way. For instance, the mouse has an internal definition for a blank wall, and a set of instructions telling it what to do when one is found — but the mouse must rely on information from its sensors to know that a wall has been found. By trial and error, the mouse finds its way to the end of the maze, learning the optimum path along the way.

Self-learning, or heuristic, methods of problem-solving are crucial in human intellectual development. In computers, they form a cornerstone of artificial intelligence.

HEXADECIMAL

Hexadecimal notation is a system of representing numerical values using base 16 — as opposed to binary numbers, which are base 2, and decimal numbers, which are base 10. In hexadecimal notation, the digits 0 to 9 are followed by the letters A to F, so that values from 0 to 15 can be represented by a single digit.

Hexadecimal notation is widely used in Assembly language code because it requires much less space than the equivalent binary value. For example, the value 255 requires three digits in decimal notation. Its binary equivalent, 11111111, requires eight digits, but the hexadecimal form, FF, requires only two.

Some microcomputer systems incorporate a *hex-pad* to simplify entering hexadecimal numbers. The pad consists of 16 keys, which are labelled 0 to 9 and A to F.

HIERARCHICAL COMMUNICATIONS SYSTEM

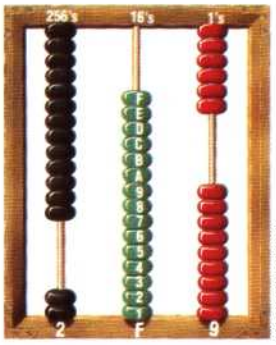
A communications network divided into levels of responsibility is called a *hierarchical communications system*. The lowest levels of the network have the most specific function, while each successive level above has a more general responsibility, and relies on the information processed at the levels below it. Perhaps the best way to examine this is to consider how a communications systems works within the operational structure of a large corporation, with offices in several locations.

Each regional office has a department whose primary purpose is to process incoming orders from locations within its area. Each order department will have its own local area network to process the data, and the department manager will be in charge of the central supervising system for that department. This supervising 'node' is then connected, via a longer-distance network, with the controlling nodes of the other order departments. The company's order manager at head office then has immediate access to data from all the separate regions. This system is, in turn, in communication with those of other central office managers.

In a *hierarchical file system*, there are several levels of files, each lower level dependent on, and related to, the next higher level. A document is stored in a file, which is a subheading of a larger file, and so on. In this system a point is reached where a single umbrella file stores all the units.

HI-RES GRAPHICS

Hi-res, short for high resolution, simply means that a graphic image is built from a large number of very small dots (pixels). The higher the resolution, the larger the number of pixels used in a graphic display — which gives a more detailed, crisper image. In practice, hi-res graphics vary according to a machine's highest level of resolution. Some computer graphics systems are capable of producing a resolution of several thousand lines. Most microcomputer manufacturers use the term to indicate the highest level of resolution their machine can produce.



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Hexadecimal Abacus
To calculate in hexadecimal values would require an abacus with 15 beads per rod. The beads stand for decimal values one through 15, represented in hex notation by the digits 0 through 9 and letters A to F. The rightmost rod represents units, then proceeds to the left in multiples of 16. Thus, each bead on the second rod from the right equals 16, the third 16^2, or 256, and so on. The number shown is decimal 761 (reading from the left, $2 \times 256 + 15 \times 16 + 1 \times 9$). This is read as '2F9 hex'