GREEDY METHOD

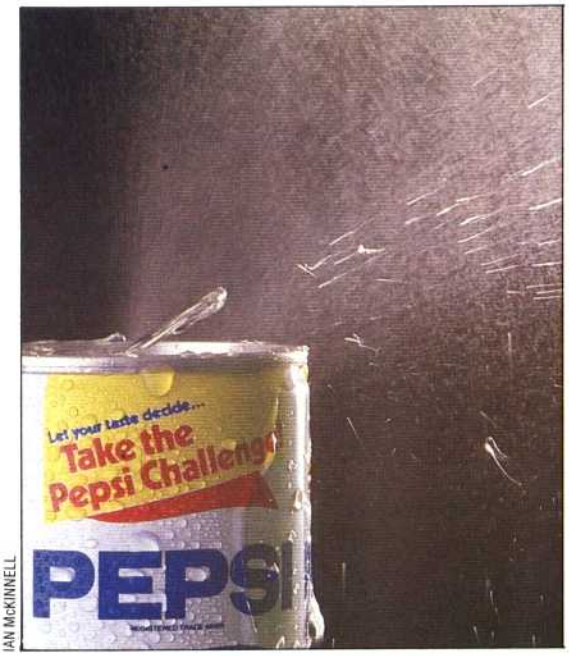
Program algorithms can be written with either a strategical or a tactical approach. They may sometimes accept short-term deviations in the cause of long-term planning, or they may at every stage take the most direct route to the long-term goal. The latter method is called the *greedy method.* It has the failings that its name implies, namely wastefulness, lack of discrimination and the inability to see profit in apparent loss. If all the algorithms in a chess program, for example, were greedy, then essential subtleties such as position and sacrifice plays would be impossible; the program would play fast and aggressive chess but would be outranked easily by more pragmatic and carefully structured play.

GROSCH'S LAW

Developed by H R J Grosch in 1953, *Grosch's Law* purports to give an indication of a computer system's profitability by using the formula:

$$\text{Performance} = (\text{Price})^2 \times (\text{A Constant})$$

During the 1950s this law was much quoted in the mainframe world, where all concerned stood to gain from encouraging the large centralised installations that the law suggested were cost-efficient — a system that costs three times as much as another should perform nine times better if this law is correct, although there was some debate as to whether the quantity (Price) should be squared or raised to a lesser power. The advent of integrated circuitry, however, has almost completely undermined the law.



IAN McKINNELL

Computer Crime
Massachusetts Institute Of Technology engineering students are reputed to hack into a Boston office block's control systems every year so that the lighted windows flash a giant message for an hour — but not all of it is so innocent: hackers allegedly caused the Pepsi-Cola Corporation's dispatching computer to divert shipments of Pepsi as a means of moving large sums of money into illicit accounts. Computer crime, especially using hacking methods, is reputedly growing at a faster rate than the computer industry itself

HACKING

In computing, *hacking* is a term applied to amateurs who devote considerable time and effort trying to crack software protection, customising operating systems, and breaking into other people's installations by using the telephone system. Hackers generally show a cavalier disregard for the concept of privacy, and in some cases are responsible for computer fraud — although it must be stressed that the majority of hackers are concerned only with testing their own limitations and those of the system they use. Hackers first came to the attention of the general public in the Walt Disney film *War Games*, in which an inspired amateur almost starts World War Three by breaking into the North American defence network.

HALF DUPLEX

A radio link as used by taxis, citizens' band and the emergency services is a *half duplex* connection — data can travel freely in both directions between stations but this cannot happen simultaneously, since one must be receiving while the other transmits, hence the need to say 'Over', or 'Come On Good Buddy for a big ten-four on that one' at the end of every speech. (See *full duplex* on page 676.)

HAMMING CODES

The transmission of data along wires inevitably introduces signal noise and errors, and computer scientists have developed many error-checking and error correction methods to counter data corruption. *Hamming codes*, invented by R W Hamming of Bell Telephone Laboratories in 1950, are a family of binary linear perfect error-correcting block codes, ideal for correcting any single error in the block.

Suppose we wish to send four bits of data in a block — 0111, for example. To them we add a three-bit Hamming code generated by the transmitting computer so that certain combinations of four bits from the seven will always contain an even number of ones. Here the code is 100, so the seven-bit block is 0111100 and the combinations are:

Data Code 0111 100		
Combinations	**Result**	**Logical Result**
0. 1. 1. 0	shows even number of ones	0
. 11. . 00	shows even number of ones	0
. . . 1100	shows even number of ones	0

The logical result of the three tests is 000, indicating no errors. Now suppose that in transmission bit four is 'flipped':

Data Code 0101 100		
Combinations	**Result**	**Logical Result**
0. 0. 1. 0	shows odd number of ones	1
. 10. . 00	shows odd number of ones	1
. . . 1100	shows even number of ones	0

The logical result of the three tests is 011, binary for three, which indicates that bit four — the third bit from the left of the block — has flipped, and so can be automatically corrected by the receiving computer. The tests fail only if more than one bit of the seven is corrupted, and for such cases there are BCH(Bose-Chandhuri- Hocquenghem)codes.