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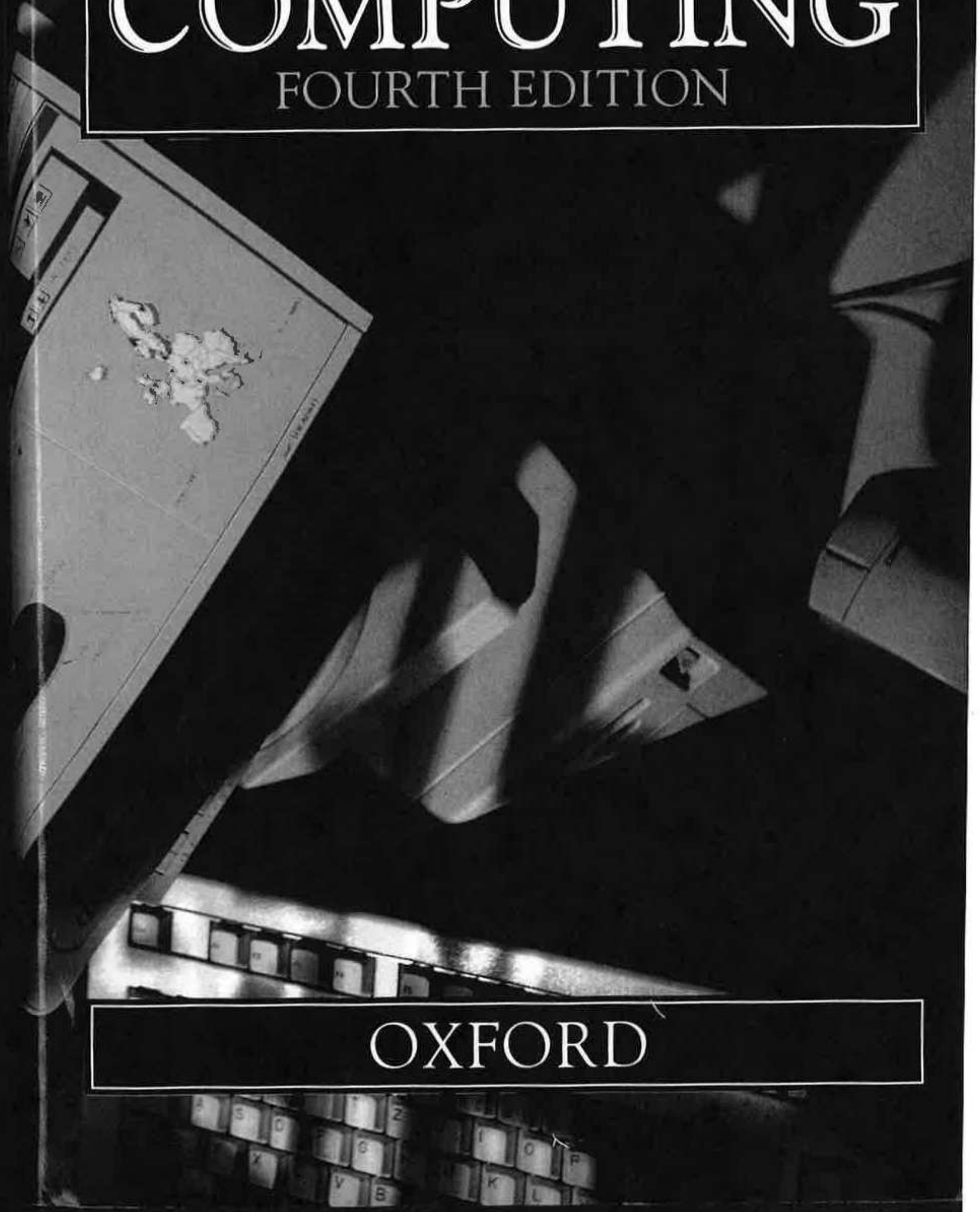
FOURTH EDITION



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reflection distribution was one of the first models to render images that could look plastic or metallic depending on the parameters of the surface.

bifurcation A splitting in two. The term can be applied in computing in various ways.

1. Bifurcation is the generic name for a collection of algorithms that initially convert a *decision table into a *tree structure, which can then be systematically encoded to produce a program.

The *bifurcation method* involves choosing some condition C and eliminating it from the decision table to produce two subtables, one corresponding to the case when C is true and the other to when C is false. The method is then applied recursively to the two subtables. From this approach a *decision tree can be built, each node of the tree representing a condition and subtrees representing subtables; leaf nodes identify rules.

2. *Bifurcation theory* is the theory of equilibrium solutions of nonlinear differential equations; an equilibrium solution is a steady solution, a time periodic, or a quasi-periodic solution. Generally *bifurcation points* are points at which branches and therefore multiple solutions appear.

big-endian Denoting an addressing organization whereby the section of a memory address that selects a byte within a word is interpreted so that the smallest numerical byte address (e.g. 00) is located at the most significant end of the addressed word. *See also* little-endian.

bijection (one-to-one onto function) A *function that is both an *injection and a *surjection. If

$$f: X \to Y$$

is a bijection, then for each y in Y there is a unique x in X with the property that

$$y = f(x)$$

i.e. there is a one-to-one correspondence between the elements in X and the elements in Y. The sets X and Y will have the same number of elements, i.e. the same *cardinality. There will be a unique function

$$f^{-1}: Y \to X$$

such that f and f^{-1} are *inverses to each other; f^{-1} will also be a bijection.

binary adder *See* adder.

binary chop *Informal name for* binary search algorithm.

binary code A *code whose alphabet is restricted to $\{0, 1\}$. In general, any *q-ary code has the important special case $q = 2$. *See* binary system.

binary-coded decimal (BCD) A code in which a string of binary digits represents a decimal digit. In the *natural binary-coded decimal (NBCD)* system, each decimal digit 0 through 9 is represented by the string of four bits whose binary numerical value is equivalent to the decimal digit. For example, 3 is represented by 0011 and 9 is represented by 1001. The NBCD code is the *8421-code such that the weighted sum of the bits in a codeword is equal to the coded decimal digit. *See also* EBCDIC, packed decimal.

binary-coded octal The representation of any octal digit by its three-bit binary equivalent.

binary counter *See* counter.

binary digit *See* bit, binary system.

binary encoding **1.** The representation of symbols in a source alphabet by strings of binary digits, i.e. a *binary code. The most commonly occurring source alphabet consists of the set of *alphanumeric characters. *See* code.

2. The encoding of a number into a binary string in which the ith bit from the end carries weight 2^i. For example, 13 is represented by 1101. This encoding of natural numbers can be extended to cover signed integers and fractions. *See also* radix complement, fixed-point notation, floating-point notation.

3. of a set A. Any assignment of distinctive bit strings to the elements of A. *See also* character encoding, Huffman encoding.

binary-level compatibility *Compatibility that exists when a program in executable binary form may be executed on different computer systems without recompilation. This will normally only be possible between systems with the same operating system and with processors or *emulations of processors capable of executing the same instruction set. *See also* ABI, source-level compatibility.

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where $z(x)$ is the exact solution of the differential equation through the previous computed point, i.e. it satisfies $z(x_n) = y_n$.

An estimate of the local error is normally obtained by using two different formulas on each step (*see* predictor-corrector methods). This estimate is kept below a user-specified tolerance, if necessary by rejecting steps and repeating with a reduced stepsize h. With further modifications this leads to efficient and reliable variable stepsize programs.

The local error is related to the local truncation error (*see* discretization error), which is defined in terms of the exact solution of the original problem rather than the current computed values used here.

local illumination An illumination model in which the illumination of a surface depends solely on its own characteristics and those of the light sources.

localization The action of tailoring a generic software product, such as an application package, by setting local parameters or configuration data.

local loop The (twisted pair) connection from a switching exchange to the subscriber terminal.

local optimization (peephole optimization) *See* optimization (in programming).

location (storage location, memory location) Any place in computer memory in which an item of data – usually a word or byte – can be stored in binary form. Each location can be identified by an *address, allowing items of data to be stored there or retrieved from there. The terms location and address are thus used interchangeably.

location operator An operator in a programming language that yields the address of its operand.

locator A type of input to a graphics system that defines a position, possibly with other information. *See also* logical input device.

lock 1. (lock primitive) An indivisible operation that allows a *process to ensure that it alone has access to a particular resource. On a single-processor system the indivisible nature of the operation can be guaranteed by turning off interrupts during the action, ensuring that no process switch can occur. On a multiprocessing system it is essential to have available a *test-and-set instruction that, in a single uninterruptible sequence, can test whether a register's contents are zero, and if they are will make the contents nonzero. The same effect can be achieved by an exchange instruction. *See also* unlock, semaphore.
2. *See* locks and keys.

lockout A mechanism for arranging controlled access to a shared resource. *See* lock, semaphore.

locks and keys A system of *memory protection in which segments of memory are assigned identification numbers (the locks) and authorized users are provided the numbers (the keys) by the operating system. This provision is done by a privileged process in some location, such as a *program status word, not accessible to the user.

lofting Constructing a number of longitudinal curves to blend a set of previously defined cross-sections in order to represent a surface (*see* blend). The term originates from the days of manual ship design: traditionally these curves were drawn full size; the drawings were too large to handle and lay out conveniently in the drawing office and were therefore stored and dealt with in large attics, called lofts.

logarithmic search algorithm *Another name for* binary search algorithm.

log file A file that is used to record transactions against a database as they occur and is distinct from the database itself. Update transactions must be recorded to provide for database recovery, the information written to the log file usually also including before and after images of the database records (or pages) changed. Information on query-only transactions may also be recorded. The log file will be used to create a *recovery log, to provide an *audit trail, and by database administration for performance monitoring and improvement.

The recording of information on a log file is known as *logging*.

logic 1. A knowledge representation and rea-

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