

DICTIONARY
OF
**COMPUTER
SCIENCE
ENGINEERING
AND TECHNOLOGY**

EDITOR-IN-CHIEF
Phillip A. Laplante

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breakpoint instruction

breakpoint instruction a debugging instruction provided through hardware support in most microprocessors. When a program hits a breakpoint, specified actions occur that save the state of the program, and then switch to another program that allows the user to examine the stored state. The user can suspend the execution of a program, examine the registers, stack, and memory, and then resume the program's execution, which is very helpful in a program's debugging.

Brent-Kung adder a type of carry-lookahead adder; the organization is based on computing carries that are parallel prefixes.

Bresenham's algorithm a technique developed in the framework of raster graphics for generating lines and circles. These algorithms use only integer arithmetic, avoid rounding, and perform an iterative computation of the primitive points by approximating the distance to the nearest pixel center along either the x or y axis. These characteristics make for efficient algorithms.

bridge an edge of a connected graph whose removal would make the graph unconnected.

brightness the perceived intensity of a radiating object.

British museum algorithm a general approach to find a solution by checking all possibilities one by one, beginning with the smallest. The term refers to a conceptual, not a practical, technique where the number of possibilities is enormous. *See also* breadth-first search, brute force search, exhaustive search.

broadcast to send a message to all recipients.

Brownian motion a stochastic process with independent and stationary increments. The derivative of such a process is a white noise process. A Brownian motion process X_t is the solution to a stochastic differential equation of the form

$$\frac{dX}{dt} = b(t, X_t) + \sigma(t, X_t) \cdot W_t,$$

where W_t is a white noise process.

browse to read uncommitted.

brute force search *See* exhaustive search.

BSD acronym for Berkeley Software Distribution, a proprietary version of Unix.

b-spline (1) the shortest cubic spline consisting of different three-degree polynomials on four intervals; it can be obtained by convolving four box functions.

(2) a multi-segment spline curve representation based on local polynomials having continuity of curve orientation and curvature at the points (knots) where different segments join. Cubic b-splines are popular, but linear, quadratic, quartic, etc. splines are also used. The b in b-spline stands for basis because the b-spline segments are formed from the weighted sum of four local basis functions. The local shape of the spline segment is controlled by four control points; in the case of b-splines, these control points do not lie on the curve itself (i.e., b-splines are not interpolating). One important advantage of b-splines is that the movement of a control point affects only four segments of the curve. B-spline surfaces can be defined from b-spline curves lying in both directions on the surface. Here, 16 non-interpolated control points are needed per patch, but each patch then has tangent and curvature continuity where it joins a neighboring patch. The b-spline is defined over a uniform parameter domain, and is evaluated as a simple polynomial function. More complex forms, such as NURBS, relax these assumptions.

BTB *See* branch target buffer.

BTC *See* block truncation coding.

b-tree a balanced search tree in which every node has between $t - 1$ and $2t - 1$ children. Insertion and deletion algorithms are modified to ensure the tree remains balanced. For example, on insertion into a full block (i.e., a collision), the block is split and the middle value is propagated up a level to the parent node. All values less than the middle value are placed in the left child of the parent; other values are placed in the right child. This is a good structure if much of the tree is on disk, since the tree height, and