

Oxford

DICTIONARY OF COMPUTING



New Edition

A Dictionary of
Computing

FOURTH EDITION

Oxford New York

OXFORD UNIVERSITY PRESS

Oxford University Press, Great Clarendon Street, Oxford OX2 6DP

Oxford New York

*Athens Auckland Bangkok Bogota Buenos Aires Calcutta
Cape Town Chennai Dar es Salaam Delhi Florence Hong Kong Istanbul
Karachi Kuala Lumpur Madrid Melbourne Mexico City Mumbai
Nairobi Paris São Paulo Singapore Taipei Tokyo Toronto Warsaw
and associated companies in
Berlin Ibadan*

Oxford is a registered trade mark of Oxford University Press

© Market House Books Ltd. 1983, 1986, 1990, 1996

*First published 1983
Second published 1986
Third edition 1990
Fourth edition 1996*

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Oxford University Press. Within the UK, exceptions are allowed in respect of any fair dealing for the purpose of research or private study, or criticism or review, as permitted under the Copyright, Designs and Patents Act, 1988, or in the case of reprographic reproduction in accordance with the terms of the licences issued by the Copyright Licensing Agency. Enquiries concerning reproduction outside these terms and in other countries should be sent to the Rights Department, Oxford University Press, at the address above

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out or otherwise circulated without the publisher's prior consent in any form of binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser

*British Library Cataloguing in Publication Data
Data available*

*Library of Congress Cataloguing in Publication Data
Data available*

ISBN 0-19-280046-9

7 9 10 8

*Printed in Great Britain by
Cox & Wyman Ltd
Reading, Berkshire*

BLENDING

blending The process of constructing *blends.

blink An attribute that causes a character to be intermittently displayed on a screen at a regular rate, usually in the range 1–10 Hz. *Compare* flicker.

blobby model A model where objects have a basic shape that can be perturbed by interactions with neighbors or the environment. Such objects are described as *soft* and include muscles and the human body. *See also* meta-balls.

block 1. A collection of data units such as words, characters, or records (generally more than a single word) that are stored in adjacent physical positions in memory or on a peripheral storage device. A block can therefore be treated as a single unit whereby data can be (and usually is) transferred between storage device and memory, using one instruction. Blocks may be fixed or variable in size.

A stream of data to be recorded on magnetic tape is divided into blocks for convenience of handling and particularly of *error recovery. (The equivalent on disks is *sectors.) Successive blocks are usually separated by interblock gaps and often also by control signals introduced by the magnetic tape subsystem and invisible to the host (*see* tape format). It is usual but not essential for the block length to be the same for all blocks of data within a volume or at least within a file, though this may not apply to *labels; where the end of a file occurs partway through a block, the remainder of the block may be filled with *padding characters*.

The choice of block length is largely dependent on *error management considerations. The minimum length of the interblock gap is defined by the standard for the tape format in use; the maximum length is usually undefined, except that a very long stretch (typically 25 feet) of blank tape is taken to mean that there is no more data on the volume. To avoid wastage of tape the gap written is usually fairly close to the minimum but it may be elongated in some circumstances, e.g. by error recovery actions or to leave space for the *editing* of a file (which in

this context means its replacement by a new version of the same length).

In conventional magnetic tape subsystems the division of data into blocks is carried out by the host. However some buffered tape subsystems, particularly streaming cartridge tape, accept a continuous data stream from the host, and the subsystem itself divides the data into blocks (in this case often called *blockettes*) in a manner that is not visible to the host. In these subsystems the interblock gap may be very short or absent.

2. In coding theory, an ordered set of symbols, usually of a fixed length. The term is generally synonymous with word or string, but with the implication of fixed length.

3. *See* block-structured languages.

4. In parallel programming, to prevent further execution of one sequence of instructions until another sequence has done whatever is necessary to unblock it. *See also* blocked process.

block cipher A cipher in which a fixed-length block of data is encrypted, or decrypted, at each iteration of the algorithm: each block is input, encrypted, and output, with no memory (to retain message-dependent information) between blocks (*compare* stream cipher). Nevertheless, it is possible to use a block cipher as a component within a more complex system that effects a stream cipher. *See also* cryptography.

block code A type of *error-correcting or *error-detecting code in which a fixed number (conventionally k) of digits are taken into the encoder at a time and then output in the form of a *codeword* consisting of a greater number (conventionally n) of digits. It is often specified as an (n, k) code, with block length k and codeword length n . The corresponding decoder takes in n digits, and outputs k digits, at a time. Since the codewords are longer than the input words, the possible received words are no more numerous. The codewords are only a selection of all possible words of their length: the selection method gives any code its particular properties. *See also* code.

block compaction Another name for memory compaction.

being displayed to determine the position of the light pen.

The light pen is used to draw items with the aid of a tracking cross. As the light pen is moved across the screen, the part of the tracking cross sensed changes thus allowing the direction of movement of the light pen to be ascertained. The tracking cross can be redrawn to locate it at the expected new center of the light pen's position and thus appears to follow the light pen.

likelihood The *probability that an observation belongs to a *probability distribution with *parameters θ , considered as a function of the parameters rather than of the observation.

The method of *maximum likelihood*, originated by R. A. Fisher, estimates *parameters in statistical models by maximizing the likelihood of observing the data with respect to the parameters of the model. The values taken by the parameters at the maximum are known as *maximum likelihood estimates*. This method is computationally equivalent to the method of *least squares when the distribution of the observations about their theoretical means is the *normal distribution.

limited license A license granted to a customer that limits the use that is made of a computer program. Under *copyright law, limited licenses restrict customers from legally being entitled to use several copies of individual programs at the same time or use copies on anything except a particular computer.

Linda A particular model for *distributed processing in which the *processes communicate by inserting, examining, and deleting objects in a common *bag. It is architecture-independent.

Lindenmeyer system See L-system.

linear algebraic equations (simultaneous equations) A problem in *numerical linear algebra that requires the solution of n equations in the unknowns x_1, x_2, \dots, x_n of the form

$$Ax = b$$

where A is a square $n \times n$ matrix. The solution obtained by computing the inverse matrix and forming $A^{-1}b$ is less accurate and

requires more arithmetical operations than elimination methods. In *Gaussian elimination* multiples of successive equations are added to all succeeding ones to eliminate the unknowns x_1, x_2, \dots, x_{n-1} in turn. Properly used, with row interchanges to avoid large multiples, this leads to a solution that satisfies exactly a system close to the one given, relative to the machine precision. The accuracy of the solution, which can be cheaply estimated, depends on the *condition number of the problem.

Many other methods are used to deal with matrices of special form. Very large systems where the matrix A has predominantly zero entries occur in the solution of *partial differential equations. Elimination methods tend to fill in the zeros causing storage problems and *iterative methods are often preferred for such problems.

linear array Another name for one-dimensional array, i.e. for a *vector. See also array.

linear-bounded automaton (LBA) A *Turing machine M such that the number of tape cells visited by M is bounded by some linear function of the length of the input string. Of equivalent power is the smaller class of Turing machines that visit only the cells bearing the input string. The *context-sensitive languages are precisely those recognized by such Turing machines.

linear channel A transmission channel in which the information *signal and the *noise signal combine additively to form the output signal. In a * q -ary linear channel, with a finite number, q , of amplitudes, the signals add modulo- q ; in the binary case ($q = 2$), this has the same effect as an *exclusive-OR operation between the signals.

linear codes In coding theory, codes whose encoding and decoding operations may be expressed in terms of linear operations. The term is usually applied to certain *error-correcting codes in which the encoding operation involves a *generator matrix* and the decoding operation involves a *parity-check matrix*. Linear codes are, therefore, also called *parity-check codes*. A particular linear code forms a commutative *group that has the zero codeword as its identity.