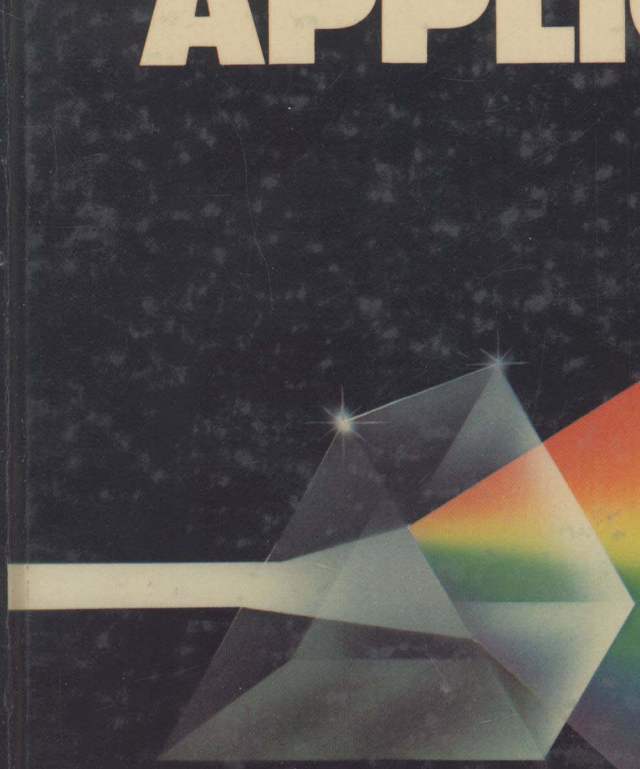
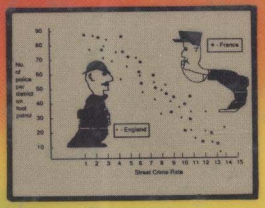
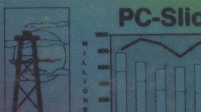
Computer Graphics in APPLICATION







GEORGE R. MARSHALL

Computer Graphics in Application

GEORGE R. MARSHALL

A Reston Book
Prentice-Hall, Inc.
Englewood Cliffs, New Jersey 07632

Library of Congress Cataloging-in-Publication Data

Marshall, George R.
Computer graphics in application.

1. Computer graphics. I. Title.
T385.M366 1987 006.6 86-9337
ISBN 0-8359-0997-2

Editorial/production supervision: *Joan McCulley*
Cover design: *Photo Plus Art*
Manufacturing buyer: *Ed O'Dougherty*

© 1987 by Prentice-Hall

A Reston Book
Published by Prentice-Hall, Inc.
A Division of Simon & Schuster
Englewood Cliffs, New Jersey 07632

All rights reserved. No part of this book may be reproduced, in any form or by any means, without permission in writing from the publisher.

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

ISBN 0-8359-0997-2 025

PRENTICE-HALL INTERNATIONAL (UK) LIMITED, *London*
PRENTICE-HALL OF AUSTRALIA PTY. LIMITED, *Sydney*
PRENTICE-HALL CANADA INC., *Toronto*
PRENTICE-HALL HISPANOAMERICANA, S.A., *Mexico*
PRENTICE-HALL OF INDIA PRIVATE LIMITED, *New Delhi*
PRENTICE-HALL OF JAPAN, INC., *Tokyo*
PRENTICE-HALL OF SOUTHEAST ASIA PTE. LTD., *Singapore*
EDITORA PRENTICE-HALL DO BRASIL, LTDA., *Rio de Janeiro*

Computer Graphics in Application

This text is dedicated
to my teacher and brother, Ösel Tendzin,
for his profound and brilliant insight and inspiration,
to my mother, Anne Lee Marshall,
for her unfailing friendship,
and to both for their kindness and love.

此为试读,需要完整PDF请访问: www.ertongbook.com

PREFACE

• PURPOSE OF THIS TEXT

The purpose of this text is to show what people are doing with computer graphics and, therefore, what the reader can do. The applications for computer graphics are vast and profound. We are in the midst of a great transition and revolution, where the individual is being provided with powerful tools of communication and connection: the graphics-based personal computer workstation, custom configured to individual needs, networked together and supported by big computers.

The approach used in the text is the description of computer graphics systems and applications in many areas, supported by illustrated examples that the reader can explore directly. That is, in large measure, the graphics systems and software used as vehicles of instruction in the text are generally available. Further, the reader is provided with all the necessary technical information on hardware and software required to understand the applications being discussed. The reader is also introduced to computer graphics programming using BASIC, LOGO, and Pascal, and to new emerging approaches to programming.

We are in a period of transition from the industrial to the information age. "We are drowning in information and starved for knowledge," writes John Naisbitt in *Megatrends*. If a picture is worth a thousand words (or ten thousand bytes), then computer graphics may be a "lifebelt" to help us stop drowning.

Computer graphics is both a new language and a new medium; not until very recently was it generally available. Computer graphics belonged to the high priests of computer technology, requiring esoteric skills in programming performed on very expensive computers, or computers designed by pioneer explorers, to create images. Now it belongs to all of us.

But will we take advantage of our new inheritance? Unless we are familiar with it, the answer is no. It has been estimated that of 30 million people who will have the opportunity to use computer graphics in the next decade, only 5 percent, or 1.5 million, will do so.

We need to learn about computer graphics because it is powerful; computer-generated imagery defies us to distinguish between reality and illusion. We need to know what it can do to us and what we can do with it. We need to learn the *know-how* in order to understand the *know-why*. The new medium moves us from *passive receivers to active producers* and promises to counteract the effect of *non*interactive media, identified by Marshall McLuhan as "perceptual numbing" in which only the most extreme experiences have any impact.

• THE IBM PC AND THE APPLE MACINTOSH

A large proportion of the graphics applications in this text are based on graphics systems and software available for the IBM PC and the Apple Macintosh. Many other systems are discussed, however, and an extensive list of graphics systems classified by application (presentation graphics, analytic graphics, computer-aided design, paint systems, graphics workstations), is included in Appendix C.

• WHO SHOULD READ THIS TEXT

Students in business, management, commerce, economics, education, government, social science, applied social science, communication, media, art, design, the humanities, liberal arts, or those studying for entry into a profession (law, medicine) will benefit from this text, especially if there is an interest in the communication, education, training, or management aspects of their disciplines or professions. Computer science students requiring a survey of graphics applications will also benefit from this text.

• COURSES SUPPORTED

Courses supported include *Introduction to Computers; Computer Literacy; Computers in Application;* and *Computers in Business,* especially if the instructor wishes to emphasize a graphics approach (graphics is becoming the interface or connection of choice between man and machine); *Introduction to Computer Graphics; Computer Graphics in Business, Management, and Marketing; Computer Graphics in Application, Communication and Media;* and courses for teacher education and training.

The text is also suitable as a *supplementary text for a computer graphics course for computer science students,* when the intent of the course is to introduce students to graphics applications, prior to or in parallel with graphics programming. Computer science students are often unaware of the computers' capabilities in relation to real-life problems. Such information is *not* readily acquired during summer employment, or soon after graduation.

• BACKGROUND

No knowledge of computer operation or functioning is required as background for this text. Chapter 2 provides an overview of what a computer is and how it works. Interest and some sense of confidence, however, are required. Many of us are afraid of technical language and subjects, incorrectly relating the use of technology to an understanding of mathematics or science. We simply assume we cannot understand such matters; we do not have the mind for it. No special mind is required. There is no such thing.

Technical discussions in the text that relate to an understanding of the internal functioning of computer graphics systems are minimal but complete. People prefer to read and scan more for the purpose of clarity, than to read and scan less in the service of obscurity. People prefer being treated as if they were intelligent. Einstein believed that any subject, no matter how technical, could be explained in understandable terms to the interested person.

Sometimes a number of images have been used to illustrate the same point. A professor of mine believed that he had to repeat every lecture three times since as he said "at any given time one third of you are asleep." This, as you might imagine, led to some extremely boring lectures. I hope multiple images will not lead to the same comatose state, but rather enrich understanding.

• WHAT THE READER CAN EXPECT TO GAIN FROM THIS TEXT

The reader will learn *how* to use computer graphics to communicate, influence, analyze, organize, design, model, simulate, animate, signal, control, monitor, program, and evaluate. The learning will *not* be abstract, but will relate to the use of tools that exist *now*, and that are, in large measure, readily available.

In order to arouse the reader's *exploration of creative possibilities* in his or her own field, examples from many disciplines have been described. They include applications in management, business, operations research, economics, design, architecture, art, education, anthropology, and others. Fields of study are not mutually exclusive. Discoveries in one arouse insights into others. An application of computer graphics in anthropology, for example, may arouse a creative solution to a business or management problem. Artists are business people, designers are researchers, and managers are philosophers. Interesting things are more likely to happen at the edge or border of things, not in the middle.

Computer graphics has its roots in the *evolution* of computation, computers, communication, and media. In Chapter 1 a chart is used to show the historical development of those roots up until the present day, and to provide the reader with some perspective. Not everything important started in 1950.

The emphasis is on applications, not programming. However, this text attempts to *open the doors to programming* by introducing the reader to BASIC, Pascal, and LOGO, and by presenting recently developed languages in which graphics itself is used to program. Since we learn by imitating, I have taken the approach of presenting small graphics programs in these three languages that the reader can enter, modify, and expand using whatever computer facilities are available. Sometimes the programs in the different languages produce the same or similar output, thus allowing for comparison. Elsewhere in the text, graphics command languages are discussed as used in various professions such as architecture, engineering, product design, and publishing.

• ORGANIZATION OF THE TEXT

The text is organized into four broad parts: *introduction, applications, programming,* and *needs.* The table of contents shows the obvious emphasis on applications. The reader may choose to study Chapter 2 and the other background chapters in the introduction in digestible doses, and read the applications chapters in parallel.

In order to make sense of the plethora of technical terms and relations, *taxonomies* have been developed of computer hardware and software in various contexts throughout the text. Many disciplines use taxonomies to help make sense of data, for example, Zoology, and we need to develop similar organizing structures for all the "species" of computer hardware and software.

A conscious effort was made throughout the text to *define terms* accurately but simply. Specialized languages are necessary, but if new terms are not defined precisely they can add to the confusion and create an unnecessary "mystique."

For each chapter a set of *questions, problems,* and *field exercises* is provided.

• A NOTE TO INSTRUCTORS

Although the text uses IBM PC and Apple Macintosh, and software for these systems as the prime vehicles for discussing computer graphics, *any* graphics computer system may be used along with this text. It is the *principles* discussed, *not* products, that constitute the heart of the book.

Color plates have *not* been used in this text. Color raises cost. It is suggested that a set of slides be used in the course to demonstrate color computer graphics. Slides for presentation graphics, analytic graphics, art, and design are often available from publishers and producers of graphics software and hardware.

The text will support either a half year or a full year program of study. The materials in the text, and the questions and exercises in Appendix A, have been designed to support the *three-pronged educational approach* discussed briefly in the conclusion to the last chapter of this text, namely: *lecture, experiment,* and *experience in practical application.* The instructor will find support for all three of these approaches in each chapter.

The appendices involve different kinds of activities including assigning tests, exercises, and field projects; reviewing product descriptions and the products themselves, and evaluating and comparing computer graphics software and hardware.

A course of study that includes the hands-on use of graphics computer systems is necessary for students to experience the synergy that comes from interactive use. It is suggested that a *tutorial workshop* be offered introducing students to computer operation. In this manner, students will progress rapidly to application, and not spend too much time getting to know the system and learning how to push buttons and move mice.

The author is interested in hearing from instructors with suggestions for improvements and information on where and how the text is being used:

Dr. George R. Marshall, Associate Professor
Department of Finance and Management Science
St. Mary's University
Halifax, Nova Scotia, B3H 3C3

Dr. George R. Marshall, President
G. R. Marshall & Associates, Consultants
2112 Bauer Street
Halifax, Nova Scotia, B3K 3W3

ACKNOWLEDGMENTS

Many people and companies helped write and produce this text. However, the author wishes to extend a special word of thanks to the following people for their continued and unflagging support: Al Atkinson of Mensa Computers, Dartmouth, Nova Scotia; my good friend, Christine Anthony; Wayne Brehaut of the Jodrey School of Computer Science, Acadia University, Wolfville, Nova Scotia, who always had time to listen and offer valuable advice; and Jeff Jordan, a graduate of Kings Regional Vocational School, Kentville, Nova Scotia, who gave unstintingly of his time far beyond the call of duty. Also my thanks to the people at Prentice-Hall; they tried to keep me away from dangerous paths, but sometimes I strayed. They include the executive editor of computer science texts, Jim Fegen, and Joan McCulley, the production editor for the text.

This text was produced on an *Apple Macintosh* computer and *LaserWriter* printer using primarily *1st Base*, *Factfinder*, and *ThinkTank*, to organize information, and *MacWrite*, *MacPaint*, and *MacDraw*, to produce text and images. *PageMaker* was used to layout all pages. My many thanks to all of the creative inventors and producers of these innovative products. Surely, without these tools I could not have produced this entire book.

The following products are registered trademarks ® of the companies indicated:

Product	Company
Apple	Apple Computer, Inc.
Atari	Atari, Inc.
Apple IIe	Apple Computer, Inc.
ATT 6300	AT&T Bell Laboratories
ATT PC	AT&T Bell Laboratories
ATT UNIX	AT&T Bell Laboratories
Business Filevision	Telos Software Products
CP/M	Digital Research Inc.
CP/M 80	Digital Research Inc.
CP/M 86	Digital Research Inc.
ClickArt Personal Publisher	T/Maker Company
DEC VAX	Digital Equipment Corporation
Do-It	Studio Software Corporation
Filevision	Telos Software Products
IBM	IBM Corporation
IBM Quietwriter	IBM Corporation
IBM 3270 PC/G	IBM Corporation
IBM PC	IBM Corporation
IBM PC AT	IBM Corporation
IBM PC XT	IBM Corporation
IBM PC/GX	IBM Corporation
IBM System/360	IBM Corporation
Jazz	Lotus Development Corporation
Lotus 1-2-3	Lotus Development Corporation
Macintosh is licensed to	Apple Computer, Inc.
MicroSoft	MicroSoft Corporation
MS-DOS	MicroSoft Corporation
Multiplan	MicroSoft Corporation
Omnis 3	Blyth Software Inc.
PFS:File	Software Publishing Corporation
PFS:Graph	Software Publishing Corporation
Prime	Prime Computer, Inc.
Sci-Mate	Institute for Scientific Information
Softstrip	Cauzin
Sun-2/50 Workstation	Sun Microsystems, Inc.
Sun-3/160 Workstation	Sun Microsystems, Inc.
Sun Workstation	Sun Microsystems, Inc.
Symphony	Lotus Development Corporation
VisiCalc	Lotus Development Corporation
WordStar	Micropro International Corporation
Xerox 5700 electronic printer	Xerox Corporation
dBase II and dBase III	Ashton-Tate
smARTWORK	Wintek Corporation

The following products are trademarks ™ of the companies indicated:

Product	Company
1st Base	Desktop Software, Inc.
1st Merge	Desktop Software, Inc.
520ST	Atari, Inc
Advanced PRO-ject 6	Softcraft, Inc.
Amiga	Commodore-Amiga, Inc.
AppleTalk	Apple Computer, Inc.
Applesoft BASIC	Apple Computer, Inc.
Aria Standalone Color Workstation	Applicon Canada
Artwork	West End Film Inc.
Atlas	Starategic Locations Planning
AutoCAD	Autodesk Inc.
AutoMac	Genesis Micro Software
Automentor	Software Recording Corporation
BRS	BRS
Barriers & Bridges	G. R. Marshall & Assoc., Consultants
Business Filevision	Telos Software

此为试读,需要完整PDF请访问: www.ertongbook.com

Canon Laser Printer	Canon U.S.A. Corporation
Chameleon	Seequa Computer Corporation
Chart-Master	Decision Resources
Cheap Paint	Hayden Software Company Inc.
Compaq	Compaq Computer Corporation
Comtec DS-300	Daiken/Comtec
daVinci Building Blocks	Hayden Software Company Inc.
DEC and Rainbow 100	Digital Equipment Corporation
DFD Draw	McDonnell Douglas Automation Corporation
Data General/One	Data General Corporation
Datacopy Model 90	Datacopy Corporation
DecisionMap	SoftStyle, Inc.
Demo Program	Software Garden, Inc.
Diagraph	Computer Support Corporation
Draft Math	DM Systems
E-Chart	G. R. Marshall & Assoc., Consultants
EXECADD	Tritek Vision Systems
Easylan	Server Technology
Energraphics	Enertronics Research, Inc.
Engineering Toolkit	Sof-Tools
Entrepreneur	Microsoft Corporation
Ethermac	3Com
Ethernet	Xerox Corporation
Excelerator	Index Technology Corporation
Exec*U*Stat	Exec*U*Stat, Inc.
Executive Picture Show	PCsoftware
ExperLogo	ExperTelligence, Inc.
FONTagenix	Devonian International Software Company
Factfinder	Forethought Inc.
Filemaker	Forethought Inc.
Filevision	Telos Software
Fontrix	Data Transforms, Inc.
Framework	Ashton-Tate
Freelance	Graphics Communications, Inc.
Fugitsu Micro 16	Fujitsu America Inc.
GDSS	Data Business Vision, Inc.
Graphic Decision Support System	Data Business Vision, Inc.
GEM	Digital Research Inc.
Graftalk	Redding Group Inc.
Graphwriter	Graphics Communications, Inc.
HP 7470 personal computer plotter	Hewlett-Packard
HP 7475 personal computer plotter	Hewlett-Packard
Halographics	Media Cybernetics Inc.
Hayden:Speller	Hayden Software Company Inc.
Hewlett Packard Desk Plotter	Hewlett-Packard
Hotview	Lotus Development Corporation
Hypernet	General Computer
ImageWriter	Apple Computer, Inc.
Imagen's Software	Imagen Inc.
Imigit	Chorus Data Systems
Integral PC	Hewlett-Packard
Integrated Profit Planning Systems	Softouch Software Inc.
Interleaf Electronic Publishing System	Interleaf, Inc.
Kaypro 2,4,10	Kaypro, Inc.
Kurzweil 4000	Kurzweil Computer Products
Lanpac	Racore
LaserWriter	Apple Computer, Inc.
LightSource	Computer Learning Systems
MacAtlas	Micro;Maps
MacDraft	Innovative Data Design, Inc.
MacDraw	Apple Computer, Inc.
MacMap	Strategic Locations Planning
MacPaint	Apple Computer, Inc.
MacPlot	Microspot
MacProject	Apple Computer, Inc.
MacPublisher II	Boston Software Publishers Inc.
MacSpin	D2 Software
MacSurf	Graphic Magic
MacVision	Koala Technologies, Inc.
MacWrite	Apple Computer, Inc.

McPic! Volume 2	Magnum Software
Micro D-Cam	The Micromint, Inc.
MicroCAD	Diehl Graphsoft Inc.
Minicad 3D-Designer	Diehl Graphsoft Inc.
Morrow MDII	Morrow, Inc.
Mouse Artist	Village Computer Resources
MSFile	MicroSoft Corporation
Multidraw	Cymbol Cybernetics Corporation
Norton Utilities	Peter Norton Computing Inc.
ORCA	Orcatech
Odesta Helix	Odesta Corporation
OverVUE	Provue Development Corporation
PageMaker	Aldus Corporation
PC eye	Chorus Data Systems
PC/IT	Sperry Corporation
PERQ	Three Rivers Computer Corporation
Perceptor	Micro Control Systems, Inc.
Picture Perfect	Computer Support Corporation
PictureBase	Symmetry Corporation
PLATO	Control Data, Institute for Advanced Technology
Polycad/10	Cubicomp, Inc.
Princeton graphic systems	Princeton Graphics Systems
Pro-Search	Personal Bibliographic Software, Inc.
ProKey	Rosesoft
Professional Bibliographic System	Personal Bibliographic Software, Inc.
Profit Projections/Breakeven Analysis	Harris Technical Systems
Project Scheduler Network	Scitor Corporation
QuickWord	Enterset, Inc.
ReadySetGo	Manhattan Graphics
Reflex For The Mac	Borland International
SIGHT	Image Resource Corporation
Sage IV	Sage Systems Inc.
Samurai Image Processor	Image Resource Corporation
Sidekick	Borland International
Sign-Master	Decision Resources
Space Tablet	Micro Control Systems, Inc.
StatView	Brainpower, Inc.
Statmap	Ganesa Group International, Inc.
Super Project	Computer Associates International, Inc.
Switcher	Apple Computer, Inc.
Systemizer	Applied Creative Technology
Tekalike	Mesa Graphics
The Finder	Apple Computer, Inc.
ThinkTank	Living Videotext, Inc.
ThunderScan	Thunderware, Inc.
TopView	IBM Corporation
Turbo-graphix	Borland International
Type Processor One	Bestinfo, Inc.
UNIX	AT&T Bell Laboratories
VCN Concorde	Visual Communication Network, Inc.
Vetrix Midas Color Card	Vetrix Corporation
Videoshow 150	General Parametrics Corporation
VideoWorks	Hayden Software Company Inc.
WIPS (Word Image Processing System)	Datacopy Corporation
Windows	Microsoft Corporation
XTAR Graphics Micro processor	Xtar Electronics
ZyINDEX	Zylab Corporation

The following is a service mark of the company indicated:

Product	**Company**
Dialog	Dialog Information Services Inc.

The following are product names of the companies indicated:

Product	Company
GKS (Graphical Kernel System)	IBM Corporation
Graphics Development Toolkit	IBM Corporation
QuickDraw	Apple Computer, Inc.

Computer Graphics in Application

CONTENTS

此为试读,需要完整PDF请访问: www.ertongbook.com