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MacintoshTM

GRAPHICS AND SOUND



DAVID A. KATER

MacintoshTM Graphics and Sound

Programming in Microsoft® BASIC

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Introduction

No matter how you look at it, learning about computers and how to program them takes time; and the more complex the subject, the more draining it can be, except when you have a particular interest in what you are learning. Motivation makes the difference. Fortunately, it is easy to get excited about computer graphics and sound, since both appeal to our creative nature.

In this book, you have an opportunity to learn about Macintosh graphics and sound by typing and running short programs. You'll find that actively using the programs in the book is the best way to learn how to use graphics statements, so try out the programs. Read the annotated program listings, paying close attention to the ways various statements and functions are used.

Above all, don't expect to learn all about computer graphics in one sitting. Be patient, and you will be rewarded with newfound graphics abilities.

Using This Book

Macintosh Graphics and Sound is designed to usher you into the world of Macintosh graphics and sound by using BASIC. BASIC (short for Beginner's All-purpose Symbolic Instruction Code) is a programming language for beginners. We will develop this book around the first BASIC introduced on the Mac: version 2.0 of Microsoft BASIC.

The challenge for any writer of computer subjects is to bridge the gap between a tutorial and a reference work. A pure reference work is often only marginally useful to the computer novice; a long, drawn-out tutorial is the last thing a polished programmer wants to wade through. *Macintosh Graphics and Sound* contains a combination of both approaches. The book is organized around graphics concepts. It starts with such basic topics as working with the video display and drawing simple shapes, and then progresses to more advanced topics like rotating two- and three-dimensional objects. It is well indexed so that you can find your way quickly to topics of interest.

For those who prefer a 'learn by doing' approach, graphics statements and techniques are illustrated with short sample programs. By reading and experimenting with the programs, you can discover what the Macintosh has to offer. Each chapter concludes with several comprehensive programs that apply the concepts and techniques learned in that chapter.

System Requirements

To get the most out of this book, your minimal hardware requirement is the original Macintosh, which has 128K of memory. You can write short programs, but you will have to be very conscious of memory limitations. Most of the programs in this book work on the 128K Mac; exceptions are carefully noted. For those who have 128K machines, Chapter 9 discusses ways to deal with limited memory.

While a dual-drive system is necessary for word processing and some other applications, BASIC programmers can use a single-drive machine. With careful file management, you can store your operating system and BASIC, and still have nearly 200K for program storage.

A printer is not an absolute necessity for using BASIC, but it can make life a lot easier. Printouts make your work on the computer somewhat transportable. A printer also allows you to distribute paper copies of your graphics displays.

You may also wish to borrow or purchase a digitizer unit that converts real-life images into digitized form in the Mac.

For software, you'll need a copy of Microsoft BASIC. The programs in this book are written in version 2.0 of Microsoft BASIC. You'll occasionally need a graphics program, such as MacPaint or MacDraw, for creating graphics images.

READER BACKGROUND

This book is designed for all BASIC programmers who want to master Macintosh's remarkable graphics abilities. On other computers, the subject of graphics is generally avoided by beginning programmers. But the Mac invites even the beginner to participate in the graphics experience.

The first few chapters start at a leisurely pace so that the novice programmer can get started with ease. At each stage we develop the tools to prepare the reader for the next section. The book is also carefully indexed so that advanced programmers will be able to find quickly the sections they want to know about.

Newcomers to BASIC and the Mac will find it best to read the chapters in sequence. Take your time and read carefully. You'll find that running each of the sample exercises will help you learn the material in a surprisingly short time and to retain it longer. Working with practice programs lets you get all the catastrophic errors out of your system before you attempt your own programs. Those who wish to minimize typing time in working with the practice programs might consider purchasing the optional program disk.

If you are an experienced programmer, you will probably want to proceed at a faster pace. You may want to skim the first few chapters to get familiar with the Mac, and then use the Index and Table of Contents to find topics of interest. The applications programs at the end of each chapter provide examples of how to use the tools introduced in that chapter. The optional program disk will allow you to modify the major programs.

The Macintosh is a machine that allows us to explore our own creativity. We hope this book will inspire you to push your limits and to make new discoveries about yourself.

Program Disk Offer

We have made many of the major programs in this book available on disk. The files are stored on a data disk, so single-drive users may want to transfer the files to a system disk.

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The cost is \$19.95, which includes shipping to anywhere in the continental United States. Residents in other parts of the world, please add \$3.00 to cover additional shipping costs (\$22.95 total). California residents, please add 6% for state tax (\$21.15 total).

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1

Macintosh Graphics

Much has been written about how the Apple Macintosh computer sets a new standard for personal computing. One of the most intriguing innovations of the Macintosh is its easy-to-use graphics. This book can teach you how to use BASIC programs that will help you take full advantage of your Macintosh's graphics capabilities.

This chapter will give you an overview of what you can do with the BASIC programs in this book. A sample programming session will help you get started.

Macintosh Graphics and You

You may wonder why you would want to use BASIC to develop graphics on the Macintosh in the first place. After all, MacPaint,

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MacDraw, Microsoft Chart, and other graphics-oriented software programs are available to satisfy the appetite of the most ardent graphics enthusiast. Each of these programs can give you useful, creative results. So why bother learning to program graphics when you can just *do* graphics?

The following examples answer this question. They illustrate some of the many ways BASIC programs can help you create and manage your graphics on the Mac.

BASIC AS A GRAPHICS MANAGER

BASIC can help you combine the graphics you have developed with other programs into complete presentations. You will learn in Chapter 6 how to transfer graphics images from other programs into BASIC. These images can be stored in memory or on disk and then

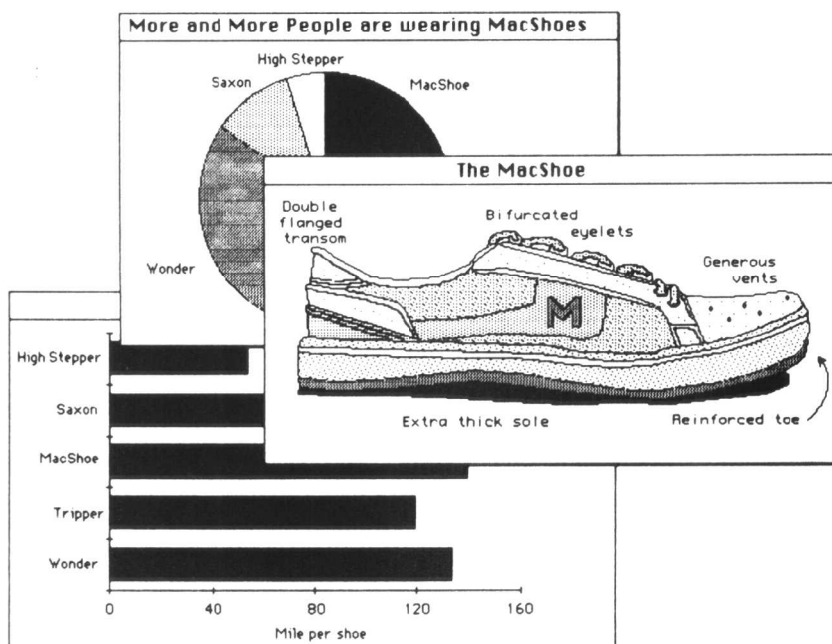


Figure 1-1.

BASIC can display frames created by Macintosh applications

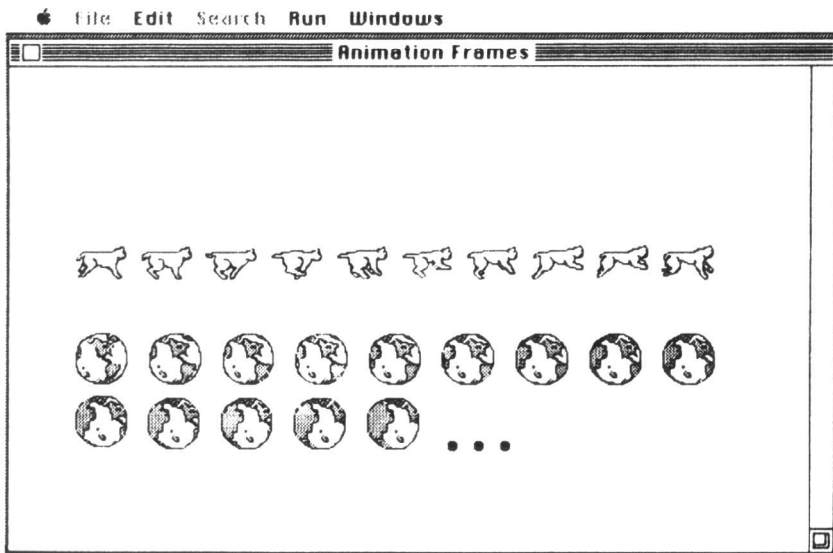


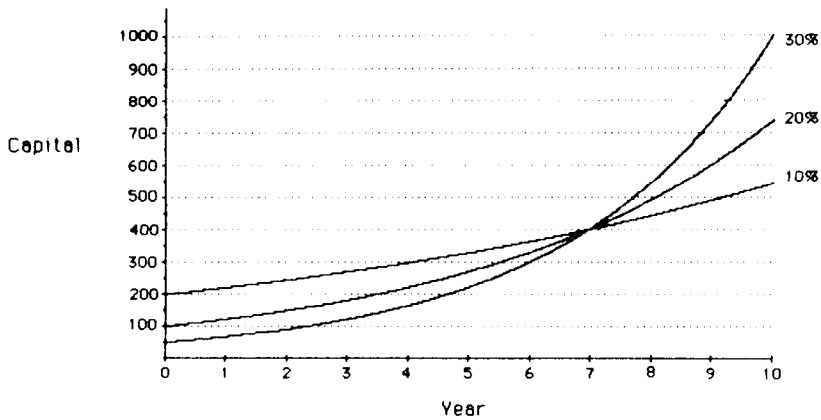
Figure 1-2.
Animation frames

displayed by a BASIC program as needed. For example, a retail sales outlet might use a BASIC program to manage a continuous slide-show sales floor demonstration, using charts from Chart, text from MacWrite, and illustrations from MacPaint. Figure 1-1 shows screens from a sample demonstration.

BASIC's abilities as a graphics manager don't stop with slide presentations. Macintosh BASIC provides several ways to store images in memory and then display them one at a time in succession to produce very believable animation. The images can be created with BASIC or some other program. Figure 1-2 shows two frame sequences created with a program developed in Chapter 7. One shows a cat leaping; the other shows the earth rotating on its axis.

PRECISION PLOTTING

BASIC also allows you to calculate and plot functions, like the one in Figure 1-3, quickly and efficiently. You can plot curves like those in Figure 1-3 with MacPaint or MacDraw, but it's much easier and more precise to plot them with BASIC. Figure 1-4 shows the short program segment necessary to plot the three curves.



```

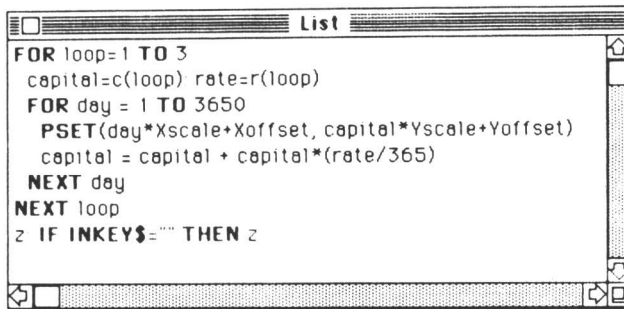
Xoffset = 70: Yoffset=240: Xscale=.1: Yscale = -.2
FOR i=1 TO 3
  READ c(i),r(i)
  DATA 50,30,100,20,200,10
NEXT i
FOR loop=1 TO 3
  capital=c(loop): rate=r(loop)
  FOR day = 1 TO 3650
    PSET(day*Xscale*Xoffset, capital*Yscale+Yoffset)
    capital = capital + capital*(rate/365)
  NEXT day
NEXT loop
z: IF INKEY$="" THEN z

```

Figure 1-3.
Function plot

PATTERNS AND ART

Part of the Macintosh's charm is the ease with which it can produce both serious business graphics and art for art's sake. MacPaint is an excellent tool for freehand drawing; BASIC is better suited for creating repetitive patterns and geometric shapes. The striking patterns shown in Figure 1-5 are created by a randomly repeating BASIC program that draws ovals gradually changing sizes and positions. A totally different effect is created by drawing lines between two curves, as shown in Figure 1-6.



```
FOR loop=1 TO 3
  capital=c(loop) rate=r(loop)
  FOR day = 1 TO 3650
    PSET(day*Xscale+Xoffset, capital*Yscale+Yoffset)
    capital = capital + capital*(rate/365)
  NEXT day
NEXT loop
Z IF INKEY$="" THEN Z
```

Figure 1-4.
Program code for growth curves

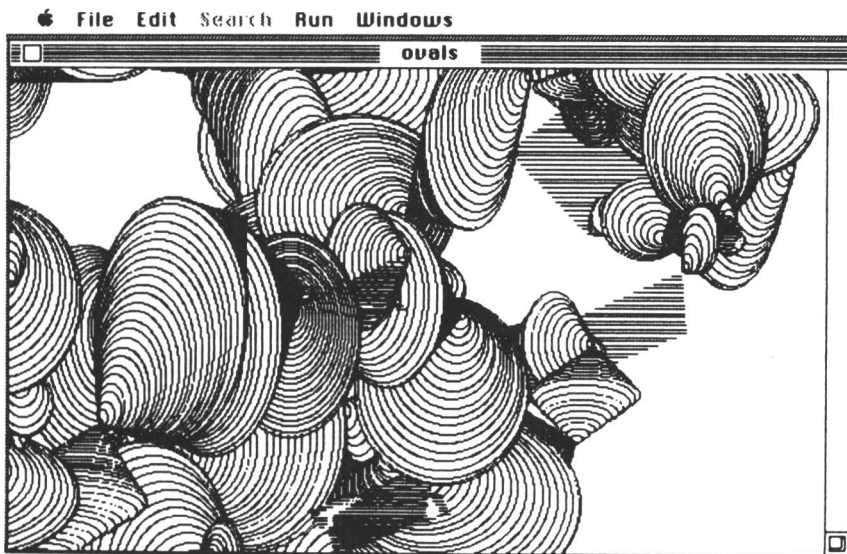


Figure 1-5.
Repeating ovals

INTERACTIVE GRAPHICS

One advantage of computer graphics over other forms of graphics is that the user can interact with the graphics images on a computer. Because BASIC can easily detect input from the mouse, you can write

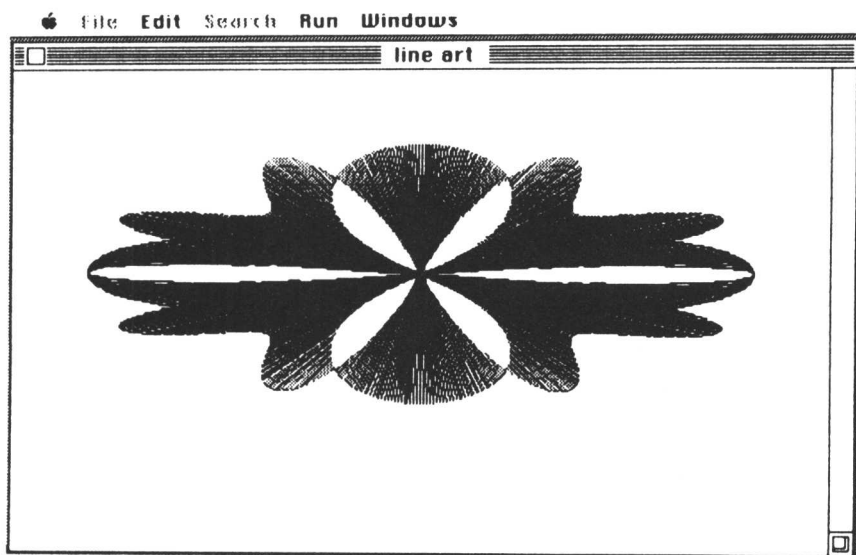


Figure 1-6.
Repeating line segments

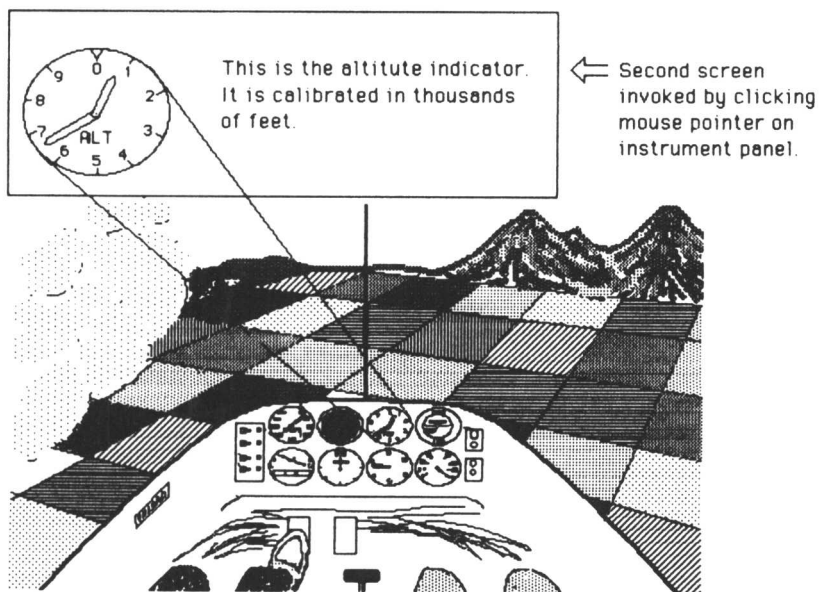


Figure 1-7.
Aircraft instrument panel

programs that will interact with the operator. This interactive ability can be used to full advantage in educational programs. Figure 1-7 illustrates how a tutorial program could introduce the viewer to the instrument panel of a small aircraft.

In this example you click the mouse pointer on any of the items on the panel. The program will respond with a close-up view of the item along with a description. This approach lets you control what you learn in a very intuitive and visual way. BASIC's ability to detect a mouse click anywhere on the screen is introduced in Chapter 4 and is used throughout the rest of the book.

The next example literally adds another dimension to the use of BASIC's interactive abilities. In Chapter 8, we introduce a program that allows you to draw three-dimensional schematic objects. Lines are drawn in panels representing three different views of the object. Figure 1-8 shows a schematic representation of a car. Once the object is drawn, the program allows you to view it from any direction.

While it is possible to draw three-dimensional objects with Mac-

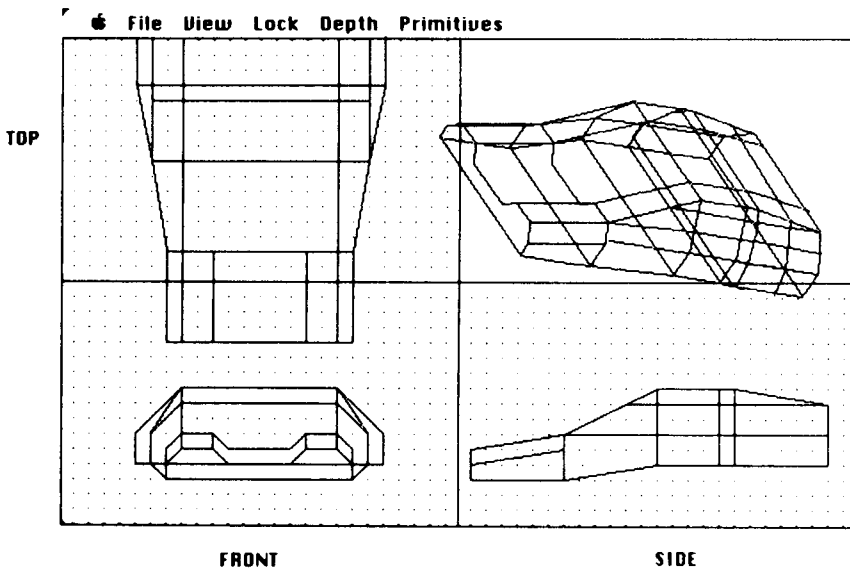


Figure 1-8.
Three-dimensional schematic depiction of car