Designing Arcade Computer Game Graphics

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Dedication

This book is dedicated to my friends Dina Willensky, Stephanie Worley, Jennifer Higbee, Faye Horwitz, Sonya Donaldson, Karen Wasserman, and Howard Offenhutter, and to my parents, Dr. Bernard Feldman and Gail Feldman. These people stood by me during this project, always offering me encouragement and support when I needed it most. Thanks everyone!

I would also like to dedicate this book to my eclectic CD collection, for without the soothing sounds from the likes of Lush, Ride, The Clash, The English Beat, and The Creation this book would have never been completed.

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Foreword

I have always looked at game artwork from a programmer's point of view. To me, the game artist was someone you worked around—someone necessary and important, but someone who would give you any old thing that looked good to him and it was up to the programmer to find a way to make it fit into the game. To this end, I have written books and Web pages on the importance of creating utilities to correct problems introduced by the artist: palette reduction, color matching, transparency replacement, size adjustments, and so on. It wasn't that the artist was incapable of taking control of those issues, or even that the artist had no understanding of the technical issues of game development; the problem was more a matter of communication between the programmer and the artist. The programmer would have a requirement and express it to the artist in technical terms. The artist's eyes would gloss over; he would nod and smile, and then pick up his mouse, and do his best to put out a product matching his understanding of the programmer's needs. Often this resulted in beautiful and enjoyable games. But behind the scenes there would be much frustration, as the programmer tried to explain and re-explain the technical aspects of game development, and the artist would try to explain and re-explain the limits of his tools and training.

That scenario has changed in recent years. With the advent of high-color and true-color display resolutions, the problems of palettes and color reduction have faded away. Modern tools give artists the ability to shrink or expand artwork, change the color depth, and add all the subtle nuances that make a game beautiful. And the systems modern game players use allow for greater resources to be expended, which means games can be bigger and use more memory, and artists are freed from the optimization constraints of earlier years.

But there is still the problem of technical communication between the programmer and the artist. It is not enough that an artist be artistically talented. He needs to be technically astute enough to be able to communicate in the language of the programmer. Once the programmer and the artist can communicate in the same language, many of the problems and frustrations of the past will fade away.

In this book Ari Feldman gently but firmly exposes the artist to the technical requirements and jargon used by professionals in the game development field. Rather than assuming the programmer is the only one who needs to know this stuff, Ari insists the artist take responsibility too. As a programmer, I think this is an idea for which the time has come. I have seen talented young artists drop out of the field of game development simply because they were overwhelmed by the expectations of the industry. And really, the technology behind computer artwork is not that difficult. All you really need is a resource that explains the capabilities and limitations to you. I believe Ari has provided such a resource with this book.

Ari is a long-time member of the game development community, and his *SpriteLib* collection has been popular for years. Recently, I was pleased to co-sponsor a game development contest with GameDev.Net (`http://www.gamedev.net`), in which programmers were asked to write games based on the artwork in *SpriteLib*. I was amazed at the results we got. There were more than two dozen entries, in categories ranging from a simple table tennis game, to various space shooters, to elaborate side scrolling adventure games. There were falling-bricks games, traffic control games, and fighting games. I couldn't believe how many ways the same artwork could be reused to produce such a vast array of delightful games.

So I guess all this proves that if artwork is well designed, you can do many things with it. And Ari is an expert on how to design arcade game artwork. So if you are interested in breaking into computer game development as an artist, it pays to study the wisdom of the masters, and this book is a great place to start. Good luck with your game development career!

Diana Gruber

Acknowledgments

Introduction

Why This Book?

Arcade games have been captivating game playing audiences of all ages for well over twenty-five years now. Their popularity practically built a multi-billion dollar industry and their colorful characters and terminology have become permanent fixtures in our everyday language and cultural landscape.

Over the years, arcade game development has become big business, attracting an extremely large and loyal following among programmers. To address that community's interest in the subject, scores of books and hundreds of magazine articles have been written on the subjects of arcade game programming and design. Yet, inexplicably, next to nothing has appeared about a topic that is just as crucial to the successful implementation of an arcade game: graphics.

Simply put, without good graphics, an arcade game has no soul. Graphics play a central role in how people perceive and enjoy the arcade game experience. Just imagine how boring a game like *Sonic the Hedgehog* would be if the adorable Sonic was represented on-screen by blocky ASCII characters rather than a dynamic, blue hedgehog graphic. Or, consider how much fun *Mortal Kombat* would be if characters like Sub-Zero appeared as lifeless stick figures rather than as photo-realistic combatants. If arcade game graphics did indeed look like the ones in these examples, arcade games wouldn't hold anyone's interest for very long, would they?

For far too long, the process of designing and creating the graphics for arcade-style games has been ignored. Quality graphics are as essential to an arcade game's development as solid design, addictive game play, and clever programming. And that is exactly why I wrote this book. If you are interested in learning how graphics are designed, created, and implemented in arcade games, then read on.

You are probably wondering why I even bothered to write a book on a "dated" topic such as 2D arcade game graphics design when 3D-style games are all the rage, right? Well, actually there are a number of very good reasons for doing so:

1. **2D, or "old school," arcade game graphics are far from dead**—The rise of the Internet as a gaming platform has opened many new applications for arcade-style games. Their simpler graphics and relatively light system

requirements make them ideally suited for this new and exciting medium and their use will only increase as more people turn to technologies such as Java™, Flash™, and Shockwave™. For example, ZapSpot, the company where I currently work, has dedicated itself to delivering small 2D-based games to users via e-mail. And they're not alone. Many companies are doing similar things, and 2D graphics and animation techniques are what makes this possible.

2. **2D arcade games still sell**—Despite the computer gaming industry's love affair with 3D game technologies, the popularity of arcade-style games has never really diminished. Rather, it has just taken a temporary back seat to flashier developments. If you doubt this, just look around the store shelves and software catalogs. Arcade games are as popular as ever. Arcade titles such as Epic MegaGames' *Jazz Jackrabbit II™* and Broderbund's *Loadrunner II™* have dominated the sales charts for some time. In fact, eight of the ten top selling commercial games of 1998 were 2D based.

3. **2D arcade games are enjoying a comeback**—The growing popularity of emulators such as *MAME*, *iNes*, and *Virtual Gameboy* has only served to reinforce the genre's immortality and has sparked a major resurgence and interest in arcade-style games.

4. **2D arcade game graphics are relatively easy to create**—For the most part, arcade game graphics are much easier to design and create than their 3D counterparts. Furthermore, the fundamental concepts behind their design and use are also much simpler to teach, making the topic ideally suited for users of all levels and competencies. If you can move a mouse and draw simple shapes in a standard graphics package, you can learn how to create arcade-style graphics. Most 3D artwork, on the other hand, requires a significant amount of skill and experience to create, something that only a handful of individuals in the game development industry currently possess.

5. **2D arcade game graphics don't require much time or financial investment to create**—Designing arcade-style graphics can be done with a relatively small investment in terms of hardware, software, and most importantly, time. In fact, all of the graphics examples in this book were created in a matter of hours using software that costs well under $200 and runs on any Pentium class PC. In comparison, it often takes an expensive, workstation class machine running software costing thousands of dollars days to create most 3D-style game artwork.

So, if issues like time, money, and audience factor into your game making plans, learning how to create arcade-style graphics is still an important skill to acquire.

Who is This Book For?

This book is for anyone who is interested in producing arcade-style games. However, for obvious reasons, those of you directly involved in game development either as a hobby or as a profession really stand to benefit the most from the information contained in these pages.

Basically, this book is for you if:

- You're a hobbyist or part-time game developer with impressive programming skills who could not draw game graphics if your life depended on it.
- You're a hobbyist or part-time game developer who can't program but is interested in learning how to design and draw game artwork and animation.
- You're a game designer who wants to learn all you can about how game graphics are made in order to make your games look and play better.
- You're a multimedia developer interested in improving the look and feel of your creations.

As you can see, this book was written to appeal to users of all different backgrounds, skill levels, and experience. Regardless of whether you are a weekend programmer or a classically trained artist, you are bound to find this book a valuable introduction, guide, and reference to the world of developing arcade game graphics.

What Can You Expect to Learn?

In this book you can expect to learn quite a bit, including a number of things about games and graphics that have either never been published before or never been published in one place. In this book, you will learn about:

- **Display Modes**—Every video display mode has a number of distinct properties that can affect your artwork. This book teaches you what these are and how to deal with them.
- **Color in Arcade Games**—Color usage can make or break an arcade game. This book teaches you how to use color to its maximum potential.
- **Arcade Game Animation**—Animation is what makes arcade games come alive. This book teaches you the fundamental techniques behind arcade game animation and breaks the process down into easy-to-understand steps.
- **Game Design and Documentation**—No game can exist without proper planning and documentation. This book teaches game design from the artist's perspective, including how to plan out your projects and write related documentation.

- **Evaluating Tools**—The key to creating high-quality artwork lies in the tools that one uses for the job. This book provides comprehensive information on the best free and low-cost graphics tools available. In addition, it gives you essential information on what to look for when evaluating graphics software for your game projects.

- **Graphic File Formats and Image Compression**—Arcade game graphics could not exist if it were not for image compression and a handful of versatile graphic file formats. This book covers the topic of image compression and identifies the essential graphic formats used in arcade game graphics development.

- **File Management**—Proper file naming and file maintenance is crucial to a successful arcade game. This book provides useful tips on asset naming, file management, version control, and file backup strategies.

- **Fonts**—Arcade games rely on fonts to display all sorts of textual information. This book provides a primer on fonts, font characteristics, and the various font formats available.

- **Creating Graphics for Actual Arcade Games**—Without actual practical application, you can never expect to master the process of creating arcade game graphics. Therefore, this book provides a comprehensive step-by-step example on how to design 2D graphics and animation for a real arcade-style game.

For a more specific breakdown of the concepts and techniques covered in the book, take a look at this chapter-by-chapter breakdown:

Chapter 1: *Arcade Games and Computer Arcade Game Platforms*

Many people tend to group arcade games as one type of game or another. This is incorrect. Arcade games span many types of games. Some share common elements and themes while others don't. This chapter tries to define exactly what an arcade game is and summarizes the primary arcade game genres as well as common arcade gaming platforms.

Chapter 2: *Designing for Different Display Modes*

Different computers offer different video display capabilities. These features directly influence how you eventually create your game graphics. This chapter identifies the various issues you can face when designing arcade game graphics in different video modes on different systems and how you can deal with them.

Chapter 3: *Image Compression and Graphic File Formats*

There are many image formats out there but only a few are actually useful for arcade game development. As such, this chapter provides an overview of image compression and discusses the most important graphic image file formats used in arcade game graphics development.

Chapter 4: *Files and File Management*

When designing arcade game graphics, the artwork you create becomes an asset as valuable as gold. After all, you put immeasurable time, thought, and sweat into creating them, why not do something to ensure that they are protected? This chapter explains how to treat your image files properly as well as safely. Among the topics covered here are proper file naming schemes, file management, file organization, and file backups.

Chapter 5: *Evaluating Graphics Creation Tools*

There are scores of programs available with which to design and create arcade game graphics. The problem is that most of these programs are totally unsuitable for the task. This chapter identifies the most useful tools as well as which features to look for when evaluating graphics software.

Chapter 6: *Essential Graphics Tools*

This chapter includes mini-reviews and exhaustive feature summaries of the 15 best programs you can use to design and create your arcade game graphics.

Chapter 7: *Color and Arcade Game Graphics*

Color is more than just something we see, it's something that we experience. This being said, you need to fully understand color in order to be able to exploit it and use it to its full potential. This chapter provides an overview of color theory and how to effectively use it in your arcade game projects.

Chapter 8: *All About Color Palettes*

For various reasons, many arcade games are limited in the amounts of color they can display. Therefore, you need to choose your colors wisely. This chapter helps you to understand what color palettes are, how they differ across platforms, and how to effectively define your own. From this information you will be in the position to best determine how to select and efficiently choose colors for your game artwork.

Chapter 9: *Arcade Game Animation*

Animation is central to the arcade game experience. This chapter provides an overview of the theory behind designing effective arcade game animation. By breaking down the most commonly used types of arcade game animation sequences into digestible pieces, you will have the basics of how to reproduce virtually any type of animated effect or action.

Chapter 10: *Fonts and Arcade Games*

Arcade games need to display text-based information to represent everything from game scores to instructions. Fonts allow us to display this information

both legibly and in various sizes and styles. This chapter provides a primer on fonts and their effective use in arcade-style games.

Chapter 11: *Planning Arcade Game Graphics*

It's unlikely for you to have a successful, not to mention timely and hassle free, game project without a proper plan. This chapter shows you how to plan out an arcade game from an artist's perspective.

Chapter 12: *Hands-On Arcade Game Project—Fish Dish*

As the previous 11 chapters mainly covered design theory, procedures, tools, and technical information, this chapter provides a comprehensive tutorial on designing the graphics and animation for an actual arcade game.

Chapter 13: *Miscellaneous Topics and Final Comments*

This final chapter examines the "missing" topics of arcade game graphics such as the different methods for representing game level backgrounds, sources of inspiration, and where to go next with the information you have acquired over the course of the book.

Appendix A: *Artist Interviews*

Every game artist has different preferences, techniques, and tool preferences. There is no better way to get this information than right from the horse's mouth. Therefore, this section includes two interviews of very talented computer graphic artists.

Here, the interview subjects answer some 21 questions about game graphics design in order to help you, the reader, gain better insight on the tools to use and how to approach arcade game graphics design.

Appendix B: *CD-ROM Contents*

No book on arcade game graphics would be complete without a CD-ROM that contains a library of useful tools and support files. This section describes the contents of the book's accompanying CD-ROM.

As a special bonus, the CD includes some very special graphics tools and several free games to give you inspiration for your own projects.

What You Need Before Beginning

I need to stress that this book doesn't require you to be an artist or even an experienced programmer for that matter. You aren't expected to be able to draw or even code. In fact, the only assumptions this book makes are:

- You have access to a PC-compatible computer running DOS or, preferably, a version of Windows 95, 98, NT 4.0, or 2000 with an SVGA color monitor. Although this book clearly targets the DOS and Windows platforms, users of Macintosh and Linux systems shouldn't despair as many of the concepts, suggestions, and techniques described in this book apply to these systems as much as they do to the DOS and Windows platforms.

- You need to be at least familiar with graphics tools and have a basic understanding of how to use them. While you don't have to be an expert with any particular graphics package, you should at least be comfortable around them. This book is a resource, not a software training manual.

- You need to be both willing and eager to apply what you learn from this book in your own projects. This being said, you should also be patient. Unless you're very lucky or just very talented, you can't possibly expect to achieve professional results from what you learn right away. Designing good arcade game graphics takes time and experience. Just keep this in mind and everything will be fine.

About the Author

Ari Feldman is the creative lead at ZapSpot (`http://www.zapspot.com`) where he is responsible for designing much of the artwork and animation for their line of wildly popular games.

Ari has been designing computer game graphics since 1991 and cut his teeth creating the artwork and animation for a number of well-received shareware, commercial, and freeware titles for the Atari ST and Windows platforms. He is also the creator of *SpriteLib*, an extremely popular collection of animated objects for arcade-style games that counts tens of thousands of users worldwide.

Before coming to ZapSpot, Ari supervised the development of high-profile interactive projects for such companies as Columbia House, iVillage, Compaq, Simon & Schuster, GTE, Lehman Brothers, American Express, Gevalia Kaffe, AT&T, and Lucent Technologies.

Should you wish to contact Ari, you can always e-mail him at `ari@arifeldman.com` or visit him online at `http://www.arifeldman.com`.

Book Support

The author realizes that despite his best efforts, it isn't always possible to cover every aspect of designing arcade game graphics within the confines of a single book. Therefore, the author has taken the liberty of building a special Web site dedicated to supporting the readers of this book.

Among other things, this site features additional resources including book addendum and errata, and provides a community where interested readers can interact with each other as well as the author in order to further their knowledge on the subjects of arcade game graphics and game design.

Be sure to visit `http://www.gamegfx.com` and tell your friends about it.