Section 1

The Basics

Imagine how the world would be if computers had no way of drawing pictures on the screen. The entire field of Computer Graphics—flight simulators, CAD systems, video games, 3D movies—would be unavailable. Computers would be pretty much what they were in the 1960s - just processing machines with monitors displaying text in their ghostly green displays.

Today, computers do draw pictures. It's important to understand how computers actually store and draw graphic images. The process is very different from the way people do it. First, there's the problem of getting the image on the screen. A computer screen contains thousands of little dots of light called pixels. To display a picture, the computer must be able to control the color of each pixel. Second, the computer needs to know how to organize the pixels into meaningful shapes and images. If we want to draw a line or circle on the screen, how do we get the computer to do this?

The answers to these questions form the basis for this section. You will learn how numbers written in the frame buffer control the colors of the pixels on the screen. We will expose you to the concept of two-dimensional coordinate systems and how 2D shapes and objects can be drawn and transformed in this 2D world. You will learn the popular algorithms used to draw basic shapes such as lines and circles on the computer.

These days, three-dimensional graphics is in vogue. As a reader, you too must be eager to get on to creating gee-whiz effects using these same principles. It is important, however, to realize that all 3D graphics principles are actually extensions of their 2D counterparts. Understanding concepts in a 2D world is much easier and is the best place to begin your learning. Once you have mastered 2D concepts, you will be able to move on to the 3D world easily. At every step, you will also have the opportunity to implement the theory discussed by using OpenGL.

At the end of the section, we shall put together everything we have learned to develop a computer game seen in many video arcades today.