A
Seminar report
on

Computer Graphics

Submitted in partial fulfillment of the requirement for the award of degree
Of MCA

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Preface

I have made this report file on the topic **Computer Graphics,**, I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the prepration of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Introduction to Computer Graphics

Today there are very few aspects of our lives not affected by computers. Practically every cash or monetary transaction that takes place daily involves a computer. In many cases, the same is true of computer graphics. Whether you see them on television, in newspapers, in weather reports or while at the doctor's surgery, computer images are all around you.

"A picture is worth a thousand words" is a well-known saying and highlights the advantages and benefits of the visual presentation of our data. We are able to obtain a comprehensive overall view of our data and also study features and areas of particular interest.

A well-chosen graph is able to transform a complex table of numbers into meaningful results. You know that such graphs are used to illustrate papers, reports and thesis, as well as providing the basis for presentation material in the form of slides and overhead transparencies. A range of tools and facilities are available to enable users to visualize their data, and this document provides a brief summary and overview.

Computer graphics can be used in many disciplines. Charting, Presentations, Drawing, Painting and Design, Image Processing and Scientific Visualization are some among them.

In particular, we will emphasize the following

a) Basic concepts of Computer Graphics

b) Different types of Computer Graphics

c) Origin of Computer Graphics

d) Working of an interactive graphics display

e) Importance of speed in displaying pictures

f) The change in size an orientation of pictures

g) Applications of Computer Graphics

History

The phrase "Computer Graphics" was coined in 1960 by William Fetter, a graphic designer for Boeing. The field of computer graphics developed with the emergence of computer graphics hardware.

Early projects like the Whirlwind and SAGE Projects introduced the CRT as a viable display and interaction interface and introduced the light pen as an input device.

A programmer for the Whirlwind SAGE system performed a personal experiment in 1954 in which a small program he wrote captured the movement of his finger and displayed its vector (his traced name) on a display scope.

The same individual, Douglas T. Ross, working at MIT on transforming mathematic statements into computer generated machine tool vectors in 1959 took the opportunity to create a display scope image of a Disney cartoon character.

What is Computer Graphics?

The term **computer graphics** includes almost everything on computers that is not text or sound. Today almost every computer can do some graphics, and people have even come to expect to control their computer through icons and pictures rather than just by typing.

Here in our lab at the Program of Computer Graphics, we think of computer graphics as drawing pictures on computers, also called *rendering*. The pictures can be photographs, drawings, movies, or simulations -- pictures of things which do not yet exist and maybe could never exist. Or they may be pictures from places we cannot see directly, such as medical images from inside your body.

We spend much of our time improving the way computer pictures can simulate real world scenes. We want images on computers to not just look more realistic, but also to BE more realistic in their colors, the way objects and rooms are lighted, and the way different materials appear.

We call this work "realistic image synthesis", and the following series of pictures will show some of our techniques in stages from very simple pictures through very realistic ones.

Object Rendering

Shading

Color

Ray Tracing

Radiosity

Types of Computer Graphics

Computer Graphics can be broadly divided into two

a) Non Interactive Computer Graphics

b) Interactive Computer Graphics

Non Interactive Computer Graphics:

In non interactive computer graphics otherwise known as passive computer graphics, the observer has no control over the image. Familiar examples of this type of computer graphics include the titles shown on TV and other forms of computer art.

Interactive Computer Graphics:

Interactive Computer Graphics involves a two way communication between computer and user. Here the observer is given some control over the image by providing him with an input device for example the video game controller of the ping pong game. This helps him to signal his request to the computer.

The computer on receiving signals from the input device can modify the displayed picture appropriately. To the user it appears that the picture is changing instantaneously in response to his commands. He can give a series of commands, each one generating a graphical response from the computer. In this way he maintains a conversation, or dialogue, with the computer.

Interactive computer graphics affects our lives in a number of indirect ways. For example, it helps to train the pilots of our airplanes. We can create a flight simulator which may help the pilots to get trained not in a real aircraft but on the grounds at the control of the flight simulator.

The flight simulator is a mock up of an aircraft flight deck, containing all the usual controls and surrounded by screens on which we have the projected computer generated views of the terrain visible on take off and landing. Flight simulators have many advantages over the real aircrafts for training purposes, including fuel savings, safety, and the ability to familiarize the trainee with a large number of the world's airports.

Application of Computer Graphics

The following are also considered graphics applications

Paint programs:

Allow you to create rough freehand drawings. The images are stored as bit maps and can easily be edited. It is a graphics program that enables you to draw pictures on the display screen which is represented as bit maps (bit-mapped graphics). In contrast, draw programs use vector graphics (object-oriented images), which scale better.

Most paint programs provide the tools shown below in the form of icons. By selecting an icon, you can perform functions associated with the tool.In addition to these tools, paint programs also provide easy ways to draw common shapes such as straight lines, rectangles, circles, and ovals.

Sophisticated paint applications are often called image editing programs. These applications support many of the features of draw programs, such as the ability to work with objects. Each object, however, is represented as a bit map rather than as a vector image.

Illustration/design programs:

Supports more advanced features than paint programs, particularly for drawing curved lines. The images are usually stored in vector-based formats. Illustration/design programs are often called draw programs. Presentation graphics software: Lets you create bar charts, pie charts, graphics, and other types of images for slide shows and reports. The charts can be based on data imported from spreadsheet applications.

A type of business software that enables users to create highly stylized images for slide shows and reports. The software includes functions for creating various types of charts and graphs and for inserting text in a variety of fonts. Most systems enable you to import data from a spreadsheet application to create the charts and graphs. Presentation graphics is often called business graphics.

Animation software:

Enables you to chain and sequence a series of images to simulate movement. Each image is like a frame in a movie. It can be defined as a simulation of movement created by displaying a series of pictures, or frames. A cartoon on television is one example of animation. Animation on computers is one of the chief ingredients of multimedia presentations. There are many software applications that enable you to create animations that you can display on a computer monitor.

There is a difference between animation and video. Whereas video takes continuous motion and breaks it up into discrete frames, animation starts with independent pictures and puts them together to form the illusion of continuous motion.

CAD software:

Enables architects and engineers to draft designs. It is the acronym for computer-aided design. A CAD system is a combination of hardware and software that enables engineers and architects to design everything from furniture to airplanes. In addition to the software, CAD systems require a high-quality graphics monitor; a mouse, light pen, or digitizing tablet for drawing; and a special printer or plotter for printing design specifications.

CAD systems allow an engineer to view a design from any angle with the push of a button and to zoom in or out for close-ups and long-distance views. In addition, the computer keeps track of design dependencies so that when the engineer changes one value, all other values that depend on it are automatically changed accordingly. Until the mid 1980s, all CAD systems were specially constructed computers. Now, you can buy CAD software that runs on general-purpose workstations and personal computers.

Desktop publishing:

Provides a full set of word-processing features as well as fine control over placement of text and graphics, so that you can create newsletters, advertisements, books, and other types of documents. It means by using a personal computer or workstation high-quality printed documents can be produced. A desktop publishing system allows you to use different typefaces, specify various margins and justifications, and embed illustrations and graphs directly into the text. The most powerful desktop publishing systems enable you to create illustrations; while less powerful systems let you insert illustrations created by other programs.

As word-processing programs become more and more powerful, the line separating such programs from desktop publishing systems is becoming blurred. In general, though, desktop publishing applications give you more control over typographical characteristics, such as kerning, and provide more support for full-color output.

A particularly important feature of desktop publishing systems is that they enable you to see on the display screen exactly how the document will appear when printed. Systems that support this feature are called WYSIWYGs (what you see is what you get).

Until recently, hardware costs made desktop publishing systems impractical for most uses. But as the prices of personal computers and printers have fallen, desktop publishing systems have become increasingly popular for producing newsletters, brochures, books, and other documents that formerly required a typesetter.

Once you have produced a document with a desktop publishing system, you can output it directly to a printer or you can produce a PostScript file which you can then take to a service bureau. The service bureau has special machines that convert the PostScript file to film, which can then be used to make plates for offset printing. Offset printing produces higher-quality documents, especially if color is used, but is generally more expensive than laser printing.

In general, applications that support graphics require a powerful CPU and a large amount of memory. Many graphics applications—for example, computer animation systems—require more computing power than is available on personal computers and will run only on powerful workstations or specially designed graphics computers. This is true of all three-dimensional computer graphics applications.

In addition to the CPU and memory, graphics software requires a graphics monitor and support for one of the many graphics standards. Most PC programs, for instance, require VGA graphics. If your computer does not have built-in support for a specific graphics system, you can insert a video adapter card.

The quality of most graphics devices is determined by their resolution—how many pixels per square inch they can represent—and their color capabilities.

Use of Computer Graphics

The use of and relevance of computer graphics has blossomed in many areas in the past 20 years, ranging from the studio arts to new mathematical disciplines such as computational geometry. The areas in which graphics have arguably had the most impact? and certainly the most visibility? can loosely be categorized as entertainment and advertising, scientific visualization, and industrial design.

Entertainment and Advertising

No doubt the most stylish deployment of computer graphics today is in Hollywood and on Madison Avenue. Special effects, photographic manipulations, computer animation, and other digital trickery routinely spice up (often otherwise dull) movies and ad spots. Students are aware that many of these effects? based as they are on generating shapes and transforming shapes over time? are inherently geometric in nature.

From the perspective of classroom geometry, these graphics applications can be great motivators. As Walter Whitely once pointed out to me, if Pixar can win Academy Awards for *Tin Toy* and *Toy Story,* then the lesson to students is clear: you can get an Oscar for being a geometer!

Scientific Visualization

Though slightly less glamorous than Hollywood, scientific visualization forms a second important focus of computational modeling and graphics efforts. Here, computer-generated illustrations and simulations are used to depict the structure of objects that cannot otherwise be inspected because they are too small (e.g., chemical compounds and crystal structures), too large (global weather patterns), too remote (topography of distant planets), too abstract (such as multi-dimensional mathematical manifolds), or too dangerous (such as atmospheric conditions in the eye of a hurricane and in deep ocean trenches).

In fact, most computer graphics technologies are originally developed to provide some new tools to the scientific visualization community, and then later reappear in less expensive applications within other domains.

The visualization technologies that this past summer allowed engineers at Pasadena's Jet Propulsion Labs to "pre-drive" a simulated robot rover across a three-dimensional, virtual reconstruction of the Martian landscape (before uploading the day's driving route, by slow satellite signal, to the actual Sojourner rover on Mars) will no doubt reappear in driving simulators in next summer's video arcades.

Industrial Design

Computer-aided design (CAD; and computer-aided manufacture, CAM) form computer graphics' third major bailiwick. Designers today routinely employ computerized visualizations and structural models to test industrial artifacts (mass-produced consumer

goods, airplanes, vehicles, buildings, bridges, etc.) for safety, cost, utility, and efficiency before manufacturing a first physical prototype.

Geometry often plays a novel role in resolving a central tension faced by industrial designers. On the one hand, it's essential to have a precise mathematical model and symbolic representation of a new design, so that it can be exhaustively analyzed for the previously mentioned viability factors (safety, efficiency, and so forth).

But on the other, if one is designing a new automobile, one can't test-drive an equation from the blackboard! Geometry mediates between these conflicting desires? for a precise symbolic representation of the engineered object, and for a fluid, artistic visualization of it? by defining the intersection of analytic and aesthetic characteristics of shape.

ADVANTAGES OF COMPUTER GRAPHICS

The main advantages of computer graphics are as follows:-

1. It provides tools for producing pictures not only of concrete real world objects but also of abstract, synthetic objects such as mathematical surface in 4D and of data that have no inherent geometry such as survey results.

2. It's have ability to show moving pictures and thus it is possible to produce animations with computer graphics.

3. With computer graphics user can also control the animation speed, portion of the view, the geometric relationship the object in the scene to one another, the amount of detail shown and on.

4. The computer graphics provides tool called **motion dynamics.** with this tool user user can move and tumble objects with respect to a stationary observer, or he can make objects stationary and the viewer moving around them.

A typical example is walk through made by builder show flat interior and building surroundings. In many case it is also possible to move both objects and viewer.

5. The computer graphics also provides facility called **update dynamics**. With update dynamics it is possible to change this shape, colour or other properties of the objects being viewed.

Disadvantages:

1. With higher resolutions and colors, there is a performance hit (speed), which could be big or small depending on your hardware and the resolution you set up (generally it's a very small performance hit).

2. This is due to the fact that there is **much** more information to deal with as well as more pixels to update on-screen (I'll get to this below), The higher you set your resolution, the smaller your icons and text, and your refresh rate drops (I'll get to this too).

Conclusion

The history of graphic design in television is one of triumph over adversity. Ever since its launch in 1936, television has been a medium that has been restrictive to the graphic designer, both on and off screen.

Originally limited to only black and white and 405-lines designers still managed to be innovative and creative and for a long period of time without the proper resources and funding.

However thanks to people such as Richard Levin who knew what benefits graphic design could bring to television, we now have a situation in which the profession is now an equal alongside set design, make-up, set design etc. (A recent development in the story of graphic design at the BBC was the creation of a commercial arm in 1998 called BBC Resources, in which departments such as graphic design, now compete for work outside of the BBC – mainly in order to keep these areas funded.)

However, in a medium that is all about visual communication, its surprising that such an important part of its output (graphic design accounts for 100's of hours worth of television every week) was disregarded for such a long time – even when departments were finally set up they were considered experimental.

Television is also is also a rapidly changing medium that is constantly benefiting from technological improvements. Although superficially beneficial to the graphic designer, they become restrained by the viewing public who until they upgrade, has to be taken into account the introduction of colour television is a prime example. Even today the introduction of digital television has meant a designer has to think of how to solve a problem in two ratios – normal analogue television 4:3 screens and digital widescreen ones. Improvements in the technology behind the screen can also be restrictive as was seen during the eighties.

Computerised control of the rostrum camera was an advantage as it did help to cut out a lot of time consuming and repetitive work that was seen when manual control was the only method. However the increasing power and subsequent multi-purpose use of the computer again hindered the graphic designer who felt obliged (sometimes even ordered) to use the computer and/or the newest effects it could create.

However as computer graphics went out of fashion when audiences became used to them, we see graphic designers using computers as they should be intended as another tool to get the required creative effect.