Chapter One – Introduction to Computer Graphics

Computer is now a well-known technology. It is one of the most important applications of technology. Computer graphics present huge information in a brief and summary form. Computer graphics allows communication through pictures, charts and diagrams to the people. Today's world is of information technology. But as the volume of information increases, a problem arises. As time is money, in the 21st century a person doesn't have time to read huge number of pages. So this problem is solved by computer graphics. A huge database can be represented by pictures like bar chart, pie chart, column chart etc.

Example

Suppose, we have to show the performance of some sugar factory related with profit since 2010GC. We required large number of pages to store this huge information related with financial, numerical and statistical information. Now for most people it require a lot of time to understand it. But if this information is presented with the help of graphical tools such as bar chart or pie chart any person can understand it at a glance.

Therefore, more precise definition of computer graphics is the use of a computer to define, store, manipulate, interrogate and present pictorial output. The computer prepares and presents stored information to an observer in the form of picture.

- **Computer graphics comply with the old saying "a picture is worth thousand words."**

Computers have become a powerful tool for the rapid and economical production of pictures. There is virtually no area in which graphical displays can't be used to some advantages and so it is not surprising to fine the use of computer graphics so wide spread.

Today, we find computer graphics used routinely in such diverse areas such as science, engineering, medicine, business, industry, government, art, entertainment, advertising, education and training.

Before we get into the details of how to do graphics, we first take a short tour through a gallery of its application.

Applications of Computer Graphics

Computer graphics are very useful. 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.

- **User Interfaces**
- **Plotting of graphics and chart**
- **Computer-aided drafting and design**
- **Simulation and animation**
- **Art and commerce**
- **Process control**
- **Cartography**
- **Education and training**
- **Image processing**

User Interfaces : It is now a well-established fact that graphical interfaces provide an attractive and easy interaction between users and computers. The built-in graphics provided with user interfaces use visual control items such as buttons, menus, icons, scroll bar etc, which allows user to interact with computer only by mouse-click.

Typing is necessary only to input text o be stored and manipulated

Plotting graphics and chart : In industry, business, government, and educational organizations, computer graphics is most commonly used to create 2D and 3D graphs of mathematical, physical and economic functions in the form of histograms, bars and pie-charts. These graphs and charts are very useful for decision making.

Computer-aided drafting and design : the computer-aided drafting uses graphics to design components and system electrical, mechanical, electromechanical and electronic devices such as automobile bodies, structures of building, airplane, and ships, very large scale integrated chips, optical systems and computer networks.

Simulation and Animation : use of graphics in simulation makes mathematic models and mechanical systems more realistic and easy to study. The interactive graphics supported by animation software proved their use in production of animated movies and cartoons films.

Art and commerce : there is a lot of development in the tools provided by computer graphics. This allows user to create artistic pictures which express message and attract attentions. Such pictures are very useful in advertising.

Process Control : By the use of computer now it is possible to control various processes in the industry from a remote control room. In such cases, process systems and processing parameters are shown on the computer with graphics symbols and identification. This makes it easy for operator to monitor and control various processing parameters at a time

Cartography : (drawing geographic and other natural phenomena from measured data) Computer graphics is also used to represent geographic maps, weather maps, oceanographic charts, counter maps, population density maps and so on.

Education and training : computer graphics can be used to generate models of physical aids. Models of physical systems, physiological systems, population trends, or equipment, such as color-coded diagram can help trainees to understand the operation of the system.

Image processing : in computer graphics, a computer is used to create pictures. Image processing, on the other hands, applies techniques to modify or interpret existing pictures such as photographs and scanned image. Image processing and computer graphics are typically combined in many applications such as to model and study physical functions, to design artificial limbs, and to plan and practice surgery. Image processing techniques are most commonly used for picture enhancements to analyze satellite photos, X-ray photography and so on.

Why Computer Graphics?

About 50% of the brain neurons are associated with vision

•Dominant form of computer output

•Enable scientists (also engineers, physicians, and general users) to observe their simulation and computation

•Enable scientists to describe, explore, and summarize their datasets (models) and gain insights

•Enrich the discovery process and facilitate new inventions

ADVANTAGES OF COMPUTER GRAPHICS

The main advantages of computer graphics are as follows:-

- 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.
- A high quality graphics display of personal computer provide one of the most natural means of communication with a computer
- With computer graphics you can also control the animation by adjusting the speed, the portion of the total scene in view, the geometric relationship of the objects in the scene to one another, the amount of detail shown and so on.
- It has the ability to show moving pictures, and thus it is possible to produce animation with computer graphics.
- The computer graphics also provides facility called update dynamics. With update dynamics it is possible to change the shape, color or other properties of the objects being viewed.
- With the recent development of digital signal processing (DSP) and audio synthesis chip the interactive graphics can now provide audio feedback along with the graphical feedbacks to make the simulated environment even more realistic etc.