

E-MODULE

ON

INTRODUCTION TO COMPUTER GRAPHICS

AND ITS APPLICATIONS

FOR

CLASS:- BSC(IT)VI-SEM/BCA VI-SEM

SUBMITTED BY:-

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WHAT IS COMPUTER GRAPHICS?

- Creation, Manipulation, and Storage of geometric objects (modelling) and their images (rendering)
- Display those images on screens or hardcopy devices
- Image processing
- Others: GUI, Haptic, Displays (VR)...
- The term of Graphics comes from Greek "*graphikos*" which means 'something written' e.g. autograph. So, Graphics are visual images or designs on some surface, such as a wall, canvas, screen, paper, or stone to inform, illustrate, or entertain.
- Computer graphics can be a series of images which most often called video or a single image. The definition of computer graphics is the technology that deals with designs and pictures on computers. So, computer graphics are visual representations of data displayed on a monitor made on a computer.

DIFFERENT TYPES OF 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

- 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.

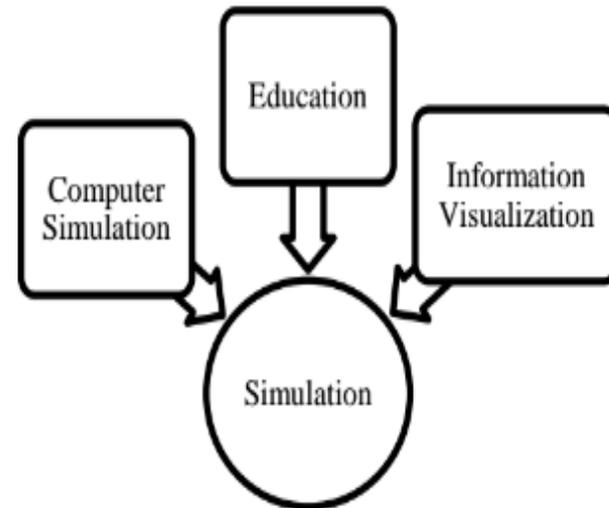
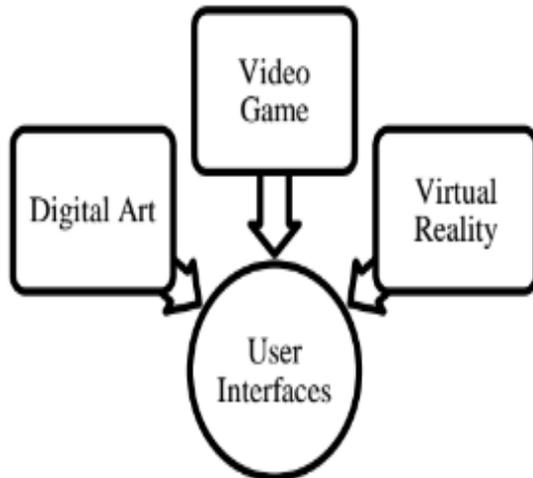
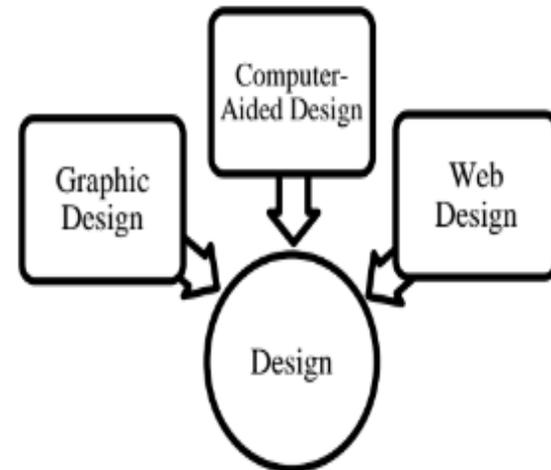
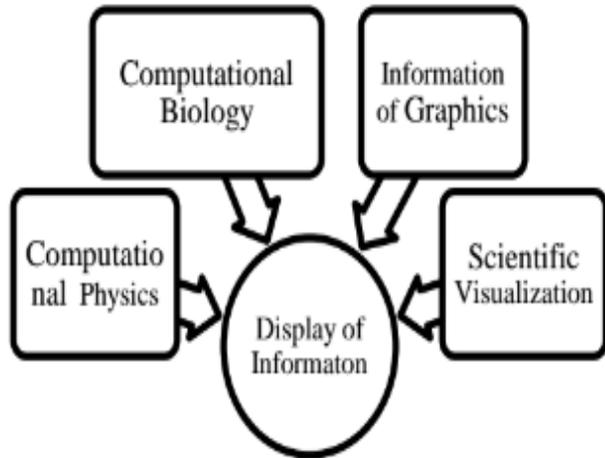
APPLICATION OF COMPUTER GRAPHICS

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.

Computer-generated imagery is used for movie making, video game and computer program development, scientific modeling, and design for catalogs and other commercial art. Some people even make computer graphics as art.

We can classify applications of computer graphics into four main areas:

- Display of information
- Design
- User interfaces
- Simulation



✓ COMPUTATIONAL BIOLOGY

Computational biology is an interdisciplinary field that applies the techniques of computer science, applied mathematics and statistics to address biological problems. The main focus lies on developing mathematical modeling and computational simulation techniques.

✓ 2. COMPUTATIONAL PHYSICS

Computational physics is the study and implementation of numerical algorithm to solve problems in physics for which a quantitative theory already exists. It is often regarded as a sub discipline of theoretical physics but some consider it an intermediate branch between theoretical and experimental physics.

✓ Information of Graphics:

Information graphics or information graphics are visual representations of information, data or knowledge. These graphics are used where complex information needs to be explained quickly and clearly, such as in signs, maps, journalism, technical writing, and education. They are also used extensively as tools by computer scientists, mathematicians, and statisticians to ease the process of developing and communicating conceptual information.

✓ Scientific Visualization:

Scientific visualization is a branch of science, concerned with the visualization of three dimensional phenomena, such as architectural, meteorological, medical, biological systems. Scientific visualization focuses on the use of computer graphics to create visual images which aid in understanding of complex, often massive numerical representation of scientific concepts or results.

✓ Graphic Design:

The term graphic design can refer to a number of artistic and professional disciplines which focus on visual communication and presentation. Various methods are used to create and combine symbols, images and/or words to create a visual representation of ideas and messages. Graphic design often refers to both the process (designing) by which the communication is created and the products (designs) which are generated.

✓ Computer-aided Design:

Computer-aided design (CAD) is the use of computer technology for the design of objects, real or virtual. The design of geometric models for object shapes, in particular, is often called computer-aided geometric design (CAGD). CAD may be used to design curves and figures in two-dimensional ("2D") space; or curves, surfaces, or solids in three-dimensional ("3D") objects. CAD is also widely used to produce computer animation for special effects in movies, advertising, technical manuals.

✓ **Web Design:**

Web design is the skill of designing presentations of content usually hypertext or hypermedia that is delivered to an end-user through the World Wide Web, by way of a Web browser. The process of designing Web pages, Web sites, Web applications or multimedia for the Web may utilize multiple disciplines, such as animation, authoring, communication design, corporate identity, graphic design, human-computer interaction, information architecture, interaction design, marketing, photography, search engine optimization and typography.

✓ **Digital Art:**

Digital art most commonly refers to art created on a computer in digital form. On other hand, is a term applied to contemporary art that uses the methods of mass production or digital media. The impact of digital technology has transformed traditional activities such as painting, drawing and sculpture, while new forms, such as net art, digital installation art, and virtual reality, have been recognized artistic practices.

✓ **Video Games:**

A video game is an electronic game that involves interaction with a user interface to generate visual feedback on a raster display device. The electronic systems used to play video games are known as platforms. This platform creates through graphics.

✓ **Virtual Reality:**

Virtual reality (VR) is a technology which allows a user to interact with a computer-simulated environment. The simulated environment can be similar to the real world, for example, simulations for pilot or combat training, or it can differ significantly from reality, as in VR games. It is currently very difficult to create a high-fidelity virtual reality experience, due largely to technical limitations on processing power, image resolution and communication bandwidth. Virtual Reality is often used to describe a wide variety of applications, commonly associated with its immersive, highly visual, 3D environments.

✓ Computer Simulation:

A computer simulation, a computer model or a computational model is a computer program, or network of computers, that attempts to simulate an abstract model of a particular system.

✓ Education:

A computer simulation, a computer model or a computational model is a computer program, or network of computers, that attempts to simulate an abstract model of a particular system. Computer simulations have become a useful part of mathematical modeling of many natural systems in physics (computational physics), chemistry and biology, human systems in economics, psychology, and social science and in the process of engineering new technology, to gain insight into the operation of those systems, or to observe their behavior.

✓ Information Visualization:

Information visualization is the study of the visual representation of large-scale collections of non-numerical information, such as files and lines of code in software systems, and the use of graphical techniques to help people understand and analyze data.

The computer-generated images we see on television and in movies have advanced to the point that they are almost indistinguishable from real-world images. Computer graphics become a power field for the production of pictures. There are no areas in which graphical displays can't be used to some advantages, so it is not surprising to find the use of computer graphics so widespread.

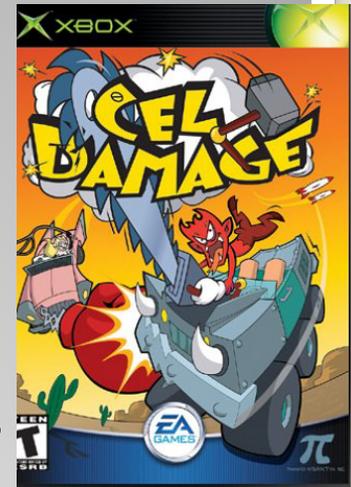
What drives computer graphics?

- Movie Industry
 - Leaders in quality and artistry
 - Not slaves to conceptual purity
 - Big budgets and tight schedules
 - Reminder that there is more to CG than technology
 - Hey, How'd they do that?
 - Defines our expectations



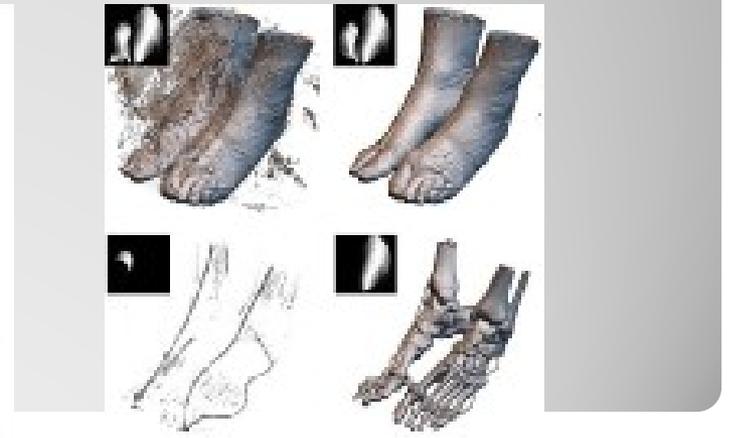
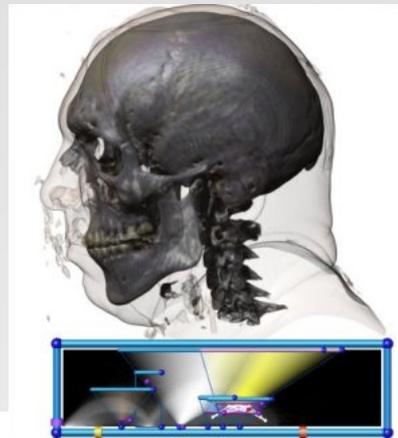
What drives computer graphics?

- Game Industry
 - The newest driving force in CG
 - Why? Volume and Profit
 - This is why we have commodity GPUs
 - Focus on interactivity
 - Cost effective solutions
 - Avoiding computating and other tricks
 - Games drive the baseline



WHAT DRIVES COMPUTER GRAPHICS?

- Medical Imaging and Scientific Visualization
 - Tools for teaching and diagnosis
 - No cheating or tricks allowed
 - New data representations and modalities
 - Drive issues of precision and correctness
 - Focus on presentation and interpretation of data
 - Construction of models from acquired data



✓ 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.

✓ 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.

✓ 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.

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).

OTHER IMPORTANT APPLICATIONS OF COMPUTER GRAPHICS

1. Tomography
2. Ultrasonic medical scanners
3. Picture enhancements
4. *User Interfaces (Graphical User Interfaces)*
5. Scientific and Business Visualization
6. Graphic Presentation
7. Graphic Design
8. Web Designing
9. Computational Physics
10. Information Visualization
11. Display of Information
12. Information Architecture
13. Genetics, Molecular Biology, Neuroscience, Animation, Statistics
14. Desktop Publishing

THANK YOU