COMPUTER GRAPHICS

Section – I
INTRODUCTION

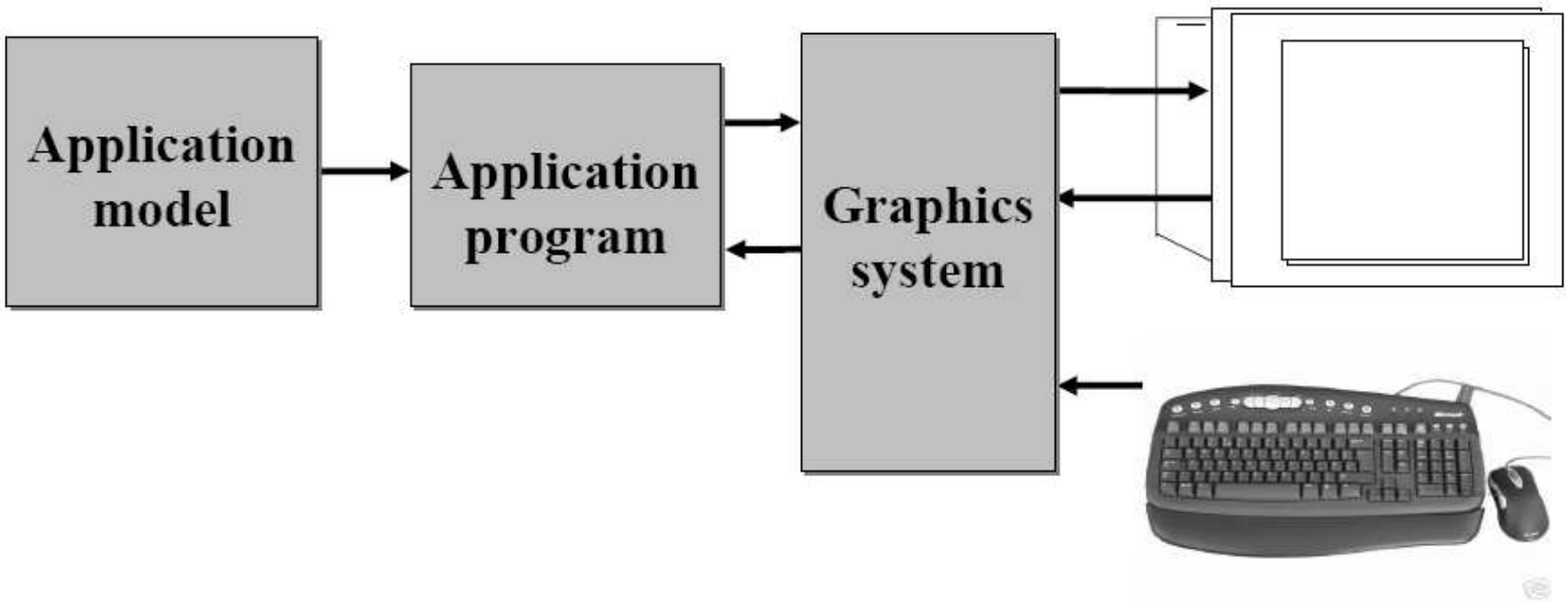
COMPUTER GRAPHICS

- *Computer Graphics is subfield of computer science which* involves display, manipulation and storage of pictures, experimental data and geometric information for proper visualization using computational techniques.

- Typical graphics system comprises of a host computer with support of fast processor, large memory, frame buffer and
  - Display devices (color monitors),
  - Input devices (mouse, keyboard, joystick, touch screen, trackball)
  - Output devices (LCD panels, laser printers, color printers. Plotters etc.)
  - Interfacing devices such as, video I/O,TV interface etc.

- Computer graphics used in diverse areas such as science, engineering, medicine ,business, industry, government, art, entertainment , advertising education and training.

Conceptual framework for interactive graphics



Graphics Applications

- **Typical applications areas are**
  - Entertainment
  - Computer-aided design
  - Scientific visualization
  - Training & Education
  - Computer art
  - Image Processing
  - GUI

Entertainment

•Animations are frequently used in advertising and television commercials.

•Frame by frame motion is used.

• Commonly used computer graphics method is Morphing

- •Object is transferred into another object
- •Eg: An automobile into a tiger.

•Computer Graphics methods are commonly used in making motion pictures, music videos and television shows

• Graphics objects can combined with live action, actors and live scenes.

Computer-aided design

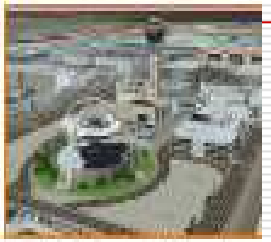
•Computer Aided Design (CAD) used in design of buildings , automobiles, aircraft, watercraft textiles etc.

•Wireframe models are used.(outline forms)

- •Show overall shape and internal features of objects.
- •Helps to watch the behavior of inner components during motion.
- • Useful for testing the performance of the system or vehicles.

•Animations in Virtual Reality Environment (VR).

- •Determines how vehicle operators affected by certain motions.
- •Helps designer to explore various positions that obstruct operators view.



Los Angeles Airport

Boeing 777 Airplane

Gear Shaft Design

Computer-aided design

Network Communications:

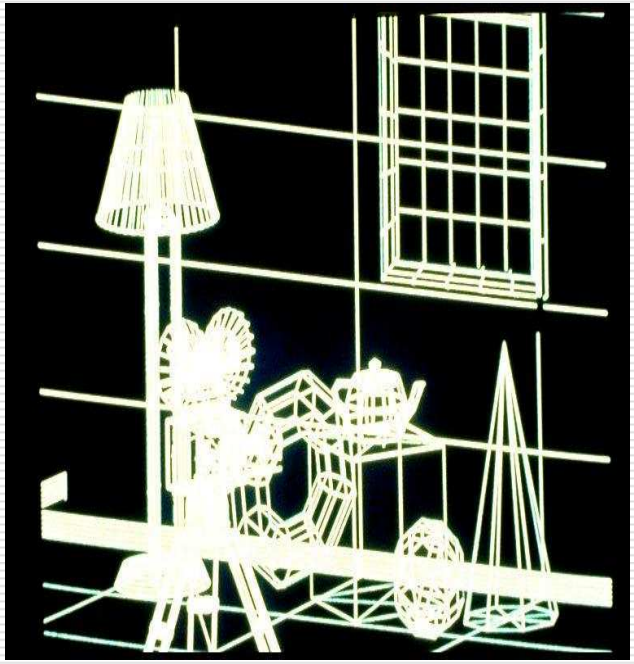
•Designed by placing components into the layout using graphics packages by providing connections.

Architectural Designs

•Architects use interactive graphics to lay floor plans,Positioning of rooms, doors, windows, stairs and other buliding features.

•Electrical Enginer can try out arrangements for wiring , electrical layouts and fire warning systems

•Realistic displays of architectural designs done.



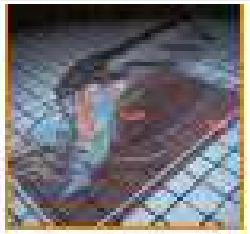
Wireframe models

Scientific visualization

•Scientists,engineers,medical personnel analysts

• analyze large of information to study the behavior of processes.

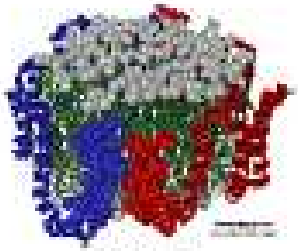
•Satellite cameras producing large data files can be interpreted and converted in the visual form



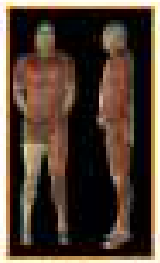
Airflow Inside a Thunderstorm

•Producing graphical representation for scientific engineering and medical datasets and processes is generally referred as **scientific visualization**.

Display of complex structures, simulation of complex process, complex molecular structures such as proteins and DNA, weather forecasting, complex mathematical objects



Apo A-1



Visible Human

•Data contain scalar values, vectors , high –order tensors or any combination of these data type. Data set can be 2D or 3D.

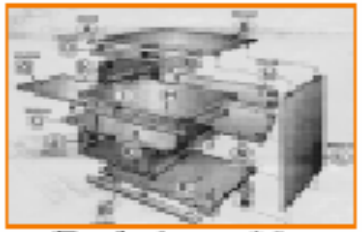
•Techniques such as contour plots,graphs and charts,surface renderings and visualization of volume interiors used.

Education & Training

- Computer generated models are used as educational aids.
- Specialized systems like simulators for training of ship captains, aircraft pilots, heavy –equipment operators are used.
- Some simulators has no video screens but only control panels and graphics screens for visual operations.
- Output of Automobile simulator is used to investigate the behavior of drivers in critical situations and optimizing the vehicle design.

Driving Simulation

Flight Simulation



Desk Assembly

Computer art

- Variety of computer methods including special purpose hardware , specially developed software like mathematics packages(mathematica),CAD packages , desktop publishing packages and animation packages provide facilities for designing object shapes and motions.
- CG methods are also applied in commercial art for logos and other designs.

Image Processing

- Image processing (IP) applies techniques to modify or interpret existing pictures.
  - Improves image quality
  - machine perception of visual information.
- Methods like retouching and rearranging of sections of photographs used to analyze satellite photos of earth and galaxies.
- Medical applications uses extensive IP techniques
  - for picture enhancements in tomography and in simulations of operations.
- IP and CG are combined in many applications , medicine uses these techniques
  - to design artifical limbs
  - to model and study phyiscal functions,
  - Computer aided surgery.

Image Composition

Image Morphing

Graphical User Interface(GUI)

- Software packages provide graphics interface.
- Window manger allows a user to display multiple-window areas.
- Each window contain different graphical or nongraphical displays.
- **Typical Components Used:**
  - **Menus ,Icons , Cursors , Dialog Boxes, Scroll Bars ,Buttons**
  - **Valuators ,Grids, Sketching , 3-D Interface**

Graphics packages and Platforms

- Various application packages and standards are available:
  - Core graphics
  - **GKS** Graphics Kernel System by ISO (International Standards Organization) & ANSI (American National Standards Institute)
  - **SRGP** Simple Raster Graphics Package
  - **PHIGS** Programmers Hierarchical Interactive Graphics System
  - **OpenGL** (with ActiveX and Direct3D)
- On various platforms, such as
  - DOS, Windows,
  - Linux, OS/2,
  - SGI, SunOS,
  - Solaris, HP-UX,
  - Mac, DEC-OSF.

Graphics packages and Platforms

- **Certain compilers**
  - Visual C/C++, Visual Basic, Borland C/C++, Borland Pascal, Turbo C,
  - Turbo Pascal, Java provide their own graphical libraries, API, support and help for programming 2-D/3-D graphics.
- Some these systems are
  - Device-independent (X11, OpenGL)
  - Device-dependent (Solaris, HP-AGP).

- Thank you