03.604
COMPUTER GRAPHICS

TEXT BOOK :

- COMPUTER GRAPHICS – DONALD HEARN & M.PAULINE BAKER

Introduction

- What is Computer Graphics?
- Applications
- Graphics packages

What is Computer Graphics?

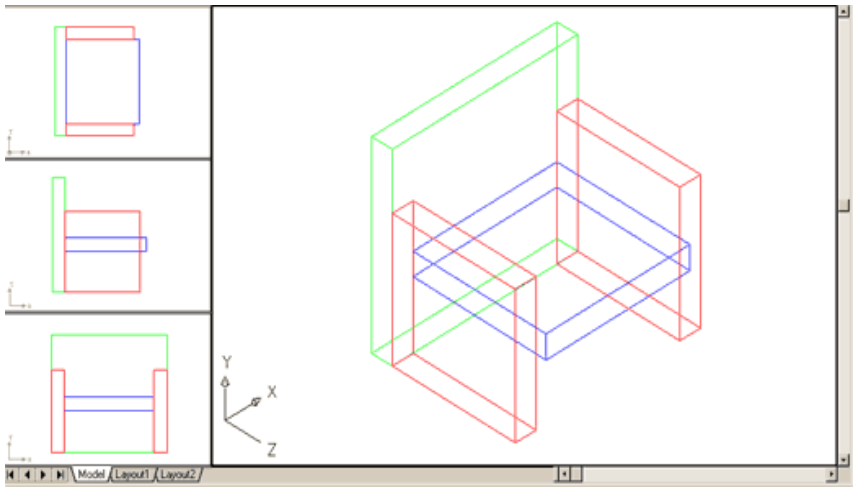
- Creation, Manipulation and Storage of geometric objects (modeling) & their images (rendering)
- Display those images on screens or hardcopy devices

Applications of Computer Graphics

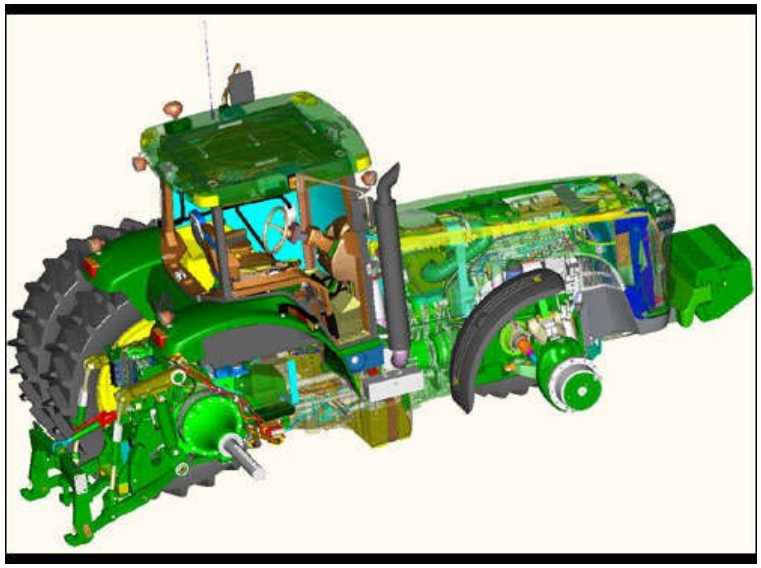
- Computer Aided Design (CAD)
- Presentation Graphics
- Computer Art
- Entertainment (animation, games, …)
- Education & Training
- Visualization (scientific & business)
- Image Processing
- Graphical User Interfaces

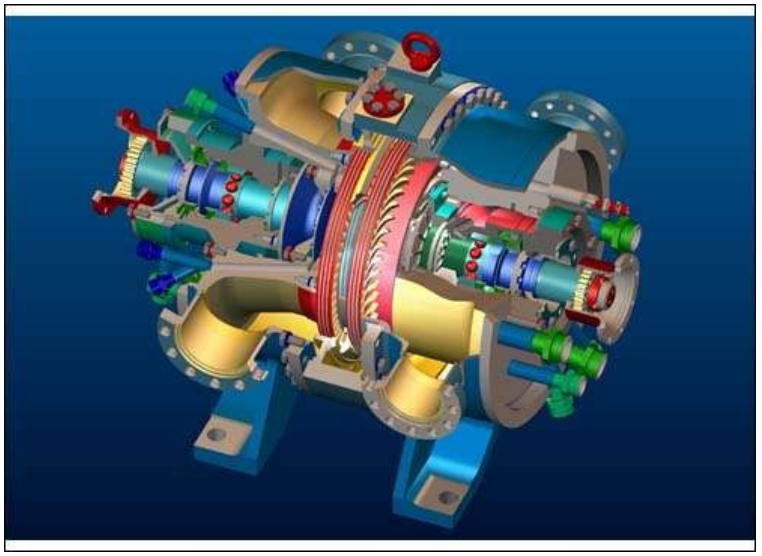
1.Computer Aided Design (CAD)

- Used in design of buildings, automobiles, aircraft, watercraft, spacecraft, computers, textiles & many other products
- Objects are displayed in wire frame outline form
- Software packages provide multi-window environment



- Graphics design package provides standard shapes (useful for repeated placements)
- Animations are also used in CAD applications
- Realistic displays of architectural design permits simulated “walk” through the rooms (virtual -reality systems)

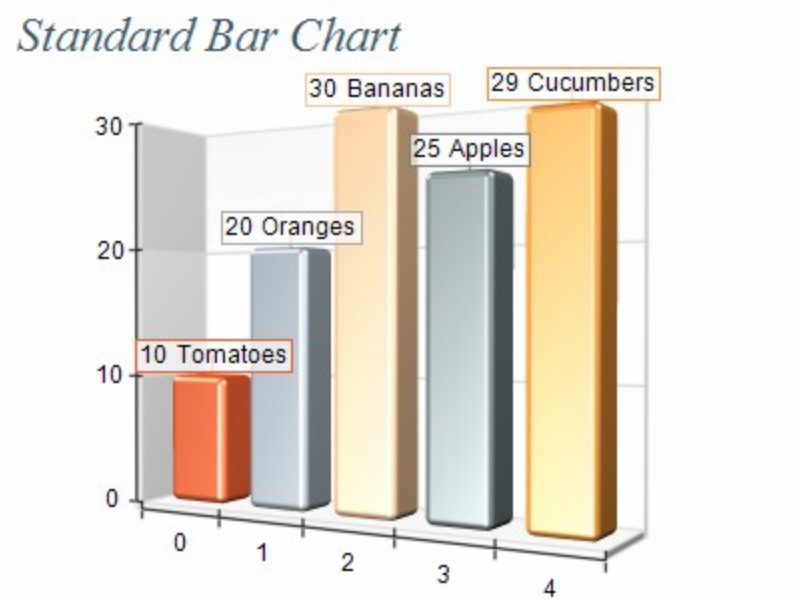


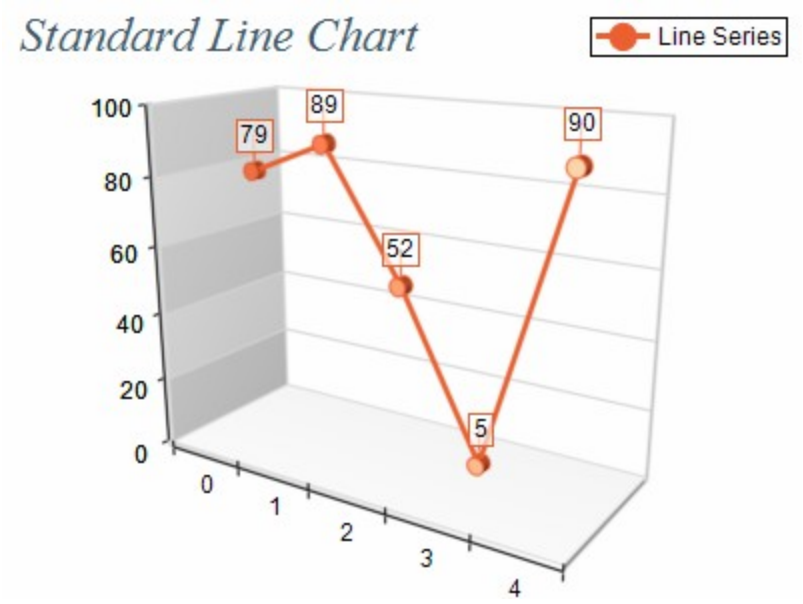


2.Presentation Graphics

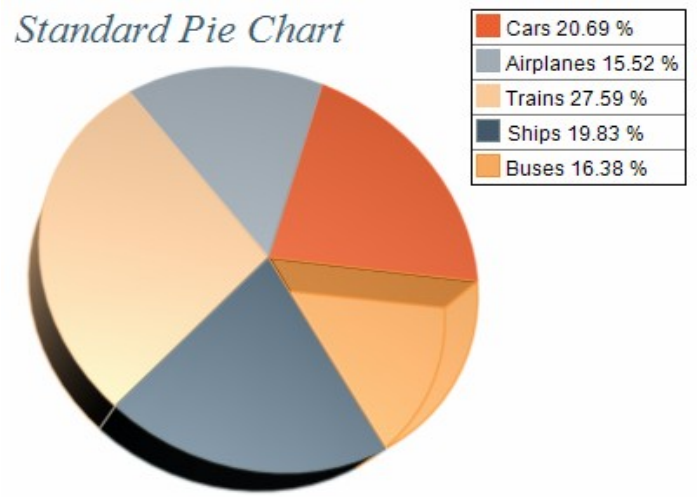
- Used to produce illustrations for reports or generate slides for use with projectors
- Commonly used to summarize financial, statistical, mathematical, scientific, economic data for research reports, managerial reports & customer information bulletins
- Examples : Bar charts, line graphs, pie charts, surface graphs, time chart

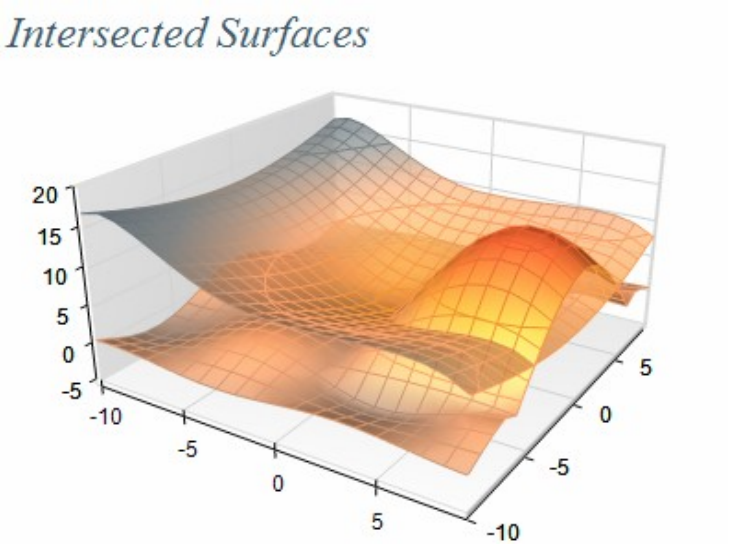
Examples of presentation graphics



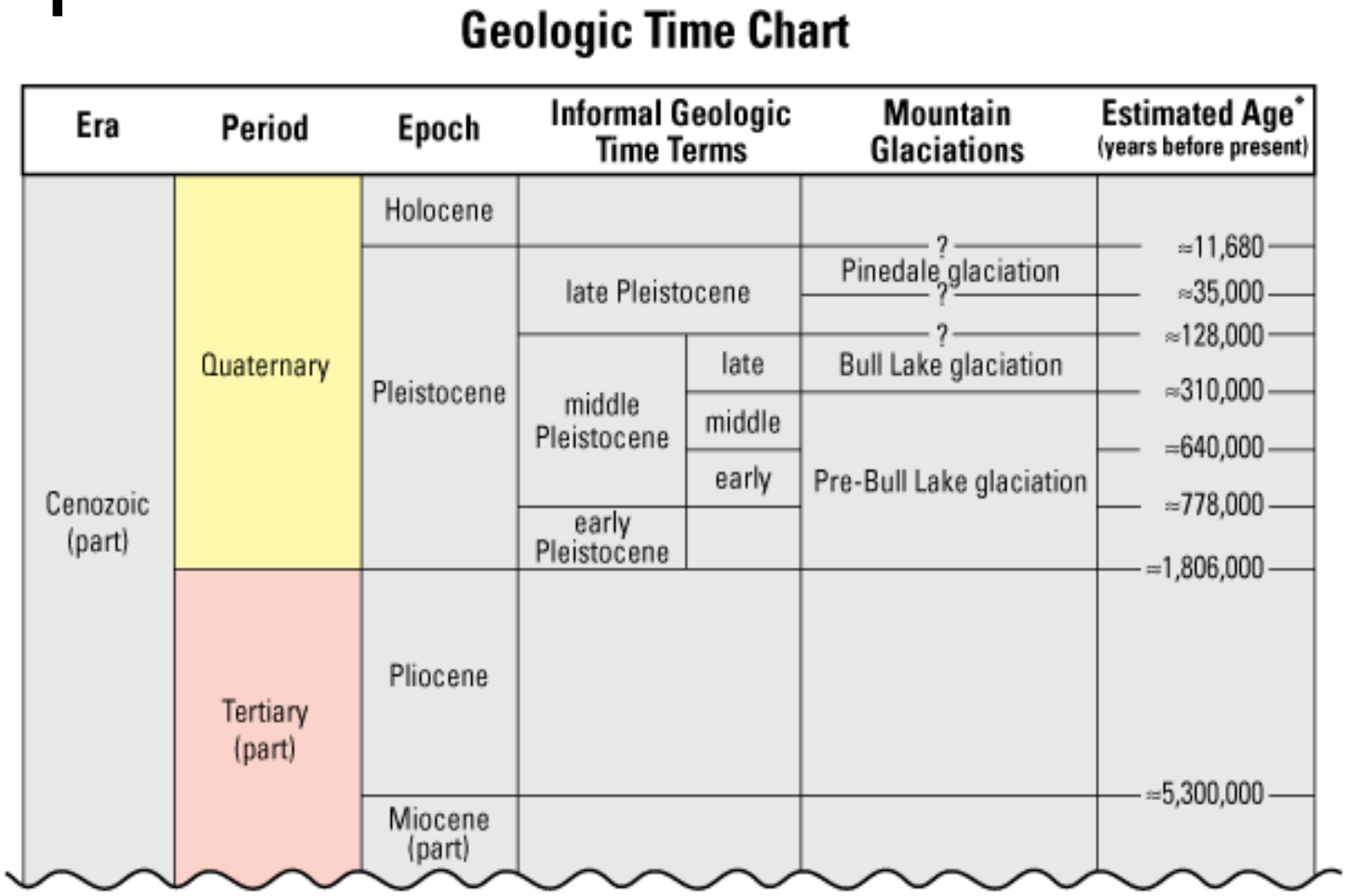


Examples of presentation graphics





Examples of presentation graphics



3.Computer Art

- Used in fine art & commercial art
  - Includes artist's paintbrush programs, paint packages, CAD packages and animation packages
  - These packages provides facilities for designing object shapes & specifying object motions.
  - Examples : Cartoon drawing, paintings, product advertisements, logo design

Examples :

Computer Art

- Electronic painting
  - Picture painted electronically on a graphics tablet (digitizer) using a stylus
  - Cordless, pressure sensitive stylus
- Morphing
  - A graphics method in which one object is transformed into another

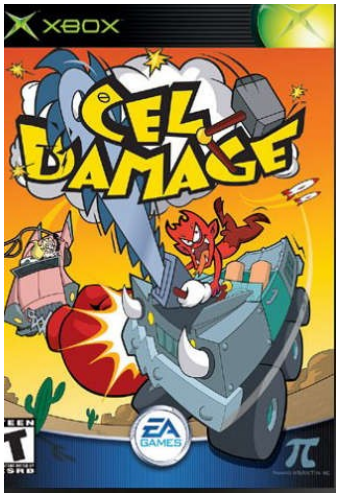

Easy Morph
File Objects Generate Display Settings Filmstrip View Help
Animate
Magnify
Generate
One Frame
End - Frogorig.trm
Start - Firegirl.trm
Tools
Result
Filmstrip
Frame
Speed
3 / 5
00:00.080
Ob
(unselected
At
Stop Sequence

4.Entertainment

- Movie Industry
  - Used in motion pictures, music videos, and television shows.
  - Used in making of cartoon animation films

Computer Graphics is about animation (films)

- Game Industry
  - Focus on interactivity
  - Cost effective solutions
  - Avoiding computations and other tricks



5.Education & Training

- Computer generated models of physical, financial and economic systems are used as educational aids.
- Models of physical systems, physiological systems, population trends, or equipment such as color-coded diagram help trainees understand the operation of the system

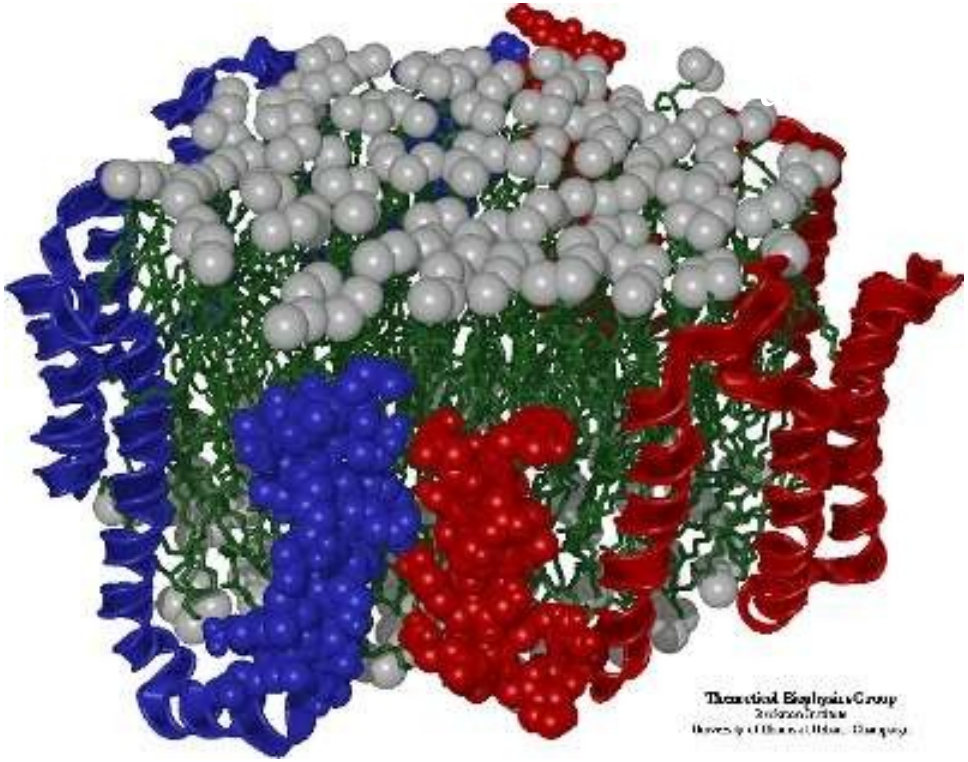
- Specialized systems used for training applications
  - simulators for practice sessions or training of ship captains
  - aircraft pilots
  - heavy equipment operators
  - air traffic-control personnel

Training

6.Visualization

- Scientific Visualization
  - Producing graphical representations for scientific, engineering, and medical data sets

Scientific Visualisation

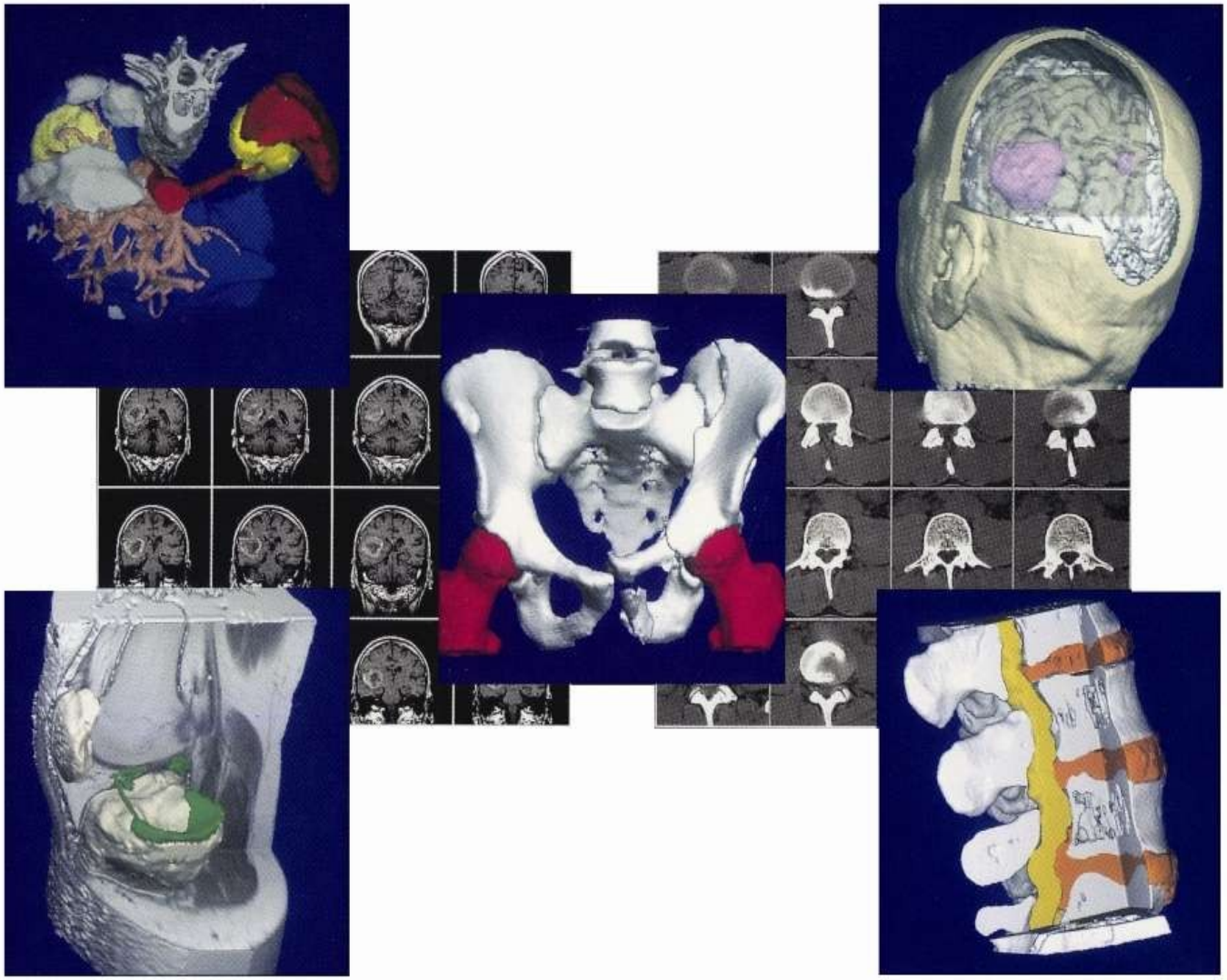


- Business Visualization is used in connection with data sets related to commerce, industry and other non-scientific areas
- Techniques used- color coding, contour plots, graphs, charts, surface renderings & visualizations of volume interiors.
- Image processing techniques are combined with computer graphics to produce many of the data visualizations

7. Image Processing

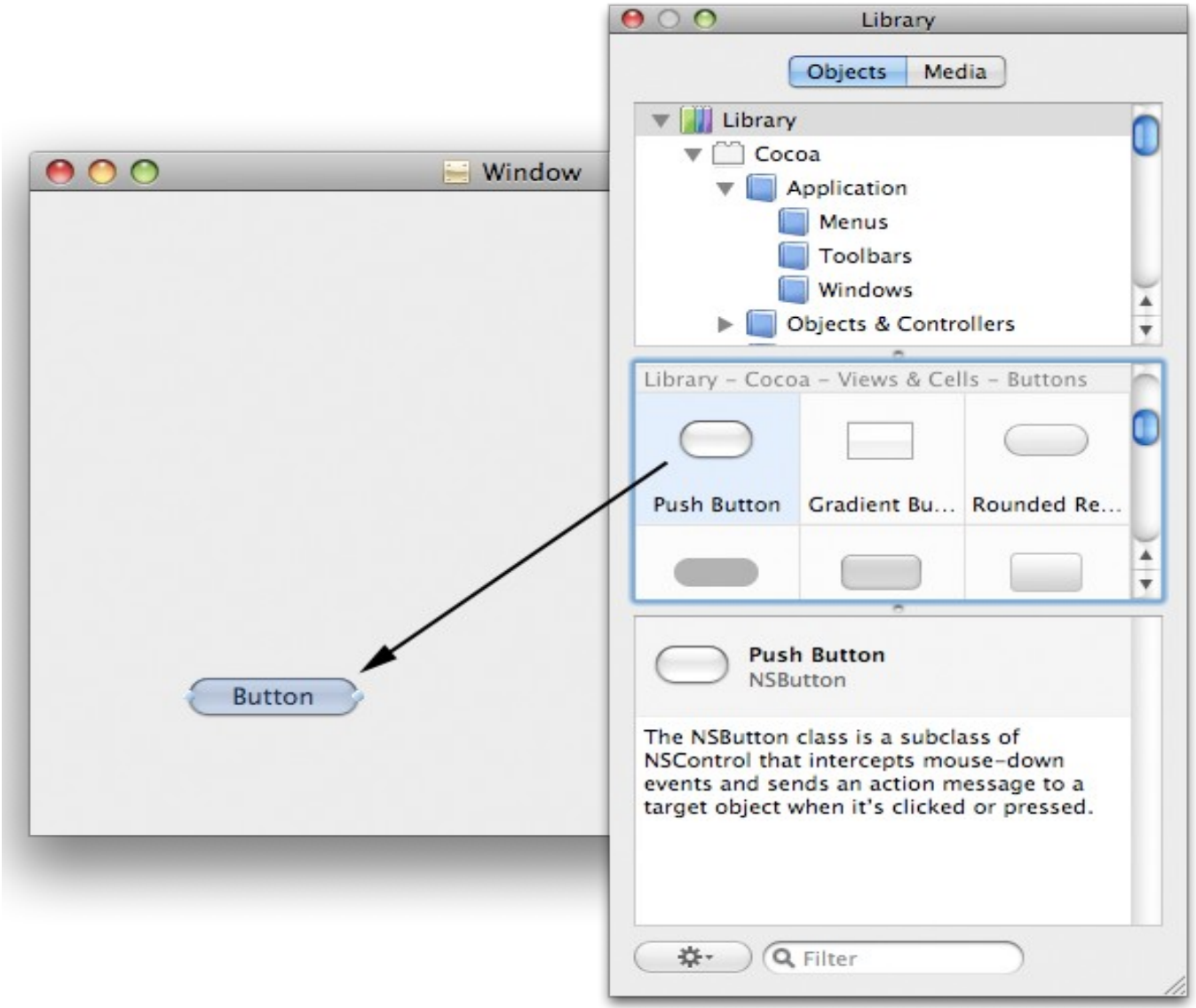
- CG- Computer is used to create a picture
- Image Processing – applies techniques to modify or interpret existing pictures such as photographs and TV scans
- Medical applications
  - Picture enhancements
  - Tomography
  - Simulations of operations
  - Ultrasonics & nuclear medicine scanners
- 2 applications of image processing
  - Improving picture quality
  - Machine perception of visual information (Robotics)

- To apply image processing methods
  - Digitize a photograph (or picture) into an image file
  - Apply digital methods to rearrange picture parts to
    - enhance color separations
    - Improve quality of shading
  - Tomography – technique of X-ray photography that allows cross-sectional views of physiological systems to be displayed
  - Computed X-ray tomography (CT) and position emission tomography (PET) use projection methods to reconstruct cross sections from digital data
  - Computer-Aided Surgery is a medical application technique to model and study physical functions to design artificial limbs and to plan & practice surgery



8.Graphical User Interfaces

- Major component – Window manager (multiple-window areas)
- To make a particular window active, click in that window (using an interactive pointing device)
- Interfaces display – menus & icons
- Icons – graphical symbol designed to look like the processing option it represents
- Advantages of icons – less screen space, easily understood
- Menus contain lists of textual descriptions & icons


Window
Button
Library
Objects
Media
Library
Cocoa
Application
Menus
Toolbars
Windows
Objects & Controllers
Library – Cocoa – Views & Cells – Buttons
Push Button
Gradient Bu...
Rounded Re...
Push Button
NSButton
The NSButton class is a subclass of NSControl that intercepts mouse-down events and sends an action message to a target object when it's clicked or pressed.
Filter

Graphics packages

- A set of libraries that provide programmatically access to some kind of graphics 2D functions.
- Types
  - GKS-Graphics Kernel System – first graphics package – accepted by ISO & ANSI
  - PHIGS (Programmer's Hierarchical Interactive Graphics Standard)-accepted by ISO & ANSI
  - PHIGS + (Expanded package)
  - Silicon Graphics GL (Graphics Library)
  - Open GL
  - Pixar Render Man interface
  - Postscript interpreters
  - Painting, drawing, design packages