A Survey of COMPUTER GRAPHICS

TEXT BOOK :

- DONALD HEARN & M.PAULINE BAKER

Contents

- Definition of CG
- Computer – Aided Design
- Presentation Graphics
- Computer Art
- Entertainment
- Education and Training
- Visualization
- Image Processing
- Graphical User Interfaces

Introduction

- What is Computer Graphics ?
- Applications
- Graphics packages

What is Computer Graphics?

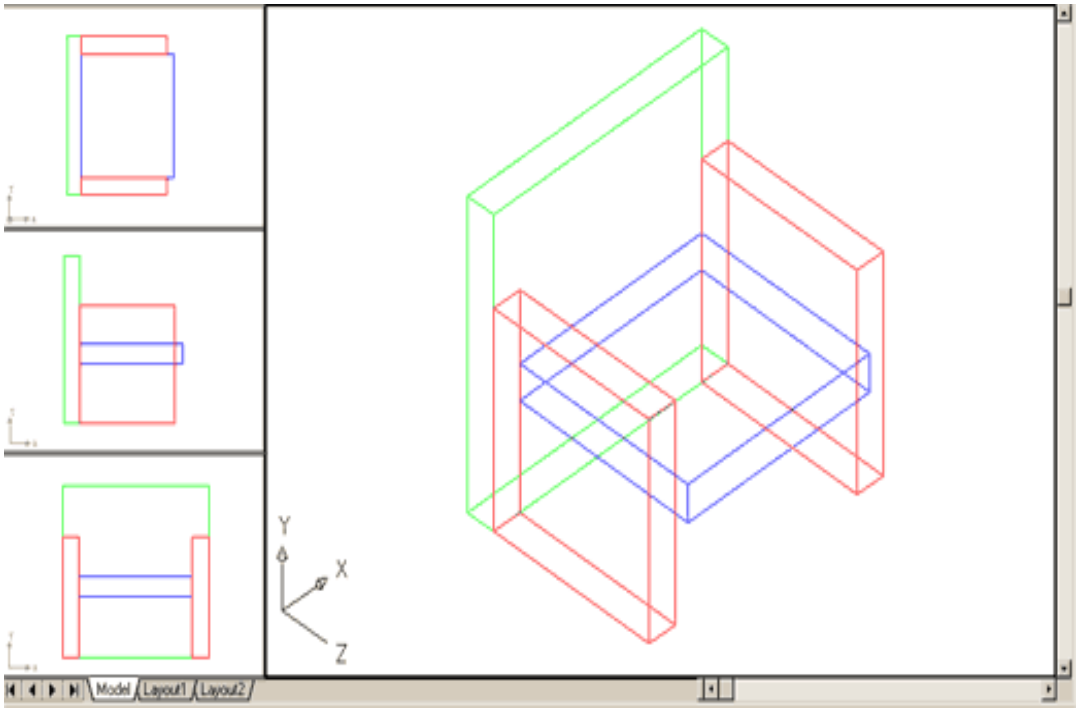
- Creation, Manipulation and Storage of geometric objects (modelling) & their images (rendering).
- Display those images on screens or hardcopy devices.

Applications of Computer Graphics

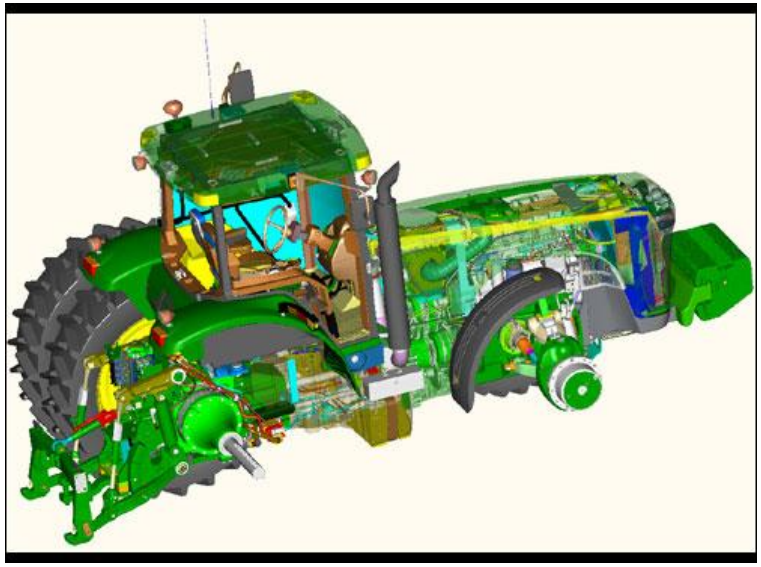
- Computer Aided Design (CAD)
- Presentation Graphics
- Computer Art
- Entertainment (animation, games, …)
- Education & Training
- Visualization (scientific & business)
- Image Processing
- Graphical User Interfaces

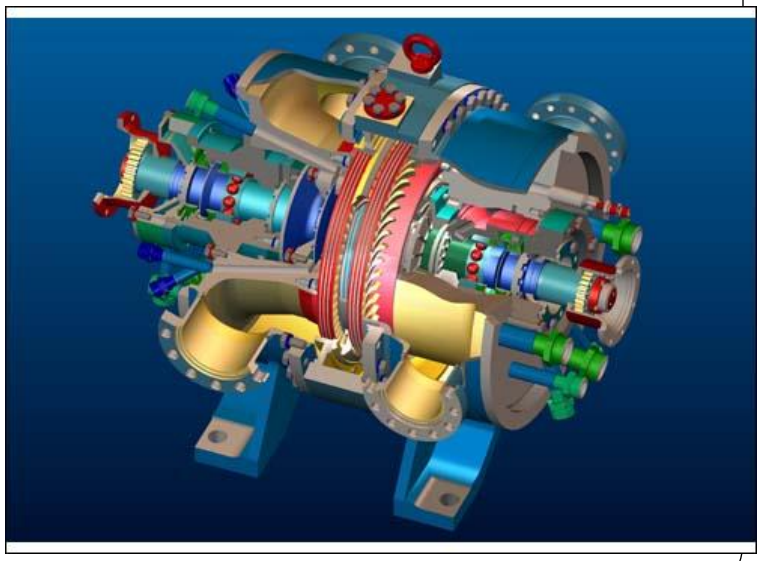
1.Computer Aided Design (CAD)

- 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)

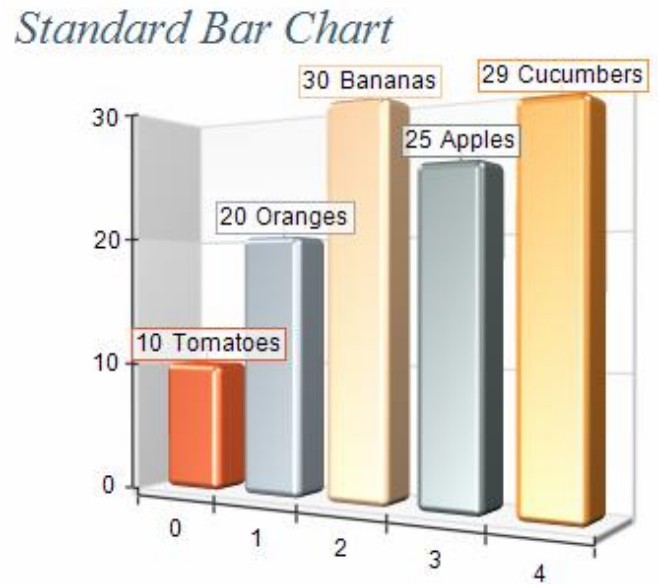


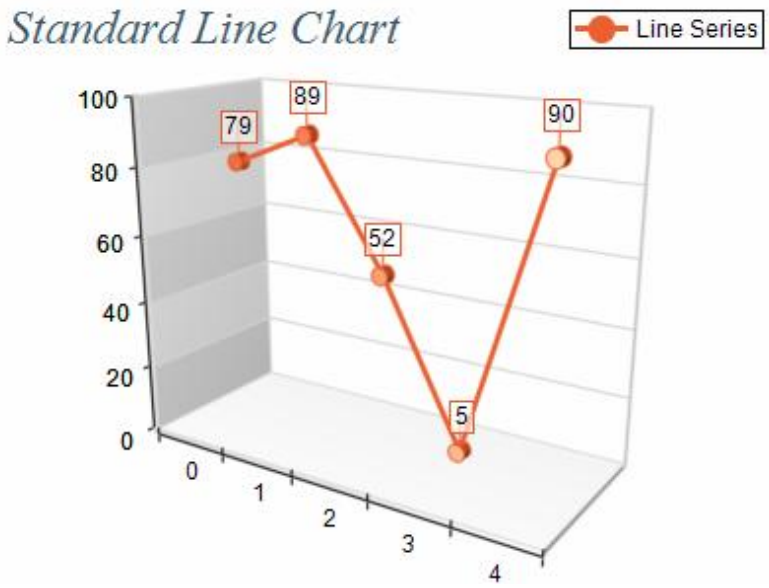


2.Presentation Graphics

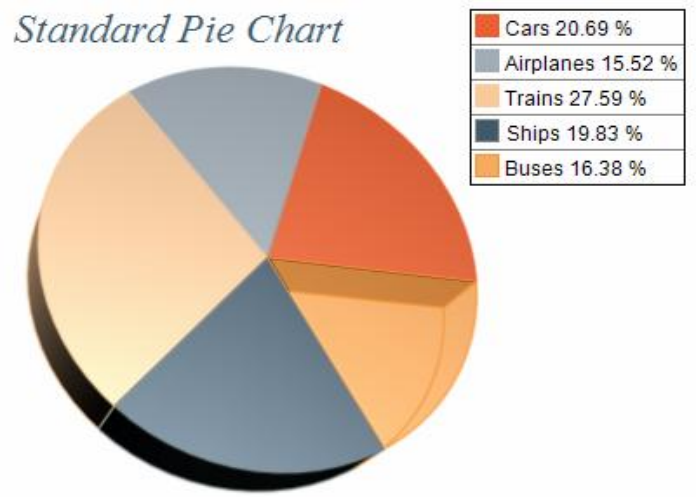
- Used to produce illustrations for reports or generate slides for use with projectors
- Commonly used to summarize financial, statistical, mathematical, scientific, economic data for research reports, managerial reports & customer information bulletins
- Examples : Bar charts, line graphs, pie charts,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

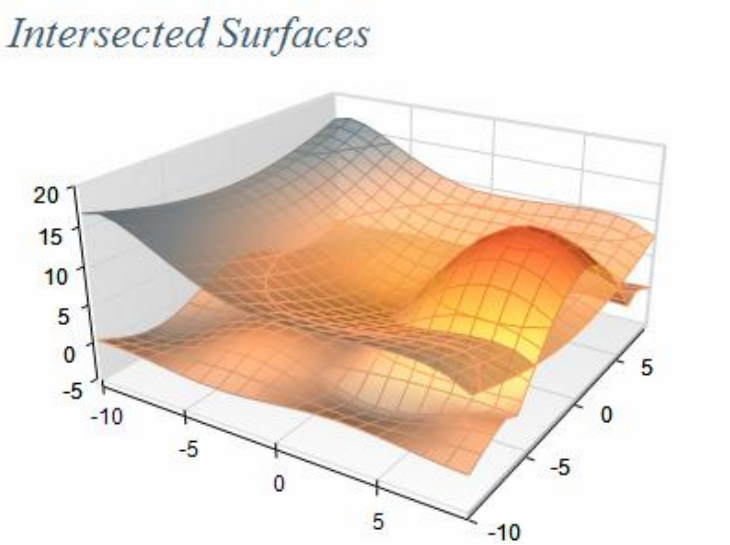
Examples of presentation graphics



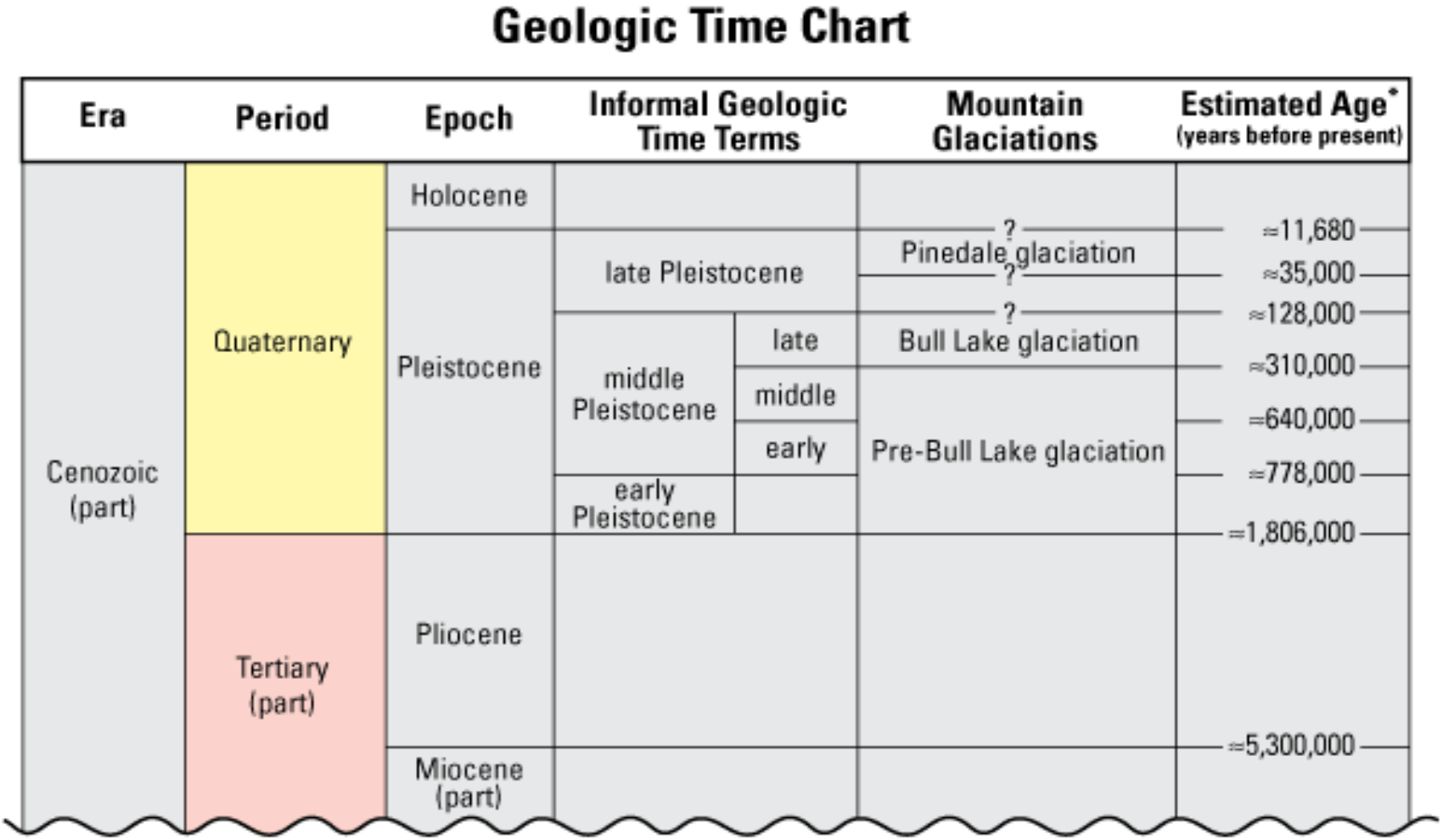


Examples of presentation graphics





Examples of presentation graphics



Geologic Time Chart

Era	Period	Epoch	Informal Geologic Time Terms		Mountain Glaciations	Estimated Age* (years before present)
Cenozoic (part)	Quaternary	Holocene				≈11,680
		Pleistocene	late Pleistocene		Pinedale glaciation ?	≈35,000
					?	≈128,000
			middle Pleistocene	late	Bull Lake glaciation ?	≈310,000
				middle	Pre-Bull Lake glaciation	≈640,000
				early		≈778,000
			early Pleistocene			≈1,806,000
	Tertiary (part)	Pliocene				≈5,300,000
		Miocene (part)				

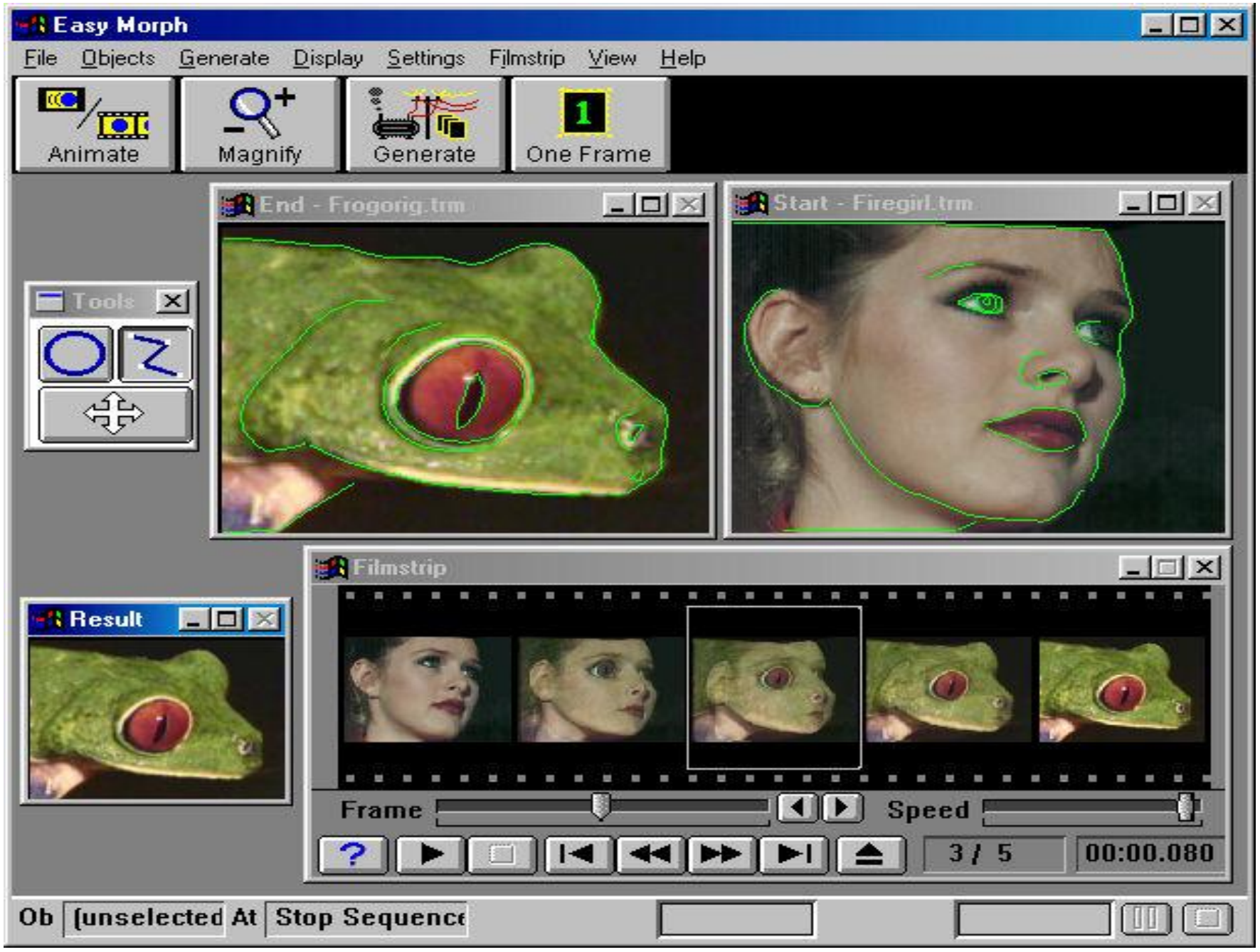
3.Computer Art

- 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

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
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3 / 5
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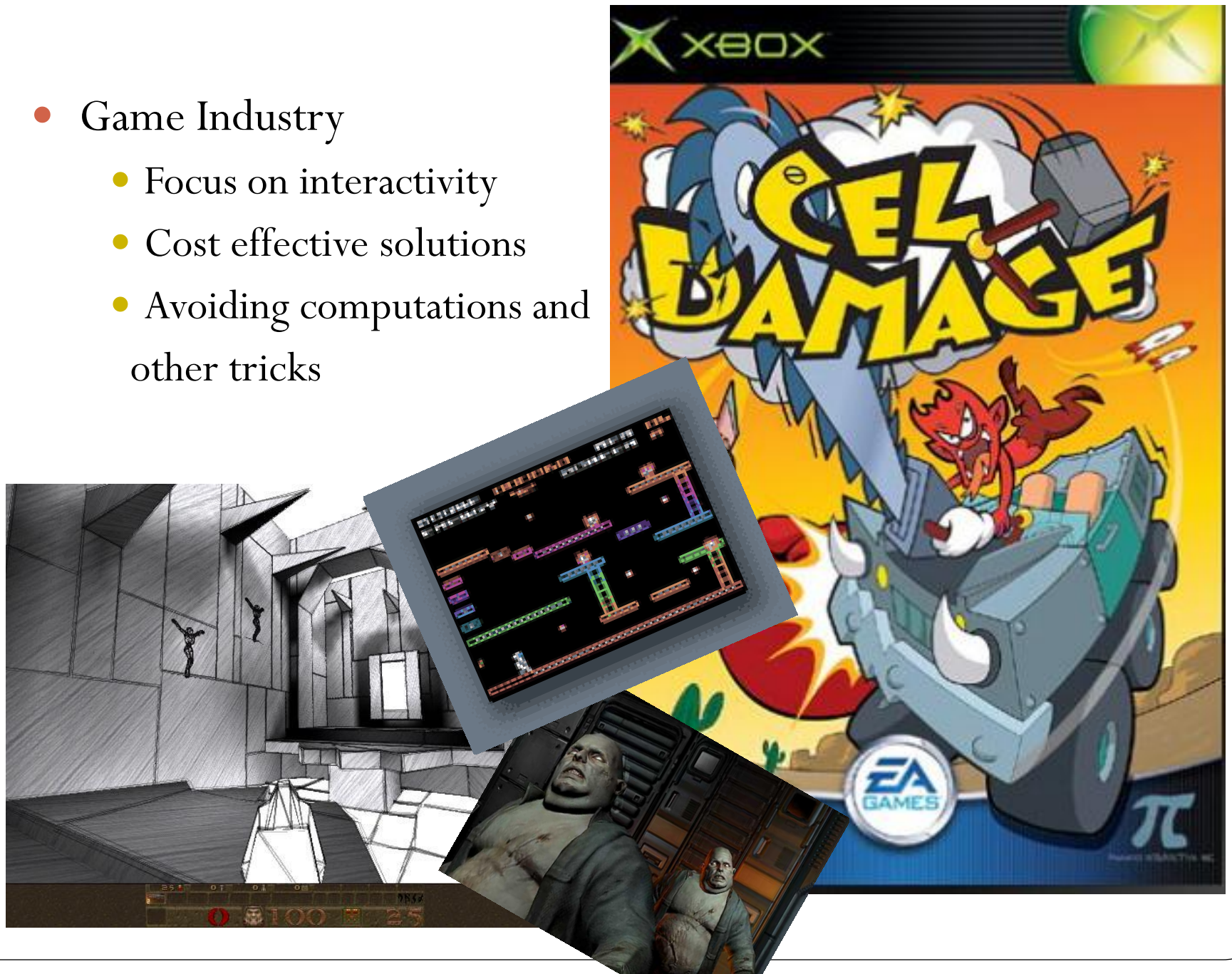
Stop Sequence

4.Entertainment

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

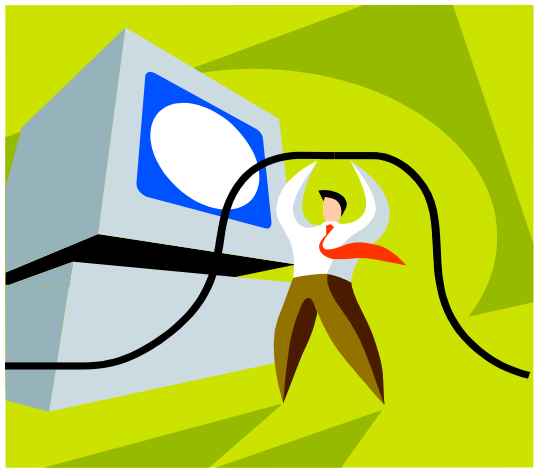
Computer Graphics is about animation (films)

- 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



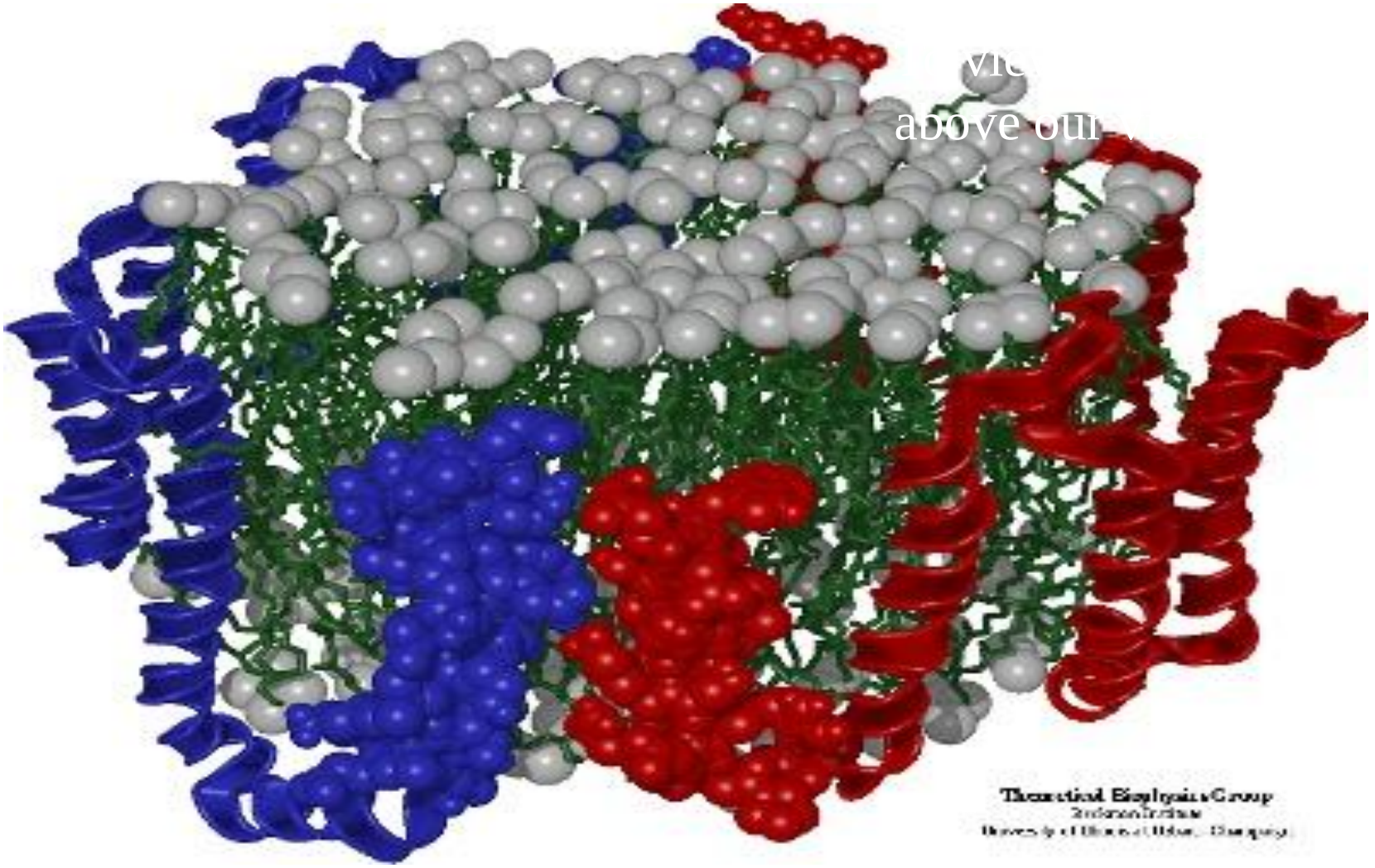
- Specialized systems used for training applications
  - simulators for practice sessions or training of ship captains
  - aircraft pilots
  - heavy equipment operators
  - air traffic-control personnel

Training

6.Visualization

- Scientific Visualization
  - Producing graphical representations for scientific, engineering, and medical data sets.
  - To check the behaviour of certain process different fields like engineering, scientists business analysts etc need appropriate visualization.

Scientific Visualisation

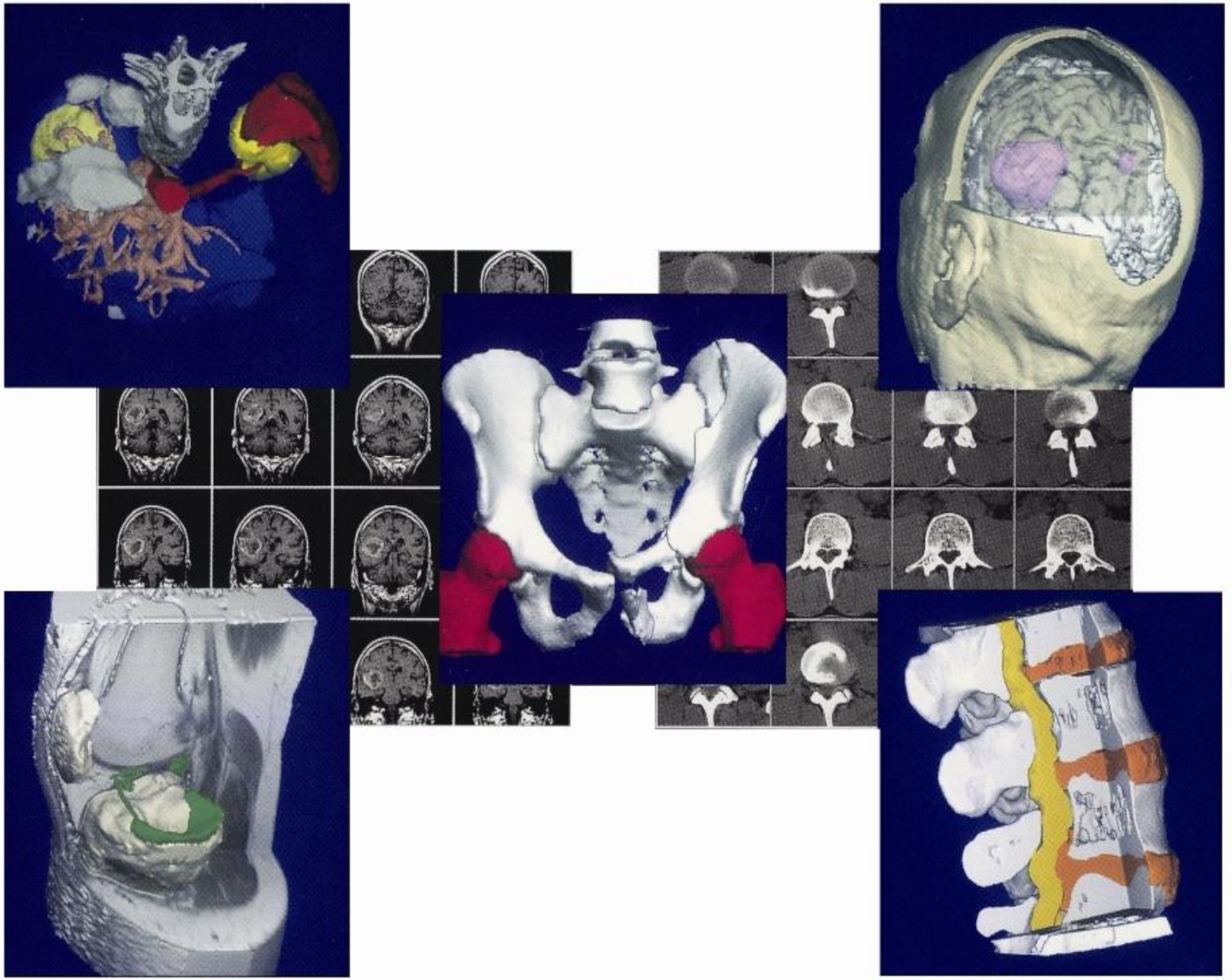


- Business Visualization is used in connection with data sets related to commerce, industry and other non-scientific areas
- Techniques used- color coding, contour plots, graphs, charts, surface renderings & visualizations of volume interiors.
- Image processing techniques are combined with computer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

7. Image Processing

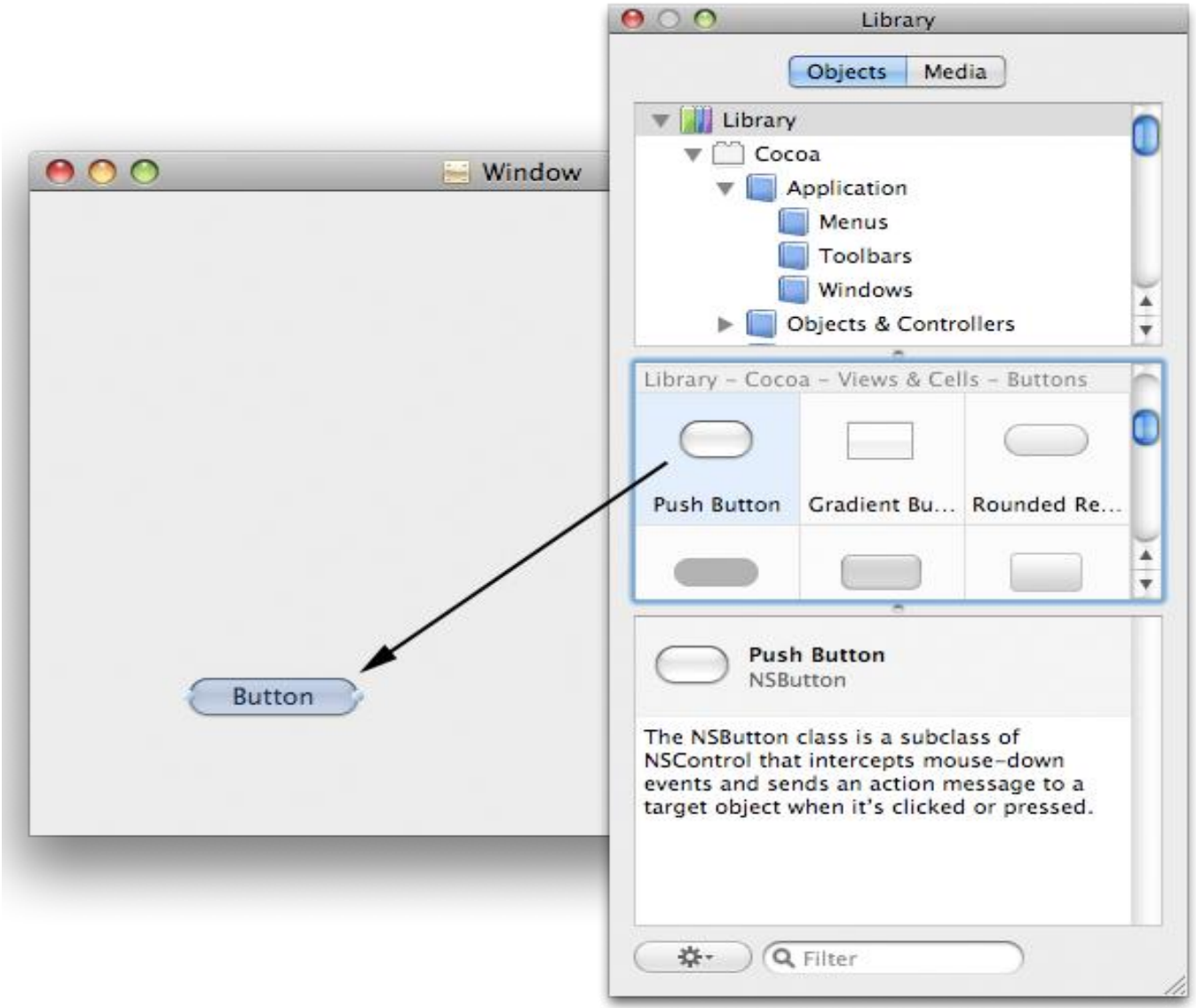
- CG- Computer is used to create a picture
- Image Processing – applies techniques to modify or interpret existing pictures such as photographs and TV scans
- Medical applications
  - Picture enhancements
  - Tomography
  - Simulations of operations
  - Ultrasonics & nuclear medicine scanners
- 2 applications 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