



GALGOTIAS
UNIVERSITY

**School of Computing
Science and Engineering**

Program: B.C.A.

Course Code: BCAS3003

Course Name: Computer Graphics

Vision

To be known globally as a premier department of Computer Science and Engineering for value-based education, multidisciplinary research and innovation.

Mission

- ❑ **M1:** Developing a strong foundation in fundamentals of computing science with responsiveness towards emerging technologies.
- ❑ **M2:** Establishing state-of-the-art facilities and adopt education 4.0 practices to analyze, develop, test and deploy sustainable ethical IT solutions by involving multiple stakeholders.
- ❑ **M3:** Establishing Centers of Excellence for multidisciplinary collaborative research in association with industry and academia.

Course Prerequisites

- Knowledge of Mathematics**
- Fundamental knowledge of Computer**

Recommended Books

Text books

- ❑ D. Hearn, P. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 1997

Reference Book

- ❑ Heam Donald, Pauline Baker M: "Computer Graphics", PHI 2nd Edn. 1995.
- ❑ Harrington S: "Computer Graphics - A Programming Approach", 2nd Edn. Mc GrawHill.
- ❑ Shalini Govil-Pai, Principles of Computer Graphics, Springer, 2004

Additional online materials

- ❑ Coursera - <https://www.coursera.org/learn/fundamentals-of-graphic-design>
- ❑ <https://www.youtube.com/watch?v=fwzYuhduME4&list=PLE4D97E3B8DB8A590>
- ❑ NPTEL - <https://nptel.ac.in/courses/106/106/106106090/>
- ❑ <https://www.coursera.org/learn/research-methods>
- ❑ <https://www.coursera.org/browse/physical-science-and-engineering/research-methods>

Introduction to Graphics

- ❑ Computer Graphics refer to the creation, storage, and manipulation of pictures and drawings using a digital computer.
- ❑ Computer Graphics has become an efficient tool for presentation of information in diverse fields such as science, engineering, business, industry, art, entertainment, etc.
- ❑ Graphic displays also improve understanding of complex systems and visualization of two-dimensional (2D), three-dimensional (3D) objects.

Introduction to Graphics

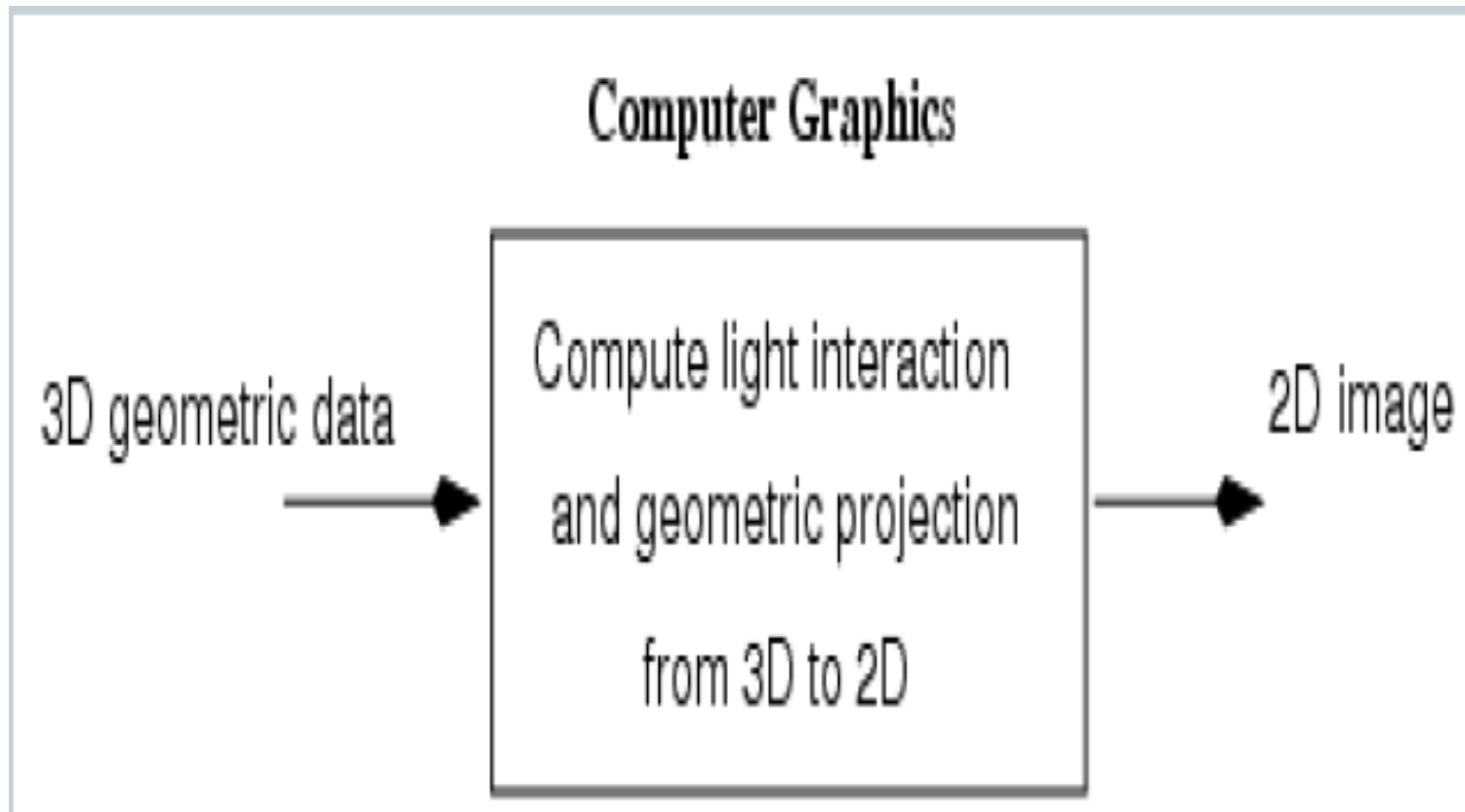


Figure 1: Computer Graphics System

Introduction to Graphics

Geographic Data

- ❑ Geographical Data is simply Longitude and Latitude. It is simply a collection of information that can describe objects and things with relation to space (Here space stands for position).

Geometric Data

- ❑ Geometric Data is simply mathematical properties (topology, metric, order). By these properties we could analyze the data. Simply says, It will refer to geometrical shapes in the application

Spatial Data

- ❑ Spatial Data is a mixture of Geometrical data and Geographical data.
- ❑ Example: A Country / State / City boundaries consist of multiple longitude and latitude. To separate or distinct with other Country / State / City, have to represent a Country / State / City with boundaries with the help of polygon shape. So, Geographic and Geometric data is tightly coupled together in terms of spatial application.

Introduction to Graphics

computer graphics

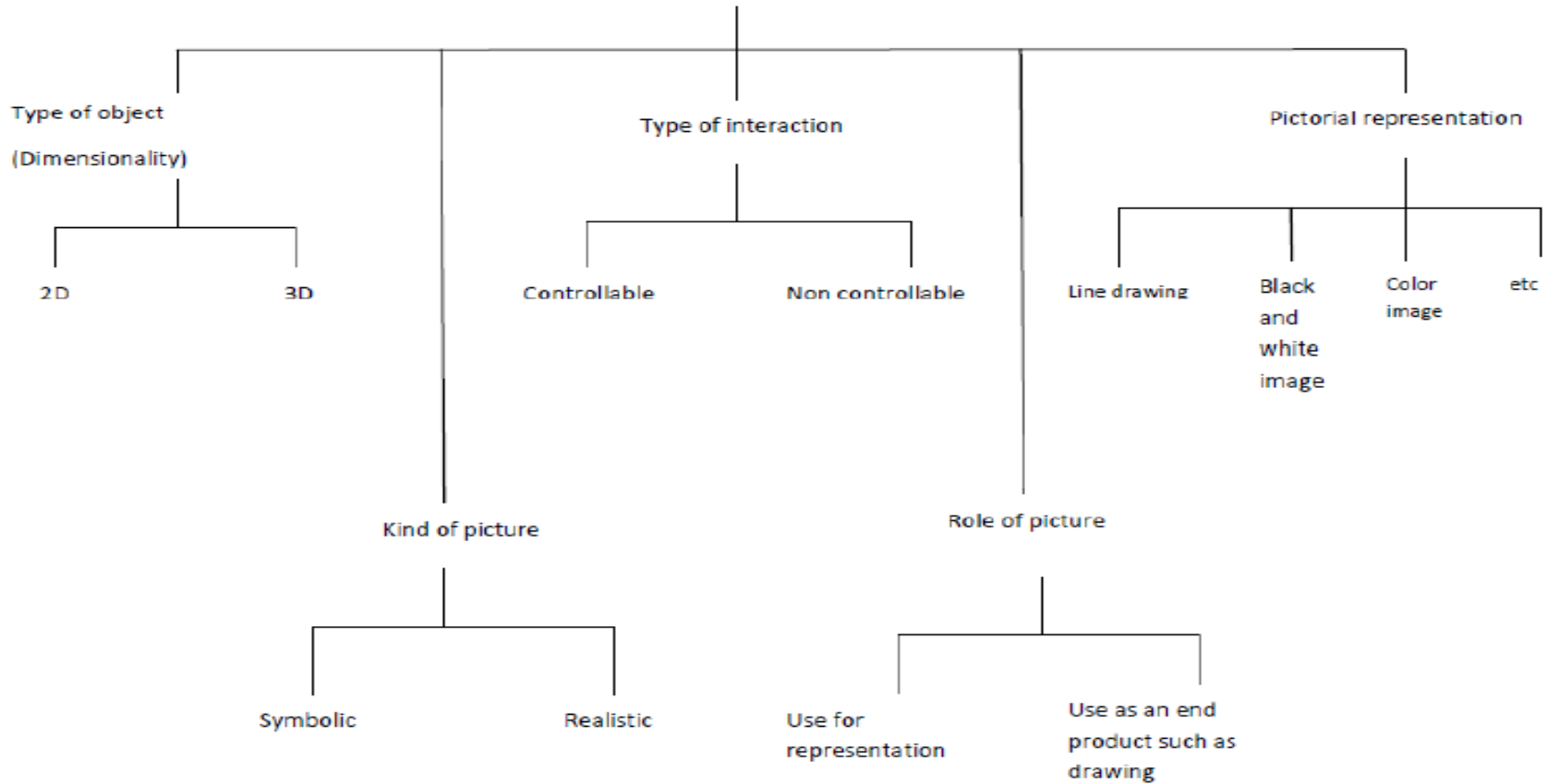


Figure 2: Computer Graphics System

Introduction to Graphics

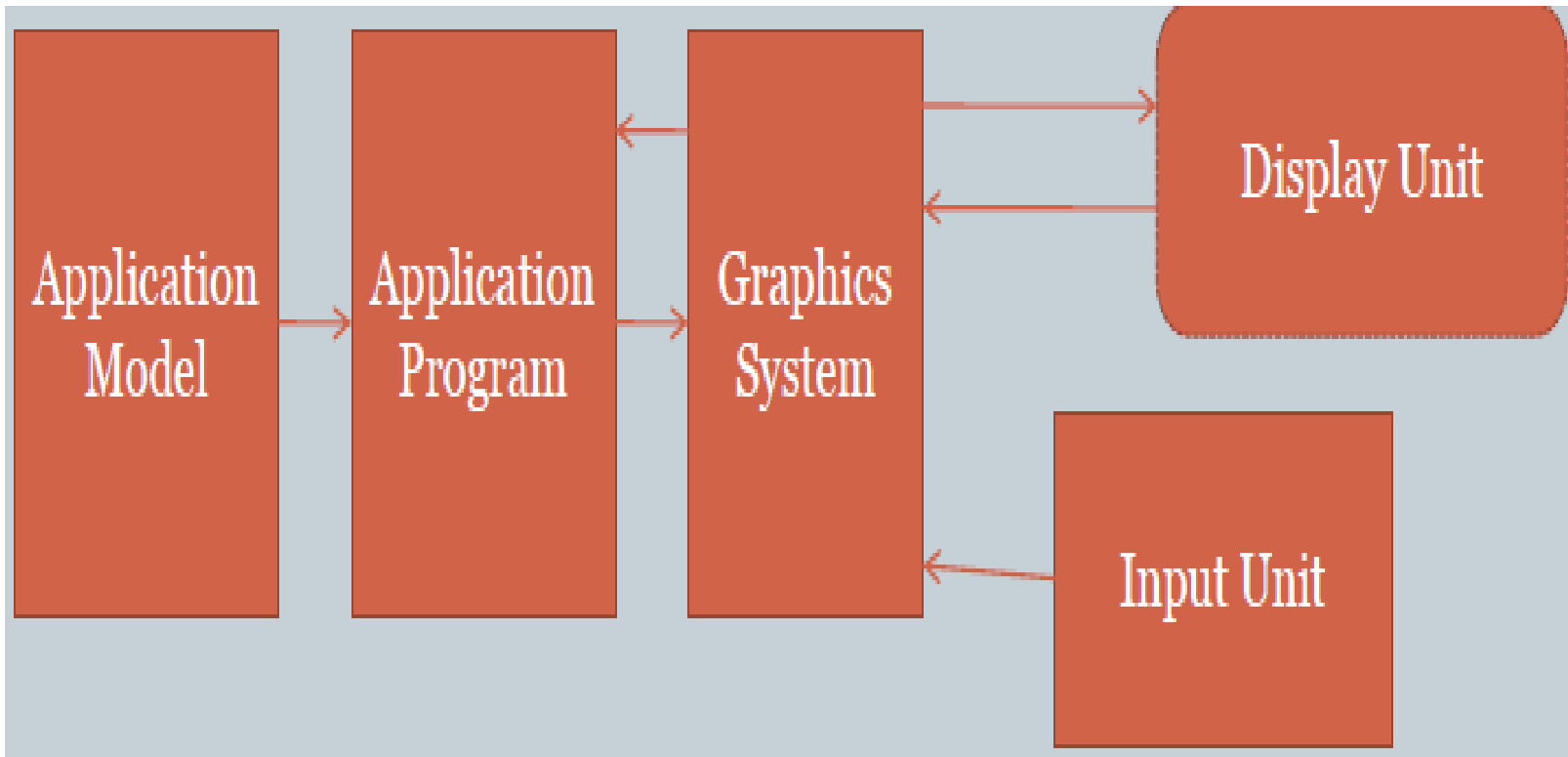


Figure 3: Interactive Graphics System

Introduction to Graphics

- ❑ Designer of computer graphics system or software engineer puts his design in application model.
- ❑ He/She will then writes the program to model the object he/she is planning to display.
- ❑ This application will run on the computer graphics system and output will be displayed on the display devices and the required input can be obtained from the input devices.

Introduction to Graphics

Advantages

- High quality graphics display provide best way to communicate with computer.
- It is possible to produce animation.
- It can be used to control animation such as speed, total scene in view etc.
- It provides facility of update dynamic which can be used to change shape, color and other properties of object in view.
- With the development in digital signal processing (DSP), it can provide audio feedback along with the video.

Introduction to Graphics

Application Areas

- Computer Aided Design(CAD)
- Presentation Graphics
- Computer Art
- Education and training
- Visualization
- Image processing
- Entertainment
 - Movies Industry
 - Gaming Industry
- Medical field
- Graphical User Interface(GUI)

Introduction to Graphics

Computer Aided Design(CAD)

- ❑ Major use of computer graphics is in design process, particularly for engineering and architectural systems.
- ❑ This include design of buildings, automobiles, aircraft etc.

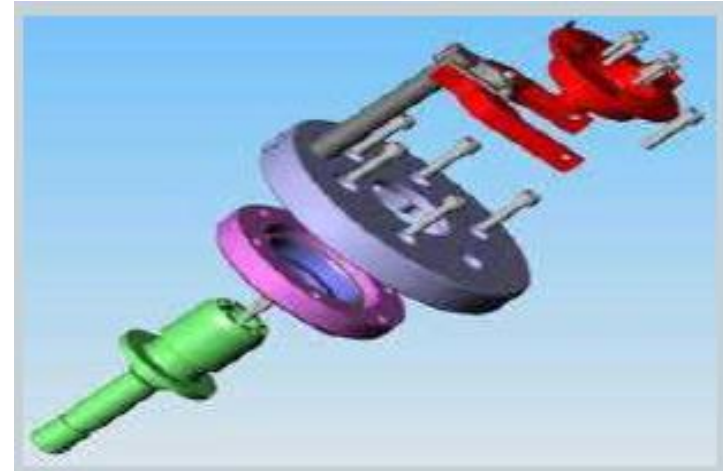
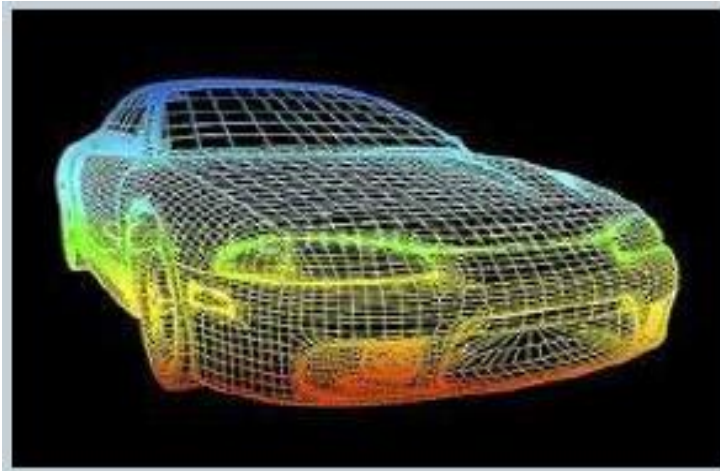


Figure 4: Example of CAD

Introduction to Graphics

Presentation Graphics

- ❑ Used to summarize the financial, mathematical, scientific and economic data.
- ❑ Typical examples are bar charts, line graphs, pie charts etc.

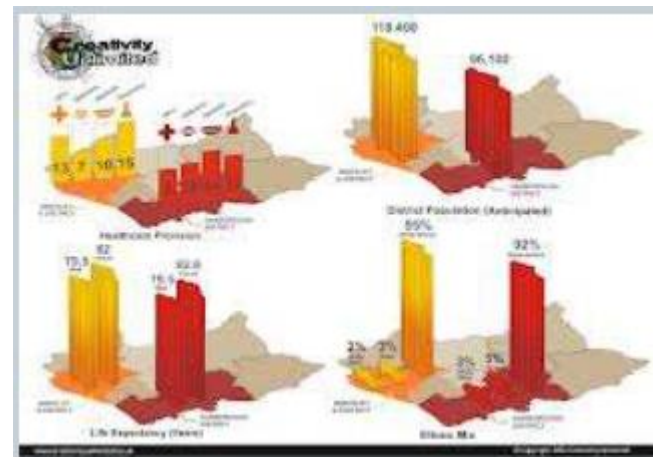
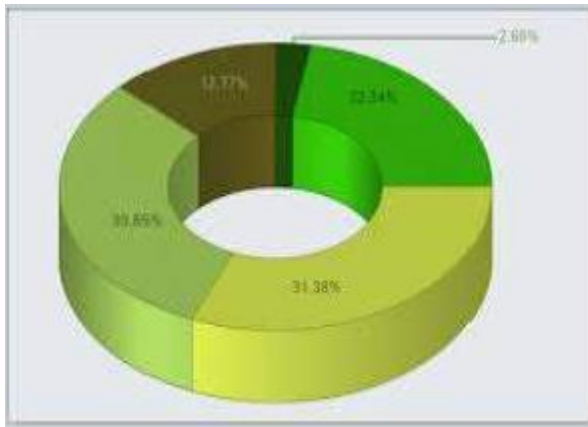


Figure 5: Example of Presentation Graphics

Introduction to Graphics

Computer Art

- ❑ Artist uses special purpose hardware and programs that provides facilities for designing object shapes and specifying object motion.
- ❑ Examples pixel paint, super paint etc.



Figure 6: Example of Computer Art

Introduction to Graphics

Education and Training

- ❑ Computer generated models of physical, financial and economic system are often used as educational aids.
- ❑ Various kinds of simulators program can be used to provide the trainings. E.g. automobile driving simulator.



Figure 7: Example of Education and Training

Introduction to Graphics

Visualization

- ❑ Various techniques can be used to represent the large amount of data obtained from scientific, medical or business analysis.
- ❑ These includes color coding, contour plots, graphs, charts etc.

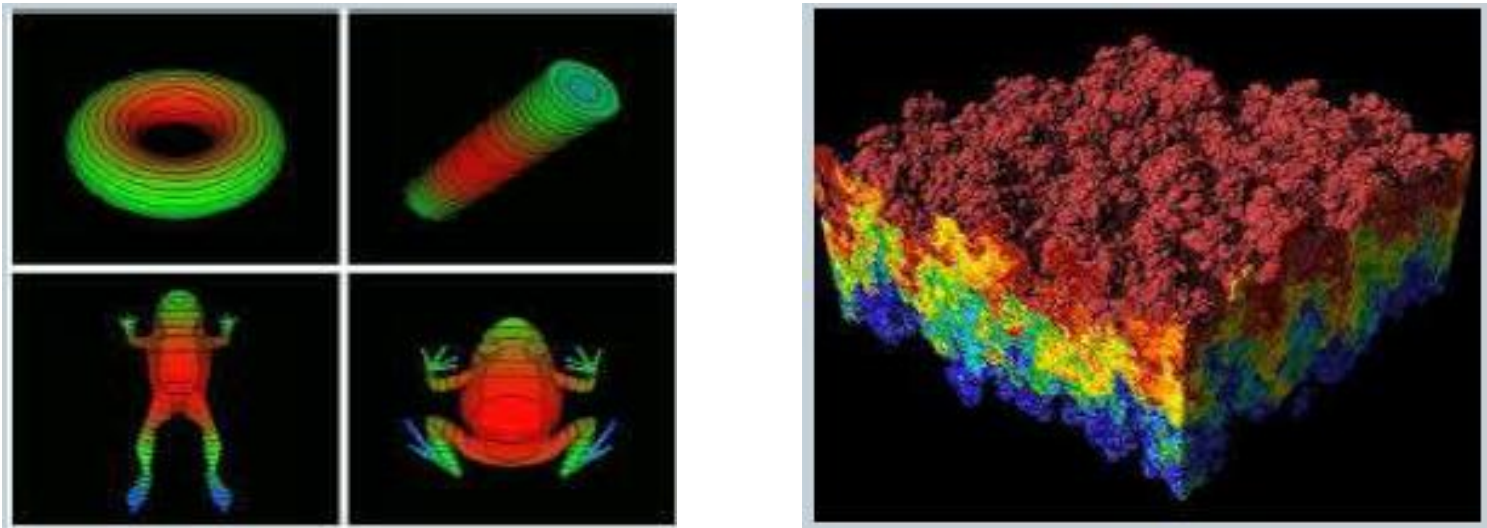


Figure 8: Example of Visualization

Introduction to Graphics

Medical Field

- ❑ Computer graphics can also be used to represent the various internal parts and process of the human body.

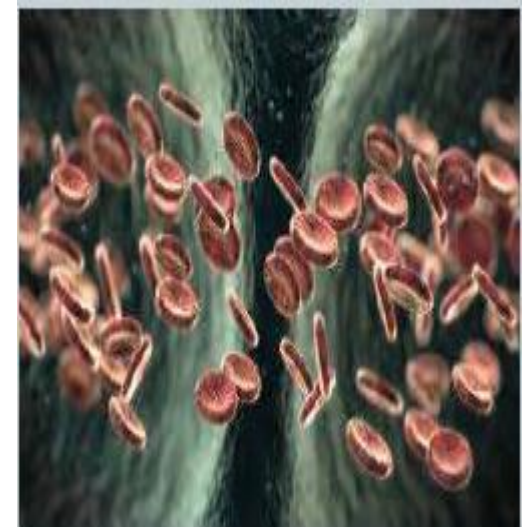
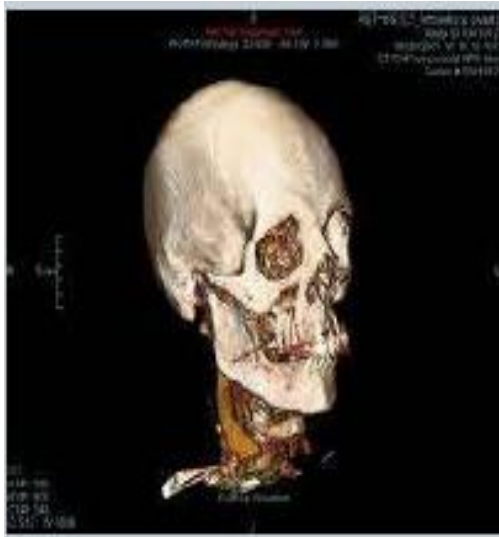


Figure 11: Example of Medical Field

Introduction to Graphics

Graphical User Interface (GUI)

- ❑ It is the interface of the software that communicates with the user with help of some input devices.
- ❑ It contains number of windows, menus and icons for fast selection of processing options.

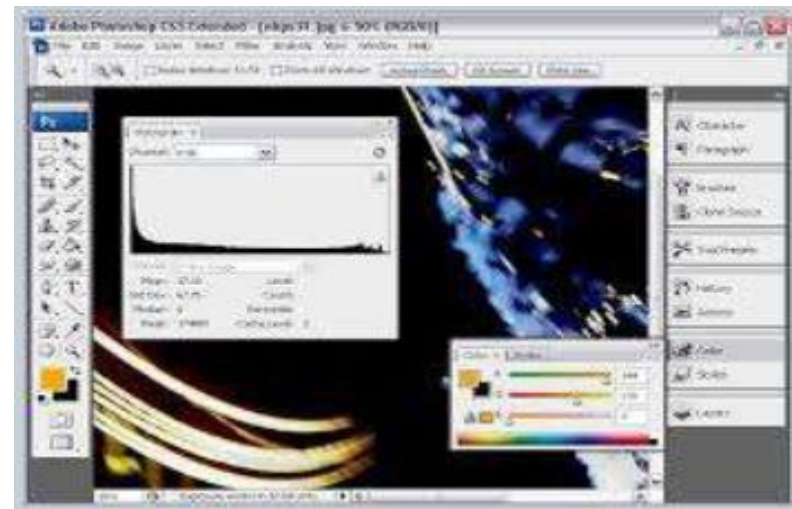
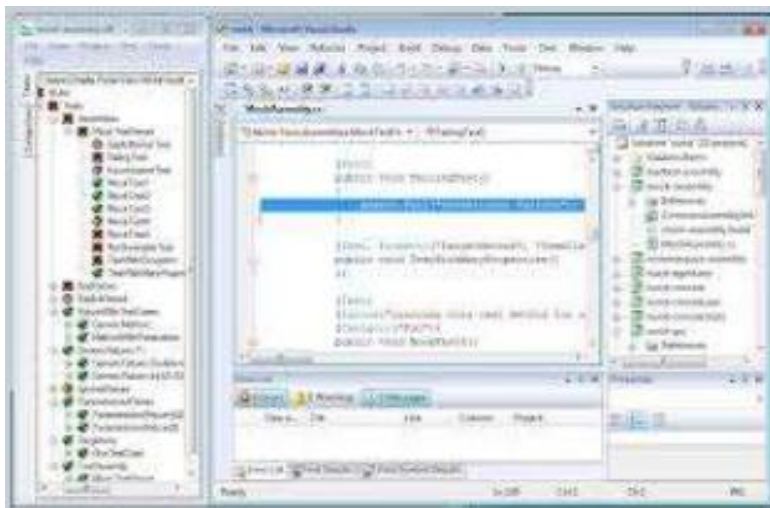


Figure 12: Example of GUI



Thank You