

Department Of Computer Science and Engineering
Kathmandu University
Dhulikhel, Kavre



Subject: Computer Graphics

Course: COMP 342

Level: B.E./B.Sc 3rd Year/2nd Semester

Credit Hours: 3

Prerequisite:

Computer science background: data structures, programming languages (such as C/C++).

Mathematics background: calculus, linear algebra, basic analytic geometry

Objectives:

This course will cover the basic concepts, mathematical foundations, fundamental theory and algorithms, software techniques, hardware and system issues, and application examples of computer graphics. The main topics will center on modeling, rendering, and interaction. It also encourages student to use OpenGL(graphics library)

Syllabus

1. Introduction to Graphics

- a. History of Computer Graphics
- b. Computer Graphics Areas and Applications
- c. Data Visualization and its applications

2. Basic Raster Graphics Algorithms for drawing 2D primitives

- a. Line Drawing Algorithms
 - i. DDA Algorithm
 - ii. Bresenham Line Drawing Algorithm
- b. Circle Generating Algorithms
 - i. Midpoint Circle Drawing Algorithm
- c. Ellipse drawing Algorithm
 - i. Mid-Point Ellipse Drawing Algorithm

3. Graphics Hardware

- a. Hardware Technology
- b. Display Technology
- c. Raster Scan Display Systems
- d. The Video Controller

4. Geometric Transformation (2D)

- a. Basic Transformation
 - i. Scaling
 - ii. Translation
 - iii. Rotation

- iv. Reflection
 - v. Shearing
- b. Matrix Representation and Homogeneous Coordinates
- c. Composite Transformations

5. Viewing in 2D

- a. The Viewing Pipeline
- b. Window and Viewport
- c. Viewing Transformation
- d. Clipping
 - i. Point Clipping
 - ii. Line Clipping
 - 1. Cohen-Sutherland Line Clipping Algorithm.
 - iii. Polygon Clipping
 - 1. Sutherland-Hodgeman Polygon Clipping Algorithm

6. Geometric Transformation (3D)

- a. Basic Transformations
 - i. Scaling
 - ii. Translation
 - iii. Rotation
 - iv. Reflection
 - v. Shearing
- b. 3D Viewing
 - i. The Viewing Pipeline
 - ii. Viewing Parameters
 - iii. Parallel Projection
 - iv. Perspective Projection

7. Chapter Six: Visible Surface Detection Methods

- a. Classification of Visible Surface Detection Algorithms
- b. Back-Face Detection
- c. Z-Buffer Method
- d. Scan Line Method
- e. A-Buffer Method
- f. Binary Space Partition Method

8. Chapter Seven: Illumination Models and Surface Rendering Methods

- a. Light Sources
- b. Illumination Models
- c. Shading
 - i. Constant Intensity Shading

- ii. Gouraud Shading
- iii. Phong Shading

9. Color Models and Color Applications

- a. Properties of Light
- b. Color Models
 - i. RGB
 - ii. YIQ
 - iii. CMY
 - iv. HSV
- c. Color Selection and Applications

10. Advanced Topics on Computer Graphics

- a. Computer Animation
- b. Morphing
- c. Ray Tracing

Textbooks:

Computer graphics: Principles and Practices by James Foley, S.K Feiner and J.F Hughes
Computer graphics: Donald Hearn and M. Pauline Baker