Surface Modeling and Rendering Techniques

Valeria Belmonti  Natacha Gueorguieva
valebelmonti@yahoo.com  natachag@postbox.csi.cuny.edu

The undergraduate course in Computer Graphics (CSC 470) is a one semester optional course offered once a year in the Fall semester and taught by Dr. Natacha Gueorguieva. Computer graphics students are expected to understand and write software that performs all three steps of the graphics pipeline: model building, transformations, and rendering.

Computer Graphics is concerned with all aspects of producing pictures or images using a computer. It goes from structuring the internal design of the object using a coordinate system, to converting those coordinates in terms of the system of the display, and to finally bring into being the image. Opposite to what many students believe, this procedure involves a amalgamation of theoretical mathematics and physics, rather than imagination and pure mental picture of scenes. This makes the subject more difficult to learn. Computer graphics students are expected to understand and write software that performs all three steps of the graphics pipeline: model building, transformations, and rendering.

Project Goals

➢ To develop additional instructional material for the course CSC 470 Introduction to Computer Graphics consisting of two main components: theoretical and practical. The theoretical component aims to provide students with fundamental concepts in computer graphics, covers methods for generating graphical objects with different geometric characteristics and realistic appearances and mathematical techniques. The aims of the practical component are to

- Assist and strengthen students' understanding of algorithms and methods.
- Teach students how to write effective and efficient computer graphics programs.

➢ To incorporate the following four modules into the above instructional material:

- 3D Modeling (parallel and perspective projections, clipping, transformations).
- Parametric Curves and Surfaces (types, definition, important properties, shape modification techniques, fundamental algorithms).
- Rendering (the Z-buffer algorithm, lighting).
- Realistic visualization (concept of visibility, shading, textures)

The goal was to design a system of instructional material that would expose students to Computer Graphics in a way that we hope will make it easier for them to understand the fundamental concepts of it, and to know the implementation of necessary mathematical theories and notions of physics.