**3D COMPUTER GRAPHICS AND ANIMATION**

**PROGRAMMING ASSIGNMENT 6**

**Difficulty: 4/5**

Create an application that simulates a viewer exploring a room. The room has 9 cubes. You decide the world coordinate of each cube. Each cube must have different colors.

A perspective projection is used for viewing; when the program runs, the user should see a one-point perspective view of (some of) the cubes.

The program must be able to:

* Move the camera forward, backward, and sideways.
* Rotate the camera left and right.
* Clip cubes (and part of cubes) that are out of the view volume.
* Change the front and back plane of the view volume.
* View other objects (not just cubes) by opening the data of objects from a file.
* Rotate the camera up and down.

Bonus points for user friendliness. Negative points for extreme user unfriendliness.

What to submit:

* An executable file
* The source code (and other libraries/files if necessary)
* A report.

The report should contain the following:

1. Introduction.

* Explain what the program is about.
* Explain in what language the program is implemented.

1. Basic theory.

* Explain how to transform a 3D object into a 2D image.
* Explain how to convert the WCS into VCS.
* Explain the main VCS parameters.
* Explain the parameters required to move the camera around the WCS and their relationship with the main VCS parameters.

1. Implementation

* Explain the main interface of the program and the components on the interface.
* Explain every feature in the program and how to use them.

1. Design

* Explain the main data structures (if any) used in the program.
  + Explain the data structure of the 3D world (the objects), the camera, and transformation matrix used in the program.
* Explain the main/global variables used in the program.

1. Evaluation

* Evaluate the following cases:
  + Moving the camera forward, backwards, and sideways.
  + Rotating the camera left and right.
  + Setting the visibility of far and near objects by changing the front and back planes.
* Include screenshots for each case. Explain whether each case is successful.

1. Work log.

* Record the date and time of every moment you work on this assignment and job description of each member at each session. The work log should be a table with the following columns:
  + Date
  + Activity / progress
  + Personnel involved
* Write a summary of the implementation of each requirement given in the first page. For each requirement, explain whether that requirement is fully implemented, partially implemented, or not implemented at all. Give explanations if necessary.

1. Conclusion and remarks.

* Explain whether the program works as expected.
* If some parts of the program do not work as expected, explain why.
* What are your comments about this assignment?

You must report your progress every week. The following features must be implemented during your progress report:

Week 1

* The program can display all 9 cubes.
* The user can move the camera forward and backwards.

Week 2

* The user can move the camera in four directions.
* The user can rotate the camera.

Week 3

* The program is able to clip (parts of) objects that are out of the view volume.

Submit the assignment no later than midnight, 2 November 2020, to [x60880@yahoo.com](mailto:x60880@yahoo.com).