Faculty of Informatics, Masaryk University

PA199

Assignment One

Advanced Game Design

Deadline: 24th March 2015

1st Assignment

Implement a set of computer graphics libraries in C++

Your assignment represents 30% of the module mark.

Task

The aim of the assignment is to implement from scratch a set of computer graphics classes that will be used for creating the physics components of different interactive computer games.

Specification

Based on the vector theory you should implement a 3D vector class in C++ which will be used as a basis for the rest of the course. Based on the matrices theory you should implement a 3×3 matrix class in C++ which will be used as a basis for the rest of the course. Based on the ray theory you should implement a ray class in C++.

Minimum Implementation

The basic implementation should include the following:

- A 3D vector class, which you can call TVector, with three components (x, y and z). Define the 3 components as doubles.
- A 3×3 matrix class, which you can call Tmatrix, with a two-dimensional array (i.e. double _Mx[3][3]).
- A Ray class which will be based on the vector and/or matrix class.

The following functions should be included:

- Unit vector (for vector class)
- Magnitude of a vector (for vector class)
- Invert a vector (for vector class)
- Add two vectors (for vector class)
- Subtract two vectors (for vector class)
- Dot product vector (for vector class)
- Cross product vector (for vector class)
- Addition (for matrix class)
- Subtraction (for matrix class)
- Multiplication (for matrix class)
- Transpose (for matrix class)
- Inverse (for matrix class)
- Calculate distance between two rays (for ray class)
- Calculate distance between a ray and a point (for ray class)

Note that you will need to use mathex.h C++ library for mathematical operations.

Extra Features

Extra credit will be given for adding more features to the classes. Some examples might include:

- Implement a place class
- Implement a camera class
- Implement advanced rotations