Assignment 4 Software Design Document

CS2300 Section 4 Fall 2021

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Project Description

The purpose of this program is to read a series of numbers from a matrix and then to perform many calculations on them. The calculations are divided into three sections, and each section has a method associated with it. SectionA attempts to treat the numbers as points of triangles. The triangles are then culled if they are inviable, and the intensity of light shining on the triangles is calculated. Part B projects the lines onto a plane and returns the point it projects onto. It then does the same with perspective. Finally, it calculates the distance to the plane. This last part is in part C of the assignment, but it makes much more sense to do it in part B, because I am already making calculations with the points. Finally in part C, the points are treated as a line and many triangles. whether a line passes through the triangle is calculated as well as the point it passes when it does hit.

Two classes hold many methods for doing calculations. Vector, which holds methods for doing vector math, and Matrix, which holds methods for doing matrix math as well as the constructor which reads the file.

Approach

Because much of the work on this assignment regarded matrix transformations, I created a vector class and filled it with many methods to perform those for me. A matrix class holds a method to calculate the determinant of a 3x3 matrix and another to calculate its inverse. These are used in Part C.
Because the constructor for the matrix class reads the file, the main() is very empty.

Detailed Design

I wrote this language in java.

It has three major methods that do most of the work.
partA(), partB, and partC

Part of the Part C part of the assignment is done in partC in the program.

partA treats the numbers from the test file as points of a triangle. The program culls any triangles which cannot be seen, and then determines how bright a light is based on their orientation

partB treats the numbers as points above a plane. The projection of those points onto the plane is calculated two ways. First without perspective and then with perspective. Finally, the distance from those points to the plane that holds that triangle is calculated. This part is removed from part c of the assignment, it makes much more sense here.

partC creates a line in space and many triangles. It then determines if that line passes through those triangles, and if it does, it determines the point of intersection. To accomplish the matrix math, a method in the Matrix class finds the inverse of the matrix. A second method must find the determinant to accomplish this

It has two classes which do some of the math:
Vector and Matrix.
Vector holds methods to do vector transformations such as adding, subtracting, scaling, making a unit length.
Matrix has the instructions to read the file in its constructor as well as some methods to do matrix math:
One to find the determinant of a 3x3 matrix when passed as 3 vectors in 3d space, the second to find the inverse of a 3x3 matrix.