Assignment 3 Software Design Document

CS2300 Section 4 Fall 2021

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# Project Description

The purpose of this program is to read a matrix and then perform some calculations on it. It begins by interpreting the matrix as a two by two matrix( a pair of vectors) and a point.

it solves for the x which would result in the point when multiplied by the vectors. it determines if the matrix is rank deficient, and returns that also. it then moves on to calculate the eigenvalues, and eigenvectors of the matrix. it resolves by calculating the eigendecomposition of the matrix. lastly, it treats the matrix as three points in space. it calculates the area of the volume of the triangle enclosed inside these three points. It calculates the function of a plane which passes through these points. and then it calculates the distance of the point to the plane

# Approach

I believed I could offload much of the work in this assignment to a Matrix class, but it did not work very well because we didn't really treat the matrices like matrices in this assignment.

Most of the work is done in four methods, one for part A, one for part B, and two for part C. the text documents are read in the constructor for the matrix class.

# Detailed Design

I wrote this language in java.

It has four major methods that do most of the work.

**findProductMatrix()**

finds an x such that the top left 2x2 matrix multiplied by x will result in b, the vector representing the top right part of the matrix.

**calculateEigenThings()**

This method calculates the eigenvalues, the eigenvectors, and the eigendecomposition, if those things exist for the top right 2x2 matrix.

**calculateAsPoints()**

This method calculates the area of a triangle with the three points as corners. It then treats the first two as points, fins the line that connects them, and finds the distance of the third point to the line.

**calculate3D()**

This method finds a vector normal to a plane created by the three points, finds the equation of the plane, and then calculates the distance to that plane.

Additionally, some of the work is done in the matrix class, including a method to multiply a 2x2 matrix with another, and a method to transpose a 2x2 matrix. A constructor in the Matrix class reads the text files.