CS 33400
Fall 2010
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Due: Tuesday September 7 at 6:00am

Assignment 1—Vectors, matrices, transformations

In a nutshell

Implement a 3D vector class and a 3x3 matrix class. Illustrate your classes by rotating a point about an arbitrary axis.

Details

1. 3D vector class
   - Stores 3 floats.
   - Constructor from 3 floats.
   - Read/write access to elements with square brackets operator.
   - Stream I/O using << and >> operators.
   - Normalization.
   - Length.
   - Dot product (choose operator).
   - Cross product (choose operator).
   - Multiplication/division with scalar (use operator).
   - Addition/subtraction with another vector (use operators).
   - Rotate point about arbitrary axis. Parameters are 2 points to define axis and a scalar (float) to define the rotation angle in degrees.
   - Rotate vector about arbitrary axis.
2. 3x3 matrix class
   - Stores 3 3D vectors
   - Constructor: identity matrix.
   - Constructor: rotation about {x|y|z} axis alpha degrees.
   - Read/write access to rows and columns.
   - Matrix inversion.
   - Matrix transposition.
   - Matrix times column vector.
   - Matrix multiplication.
   - Stream I/O using << and >> operators.
3. Example
   - Rotate a point about an arbitrary axis 360 times with 1^o increments. Plot the x, y, and z coordinates of the point as functions of the rotation angle. One graph, 3 curves. Choose your favorite graphing tool (e.g. Matlab, Excel, etc.) You choose the point and the arbitrary axis, but specify the point, the axis origin,

and the axis direction in a text file called README.txt. Save the graph in an image file called GRAPH.<ext>, where the extension depends on the file format chosen. Use a popular file format such as tif, jpeg, bmp, etc.

Turn in

- Submit your code, README.txt and GRAPH.<ext> files via Blackboard

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