

COMPUTER GRAPHICS CISC 4/640 Fall 05

Programming Assignment-4 (Due on Nov. 10 '05 (Thu.) by 10PM.)

Enhance your existing graphics software to include the following operations on 3D world coordinates:

1. Read a polygon or set of polygons (object) and display its projection. User should be able to pick either orthographic or perspective projection type.

i) In case of orthographic, user should be able to choose front/side/top view.

ii) In case of perspective, assume the simple case where projection plane is at $z=0$ and the center of projection is at $z=-d$ (user should be able to change "d").

-Remember to use M' perspective projection matrix. i.e, $X_p=x/[(z/d)+1]$, $Y_p=y/[(z/d)+1]$

-Use viewport coordinates for the projections, and all transformations

2. Apply any specified sequence of 3D transformations to the displayed polygon or object. Calculate the polygon/object-center and rotate it around that point instead of origin. The program is to be designed such that user can select the polygon/object and the transformation sequence and associated parameters from displayed menus (and corresponding keyboard entries), and the composite transformation is then calculated and used to transform the polygon/object. Display the original polygon/object and the transformed polygon/object in different colors.

3. User should also be able to use mouse in order to translate, rotate and scale the polygon/object. Remember that for rotation you need to prompt how to distinguish from the rotation w.r.t different axes. For example, you can use left mouse button for x-axis rotation, right mouse button for y-axis rotation and middle mouse button for z-axis rotation. For those having only two mouse buttons, pressing both buttons at a time will substitute for the middle button.

4. User should be able to edit the polygons/objects existing on the screen (add/delete). Delete can be done by selection of the polygon/object (using similar strategy as before). Since adding 3D polygons through mouse is a little long-winded (for example, what would be the best strategy to specify z using mouse?), I am leaving that out as an option. Adding polygons/objects through files at any instance should be accommodated.

5. (4/640 EXTRA CREDIT: 2 points) Animate the object by incrementally rotating it about x, y, or z-axis. Use appropriate approximations to the trigonometric equations to speed up the calculations, and reset the object to its initial position after each complete revolution.

Do not assume polygons to have only 3 sides.

Format of the Data is as Follows. Other sample files are available at the class web-page.

```
g
# 5 vertices
v 50 50 50
v 200 50 50
v 200 200 50
v 50 200 50
v 125 250 100
g surface
# 5 polygons
f 1 2 3 4
f 1 2 5
f 5 2 3
f 5 3 4
f 1 4 5
```