CSCI4810/6810
Program 4 (Assignment 3)

Due Date: July 25, 2020 (Saturday – 11:59pm Georgia time-zone)

This programming assignment is almost identical to the example we discussed during one of the lectures on Perspective Projection (refer to the document "rough-notes-07-13.pdf"; in particular, see pages 15 through 18.)

Consider the 3D object shown (refer to the next page of this document). The coordinates of the ends of the lines are all provided in terms of the Eye-Coordinate-System (ECS) – reminder: this would mean that the origin of the ECS is at 0,0,0 and the Z axis of ECS shows the line of gaze (the viewing direction). Assume that the distance from the viewpoint/eye to the center of the screen is 2.5 cm (ie, D=2.5); the screen (virtual and physical) is a square with side equal to 100 cm (ie, S=50 cm); the physical screen resolution is 1000X1000 pixels (feel free to use smaller resolution if this is too big for your computer); assume that the viewport's size is the same as the screen (ie, Vsx=Vsy=Vcx=Vcy=500).

- Write a function to display a 3D object using Perspective Projection.
- Write a function to apply a 3D Translation to a 3D object.
- Write a function to apply a 3D Scale (Basic) to a 3D object.
- Write a function to apply a 3D rotation (Basic) to a 3D object
- Add any other misc functions to your program (such as: line scan-conversion, …).

Embed the above functions into a complete program. **Experiment** with your program (by using different images, changing various parameters, such as changing: screen size (S), distance from the screen (D), number of pixels, applying various transformations, and others). Write-up a report (discuss your experimentation + your findings + interesting results + …); your report should be between 8 and 10 well written pages (single spaced; font size of 10) including the screen-shots showing the resultant pictures. The report should be self-contained (but no need to describe the algorithm in your report). Explain the impact of changes to the parameters and the reasoning behind the results you obtained.

NOTES:
The routine which does the Perspective Projection must be able to handle any 3D image (not just the one shown in this document). There is no need to clip the lines. Apply the transformations in such a way that the resultant image would be viewable on your screen.

Refer to the next page of this document to see the 3D picture (example) and also the description as to what to submit and how to submit your assignment.

(40 points)

What and how to submit your assignment:

Include all the followings in a directory on your computer:

- Your source program(s) – it should be well documented with in-line comments.
- Your Report in docx format.

Submit/copy the assignments on ELC so that the TA + Professor can view them for grading.

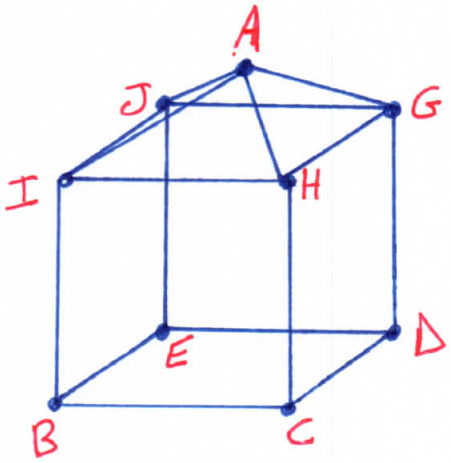
In case of questions about the submission steps, you can contact Mr. Fukun Liu (your TA) with email addresses: fl79416@uga.edu and Fukun.Liu@uga.edu (and CC your email to: hra@uga.edu).

If you have any questions about the assignment, feel free to call my cell at 706 340 4707 (you can call me between 11:00am and 5:00pm daily, 7 days a week). However, I will NOT be reachable between July 24 through July 30, 2020 (no access to email).

3D Image/Object:

Coordinates are given in terms of Xe, Ye, Ze (ie, in terms of the ECS):

I	(50, 150, 10)
B	(50, 0, 10)
C	(150, 0, 10)
D	(150, 0, 100)
E	(50, 0, 100)
H	(150, 150, 10)
G	(150, 150, 100)
J	(50, 150, 100)
A	(100, 200, 45)



The image is composed of 9 vertices and 16 lines – the lines are:
A to C; C to D; D to E; E to B; I to J; J to G; G to H; H to I; I to B; H to C; J to E; G to D; A to I; A to J; A to G; A to H.