**ClassAssignment1 report**

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**Requirement**

I implemented all of this requirements.

First of all, I set the camera position at (0,3,3) // eye = np.array([0.,3.,3.])

And set target point at (0,0,0) // at = np.array([0.,0.,0.])

By using global variable eye, at, I use them for gluLookAt parameter.

First, I make Orbit and Panning.

For this, I set the global variables gCamAng, gCamHeight, left\_m, right\_m, dx, dy, befx, befy

And in button\_callback(window, button, action, mod) function, when I press left mouse button, set left\_m 1 for Orbit. And when release it, reset it by 0.

Also, when I press right mouse button, set right\_m 1 for Panning. And when release it, reset it by 0.

And in cursor\_callback(window, xpos, ypos) function, I save the before xpos and ypos in befx, befy.

When I press left mouse button or right mouse button, if mouse position is changed, I change the gCamAng, gCamHeight, dx, dy.

Rotate the eye point from target point. By using gCamAng, rotate it for y axis and by using gCamHeight, rotate it for x axis. For this, we can use Orbit.

And by using dx, move the camera position and target point u axis direction, and by using dy, move the camera position and target point v axis direction.

And I use the global variable dz for Zooming.

And in scroll\_callback(window, xoffset, yoffset) function, when wheel movement is detected, I change the dz.

And in render, by using dz, move camera position w axis direction.

And by using drawX, drawZ, drawXZ function, I draw a rectangular grid with lines on xz plane.

And by using drawFrame, I draw x, z axis.

And by using matrix stack and use drawUnitCube function, I create an animating hierarchical model. One blue box is root, first level, and four red box is second level, and for green box is third level. So it have at least 3 levels.

**Screenshot.**

Start screen -> Orbit -> Panning -> Zooming



