CS 460
HW-3
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Problem Statement

- **Part A:** Implementing 3D viewing with an active virtual camera. Creating a 3D viewing environment with a perspective view using an active virtual camera. The camera's position, orientation and field of view should be adjustable. Implementing several basic functions of the virtual camera including Roll, Pitch, Yaw and Zoom (translate the virtual camera along its viewing direction).

- **Part B:** Constructing a graphical model by composing a number of primitive models. Implementing series of geometric transformations to construct a "lever" object using the primitive models "cylinder" and "sphere", and performing the rotation of the "lever" in a specified orientation.

Algorithm Design

There are three main files of this program: menu, display and main. Functions for the display file; **setup, display, projection, RenderGLScene, RenderGLScene2, DrawGround, RollUp, RollDown, PitchUp, PitchDown, YawUp, YawDown, SlideUp, SlideDown, leverPlus, leverMinus.**
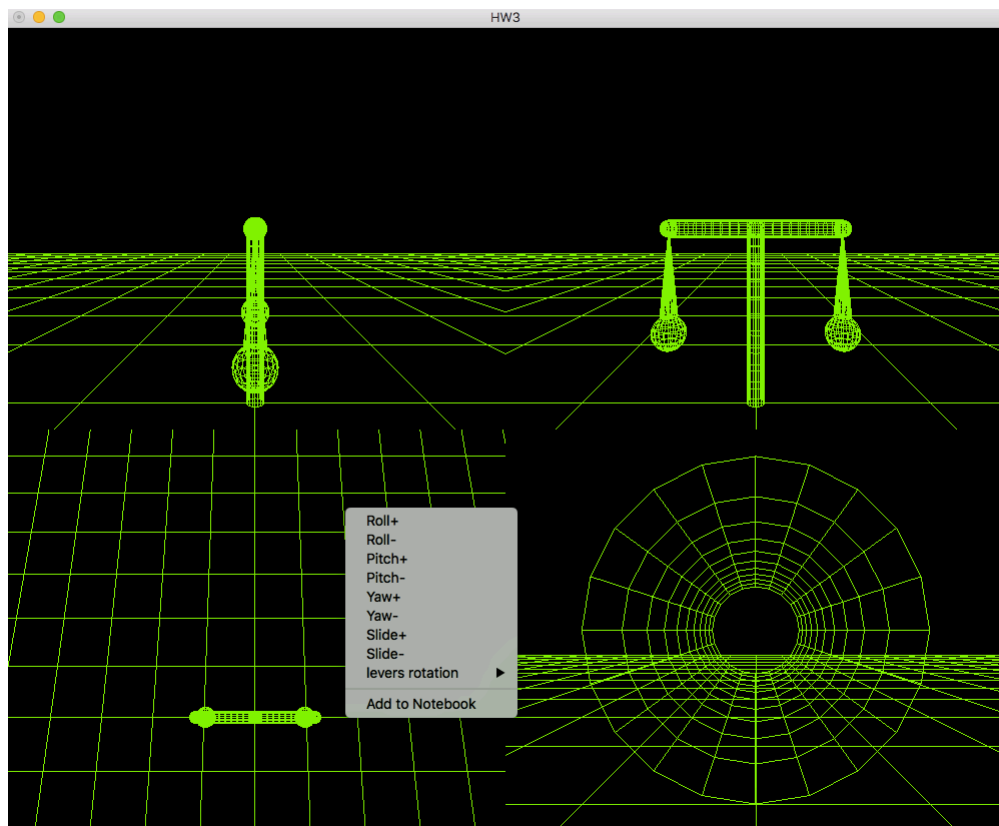

Figure 1: V1,V2,V3,V4 and Menu

Program creates a window that shows a four viewports called V1(lower-right), V2(lower-left), V3(upper-left) and V4(upper-right). V1 shows the active virtual camera view. V2, V3 and V4 shows the static virtual camera view at three different locations to view the constructed object. V2 shows the top view, V3 shows the side view and V4 shows the front view of the object. All four views are defined as perspective projections.

Menu contains Roll+, Roll-, Pitch+, Pitch-, Yaw+, Yaw-, Slide+, Slide- and lever rotation(sub menu) -> + , _options.

- **setup** function displays black background.

- **display** function divides the window to four viewports by calling **glViewport**, sets the perspective by calling **projection** function, sets the camera view by calling **gluLookAt** function and calls the **RenderGLScene** and **RenderGLScene2** to draw the cylinder for V1 and lever object for V2, V3 and V4.

- **projection** function sets the perspective of the view.

- **RenderGLScene** function draws a cylinder by using gluCylinder.

- **RenderGLScene2** function draws the lever object by using gluCylinder, gluSphere, glRotatef and glTranslated functions.
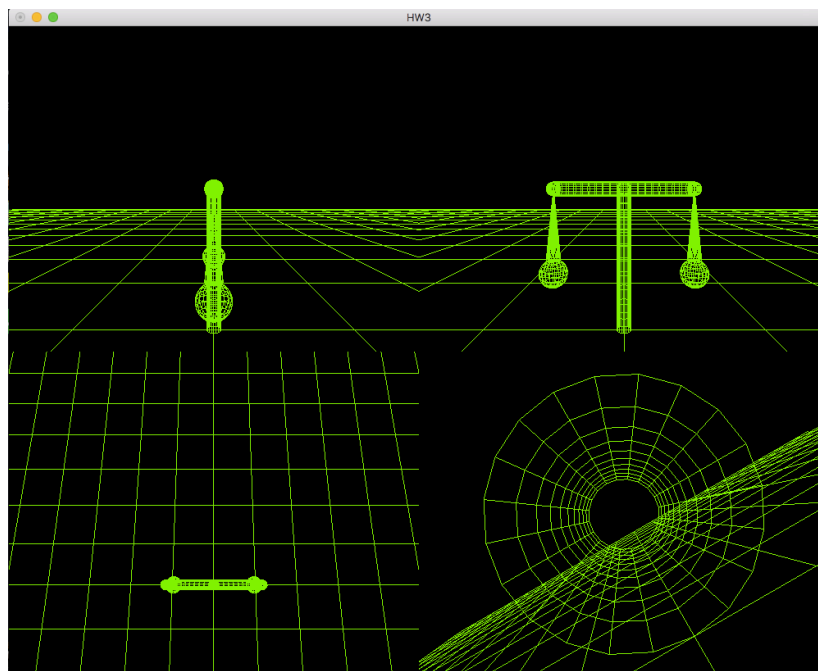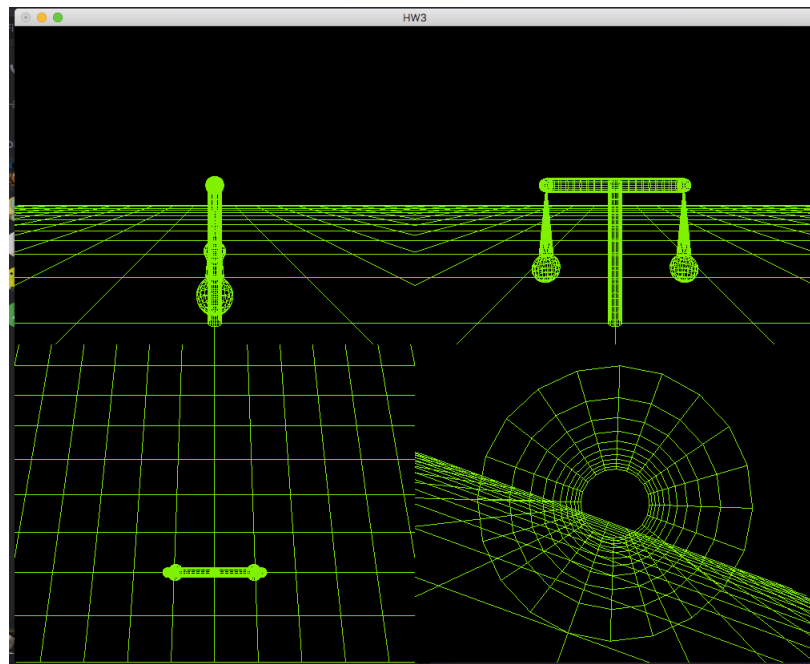

Figure 2: V1 --> Roll+
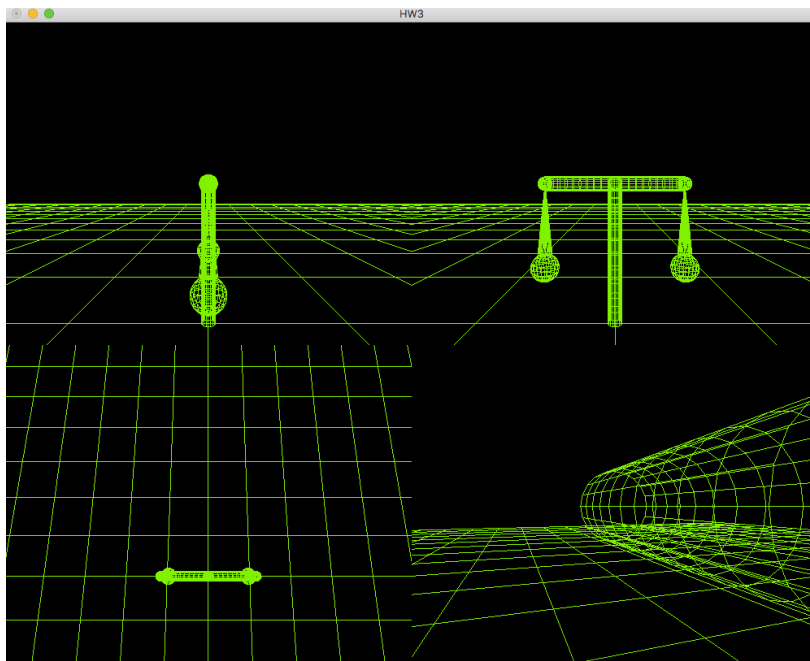
Figure 3: V1 --> Roll-
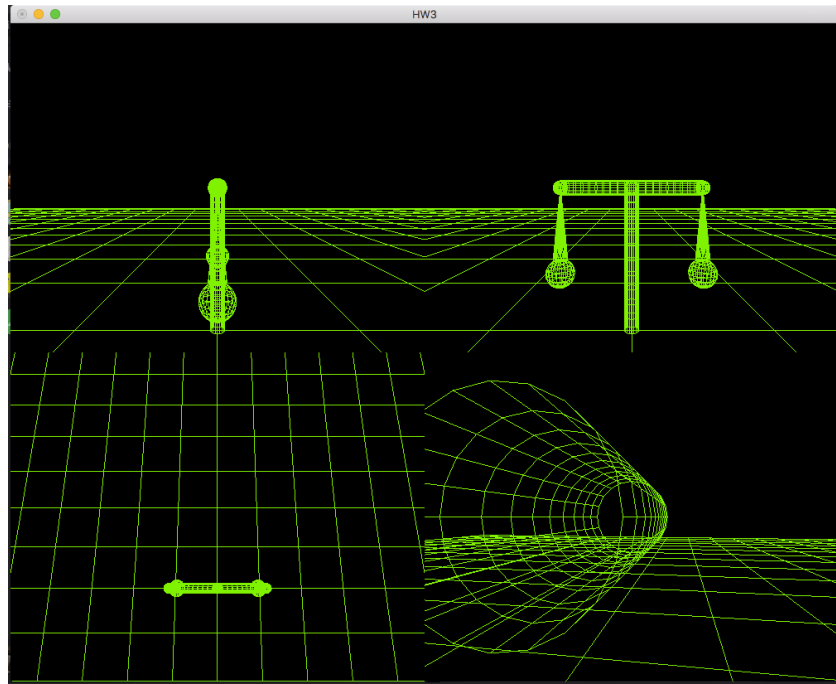

Figure 4: V1 --> Pitch+

Figure 5: V1 --> Pitch_

- **DrawGround** function draws the ground.

- **RollUp** function rotates camera around +n axis.

- **RollDown** function rotates camera around -n axis.

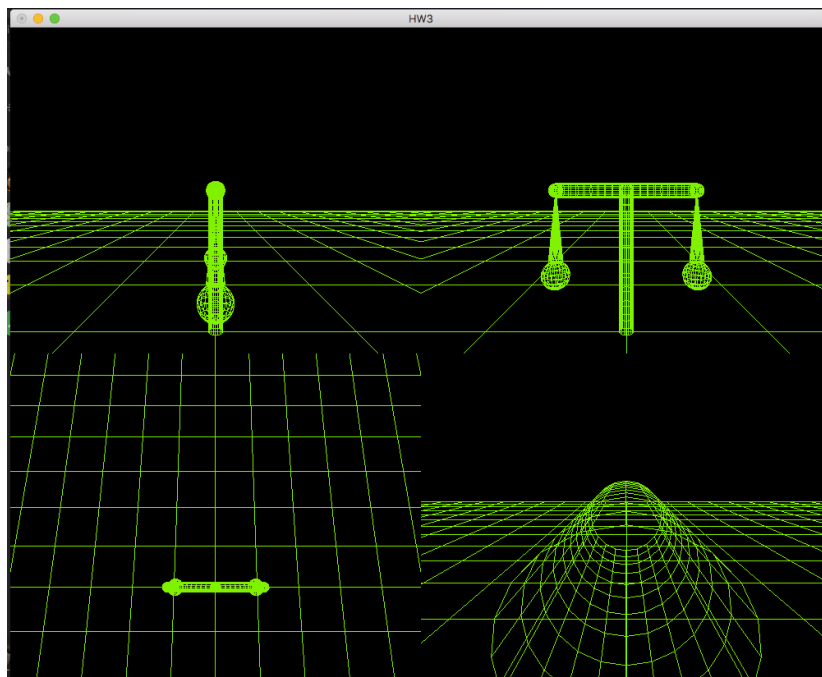- **PitchUp** function rotates camera around +u axis.
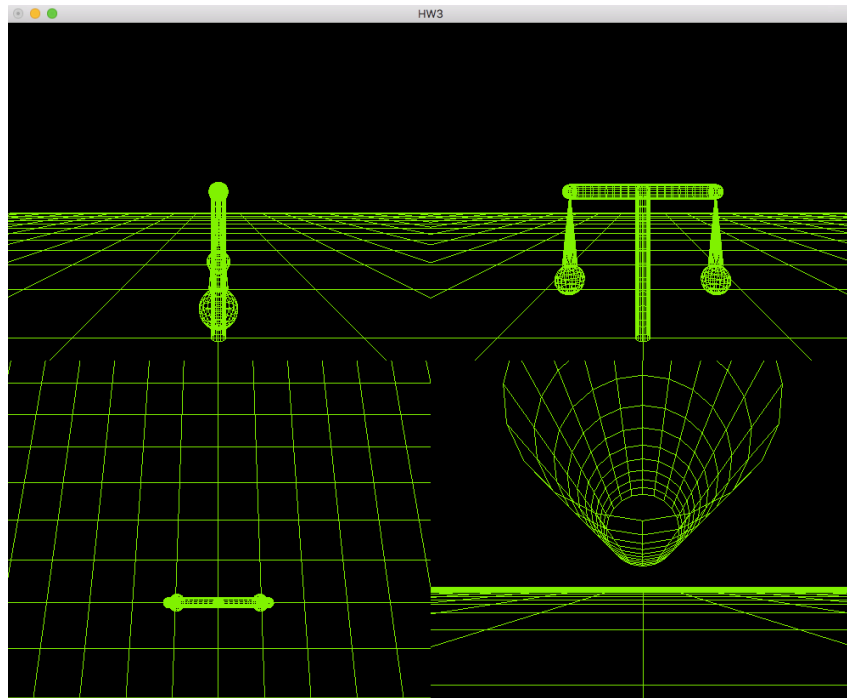

Figure 6: V1 -> Yaw+

Figure 7: V1 -> Yaw-

- **PitchDown** function rotates camera around -u axis.

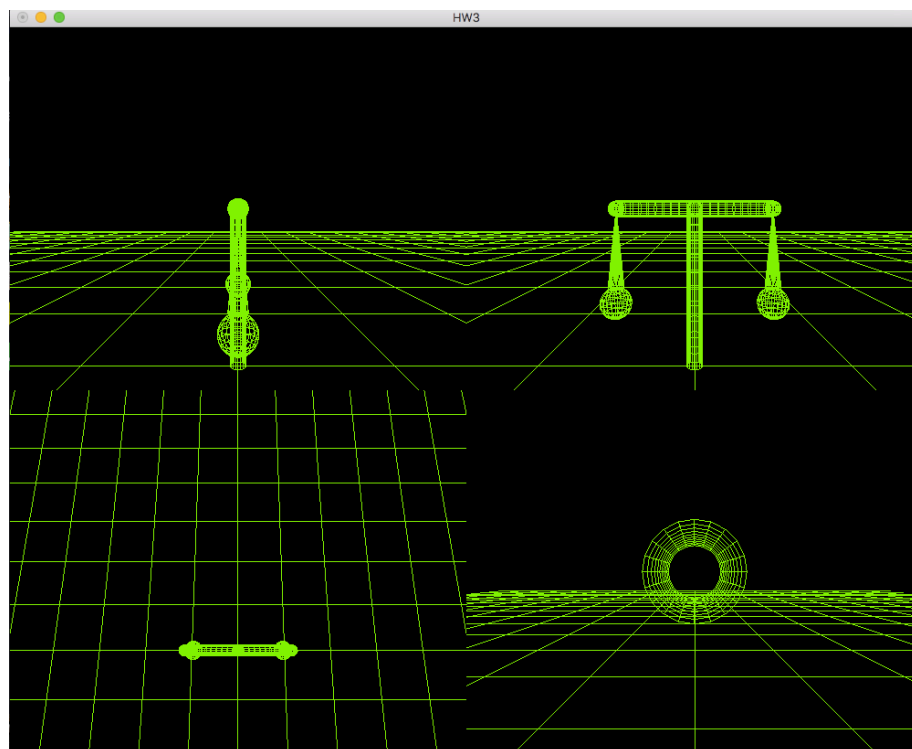- **YawUp** function rotates camera around +v axis.
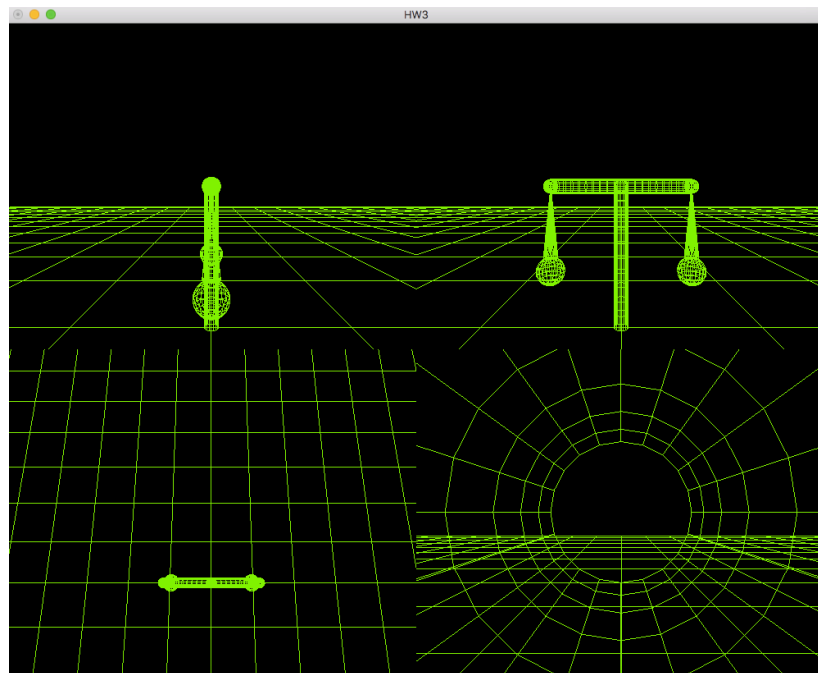

Figure 8: V1 -> Slide+

Figure 8: V1 -> Slide-

- **YawDown** function rotates camera around -v axis.

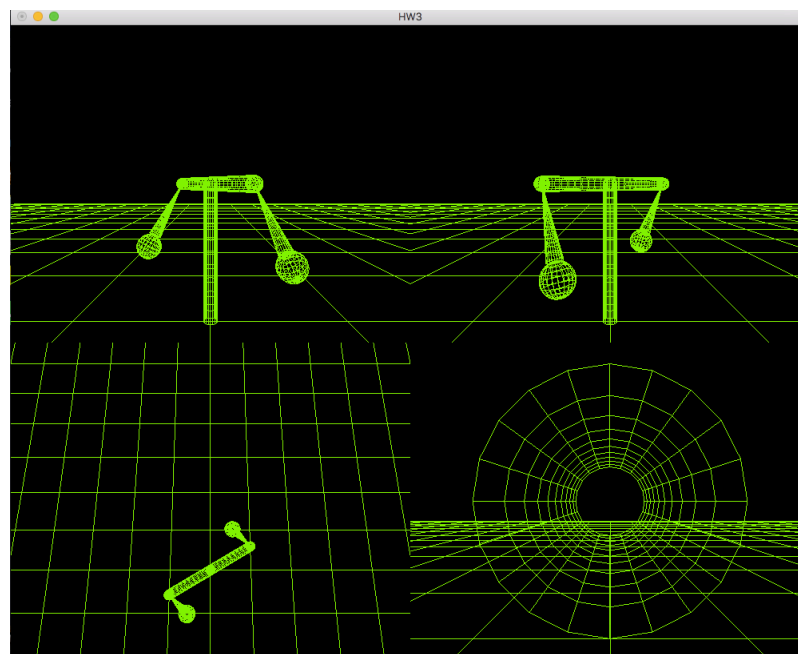- **SlideUp** function translates the camera along its own viewing +axis.

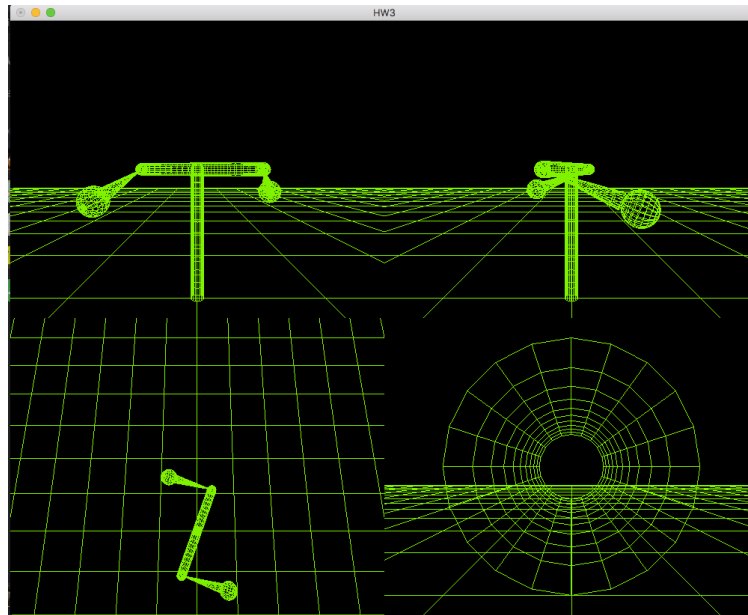**Figure 9: V2, V3 and V4 rotates lever 10 degree**

Figure 10: V2, V3 and V4 rotates lever 10 degree

- **SlideDown** function translates the camera along its own viewing -axis.

- **leverPlus** function rotates S2, S3, B1 and B3 parts of the lever +10 degree.

- **leverMinus** function rotates S2, S3, B1 and B3 parts of the lever -10 degree.

How To Run

There is a Makefile in the folder. You can run with command **./project** after **make**.