Assignment 2: Transforming, Viewing and Projection

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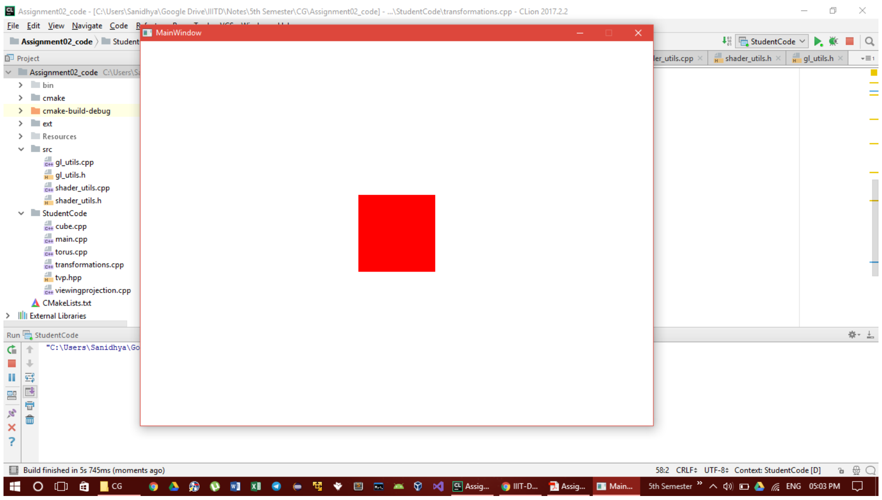
Initial Run:



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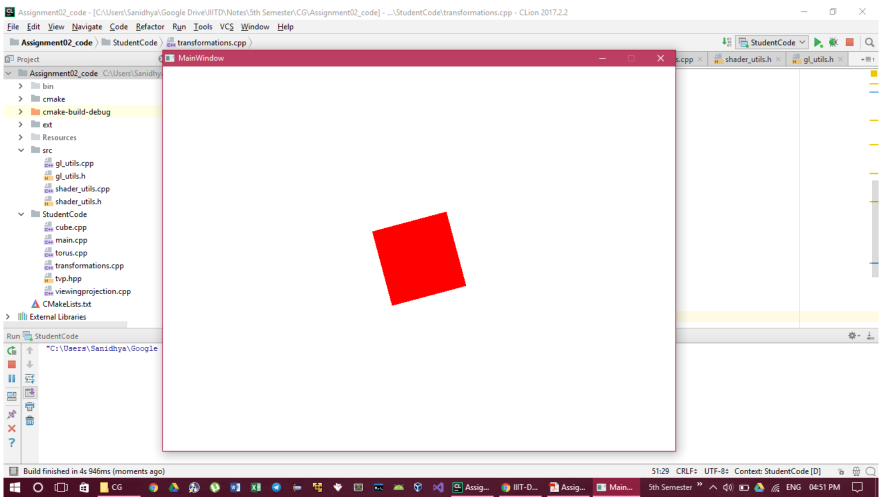
0004-5411/2017/9-ART1 $15.00
https://doi.org/0000001.0000001

1 TRANSFORMATION

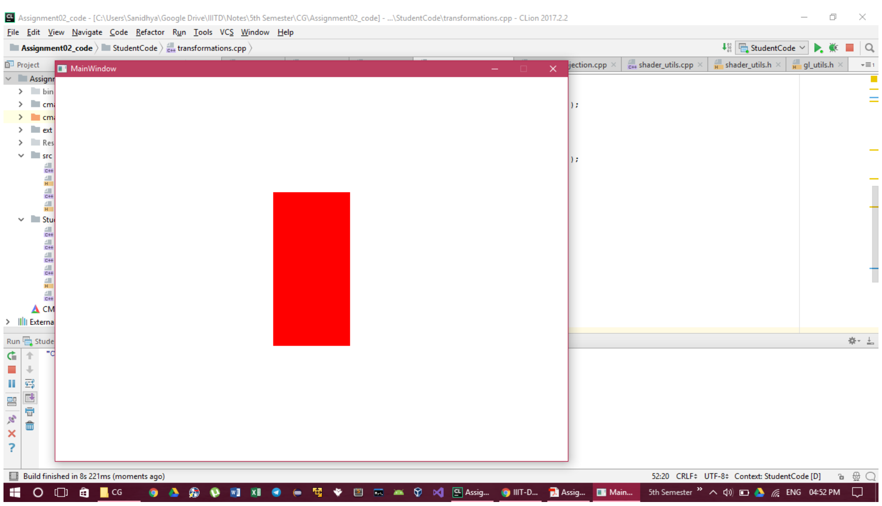
Ans 1

The screen-shots are shown below:

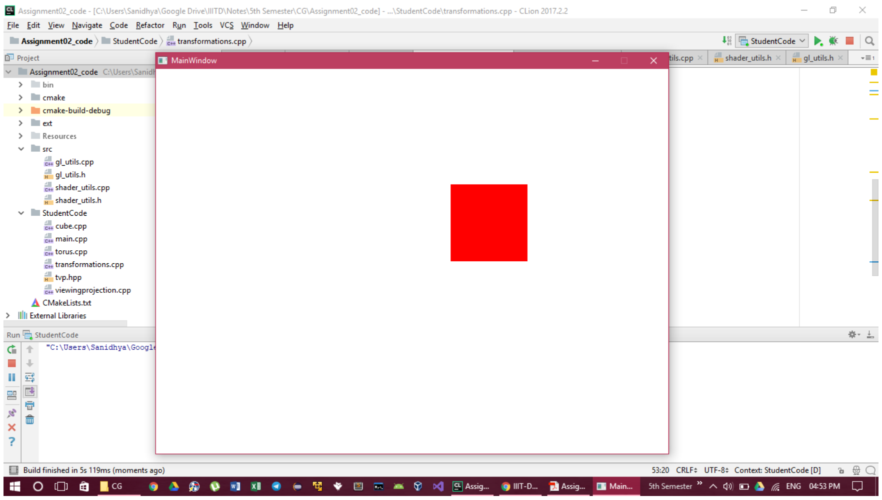
(1) Rotate about z-axis by 15 degrees



(2) Scale along y-axis by 2.0

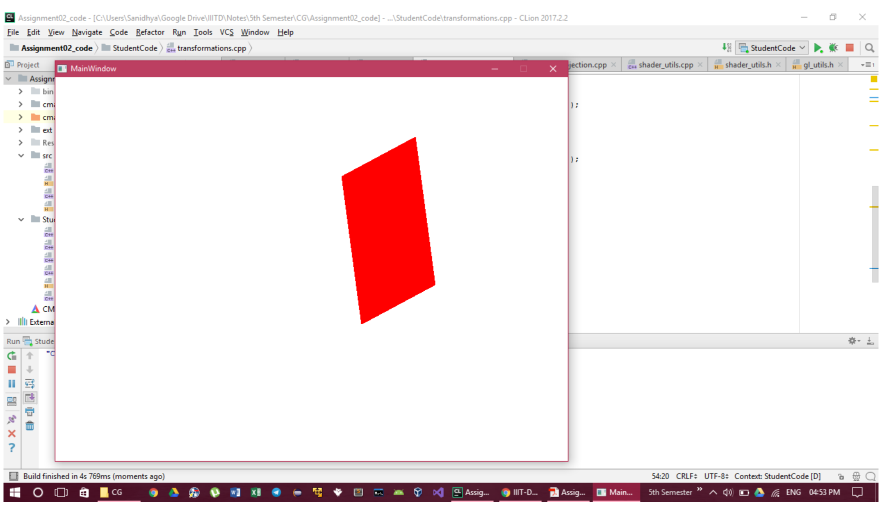


(3) Translate by (20, 10)

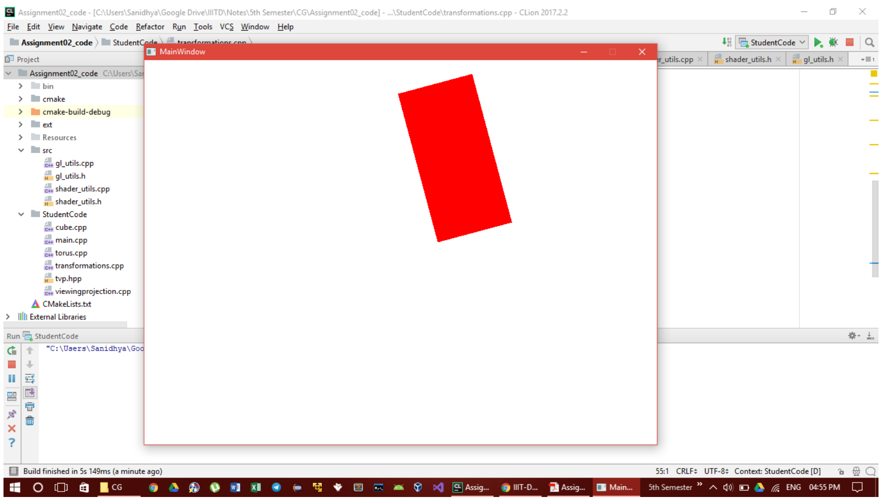


Ans 2
The screen-shots are shown below. The two outputs are not identical. The reason behind this is that matrix multiplication is NOT commutative. $AB \neq BA$

(1) <a,b,c>
Here, we first rotate the object along z-axis by 15 degrees, then scale it along y-axis by 2.0 and finally, translate the result by (20, 10). Following is the result obtained:



(2) <c,b,a>
Here, we first translate the object by (20, 10), then scale it along y-axis by 2.0 and finally, rotate the object along z-axis by 15 degrees. Following is the result obtained:



2 VIEWING

Ans 3

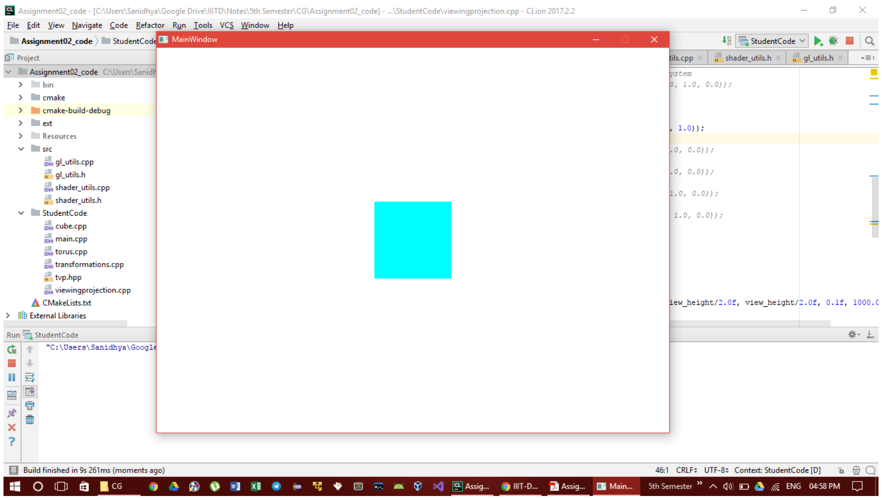
The `myLookAt()`and `glm::lookAt()` routines generate identical results.

3 PROJECTION

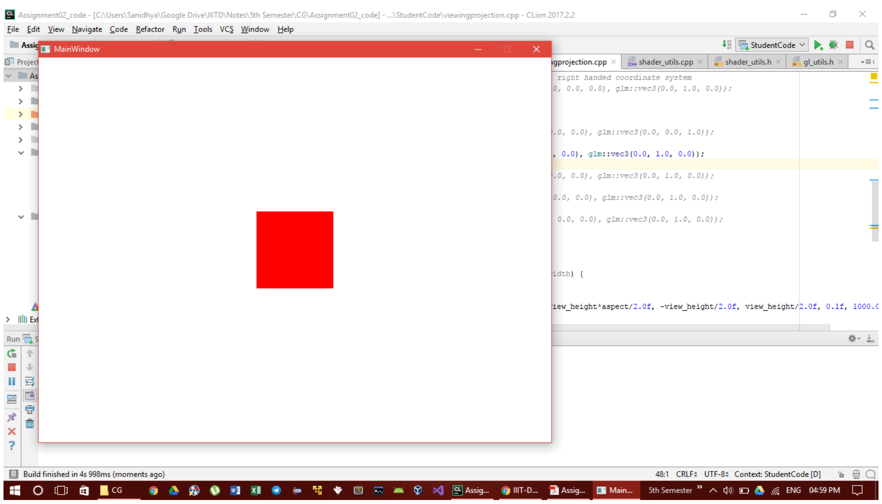
Orthograthic Projection

We have a camera that is looking down the negative z-axis in a right handed coordinate system.

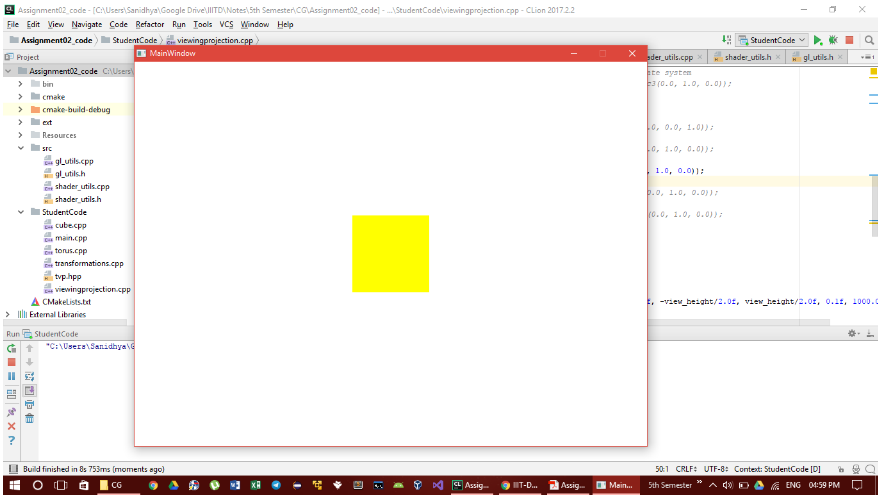
(1) **Top**: The eye of the camera is at (0,100,0)



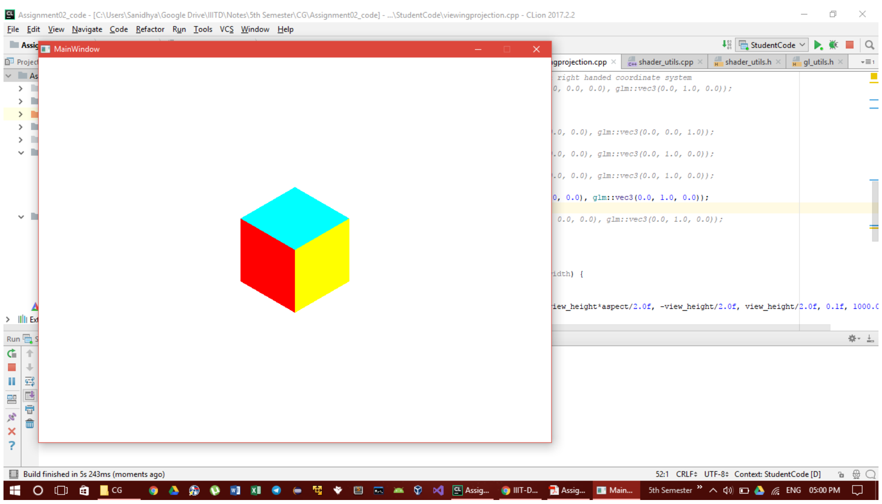
(2) **Front**: The eye of the camera is at (0,0,100)



(3) **Side**: The eye of the camera is at (100,0,0)



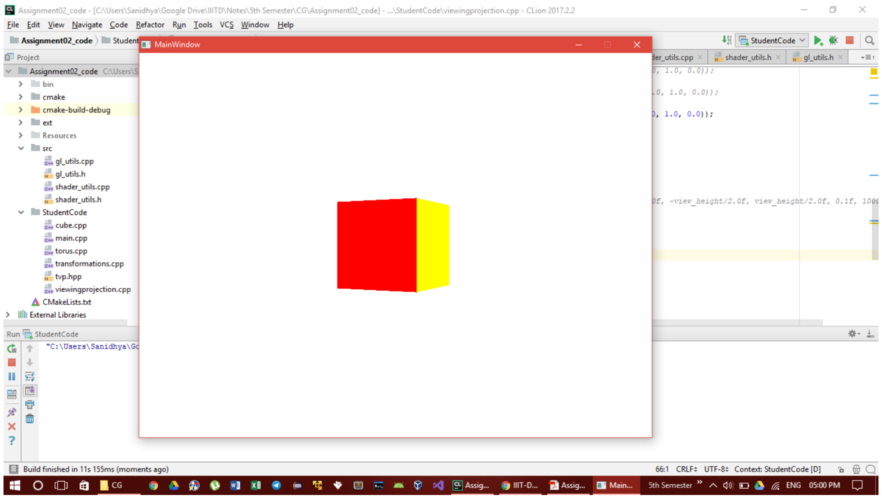
(4) **Isometric**: The eye of the camera is at (50,50,50)



Prespective Projection

The eye of the camera is at (50,0,100)

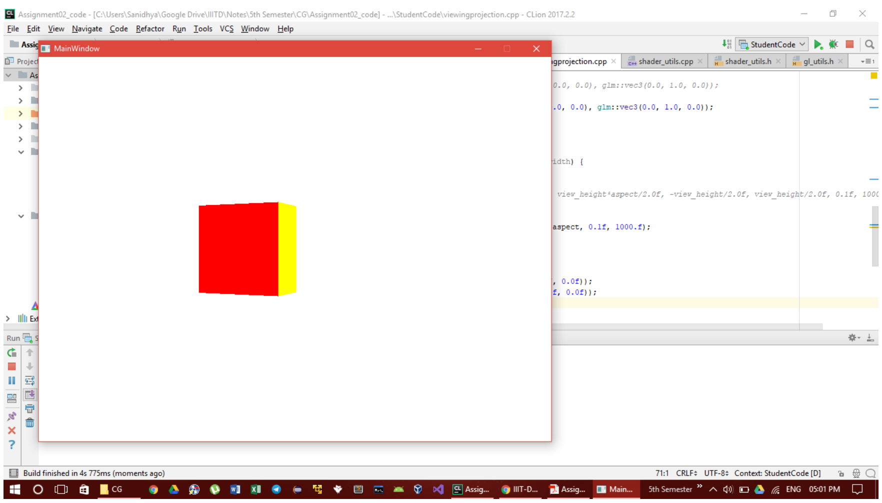
(1) **One-point**



(2) **Two-point**

Two-point projection is obtained from one-point projection as follows [1]:

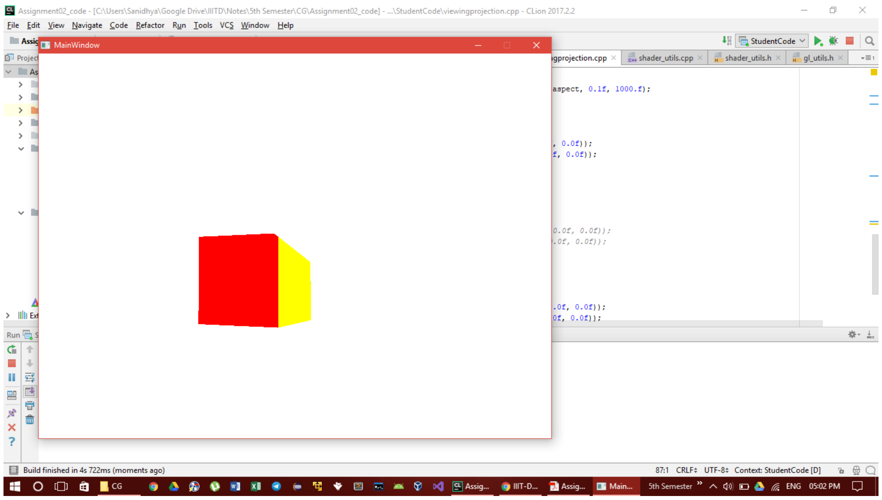
$$P_2 = R_y(-\theta) \cdot P_1 \cdot R_y(\theta)$$



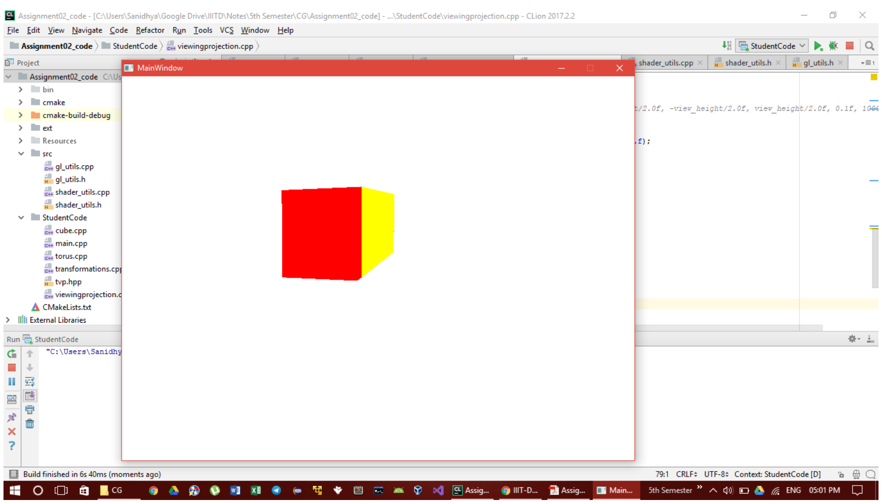
Three-point projection is obtained from two-point projection as follows [1]:

$$P_3 = R_x(-\phi) \cdot P_2 \cdot R_x(\phi)$$

(3) **Three-point (Bird's Eye View)**



(4) **Three-point (Rat's Eye View)**



REFERENCES

[1] The Mathematics of Two- and Three- Point Perspective
https://people.eecs.berkeley.edu/~barsky/perspective.html