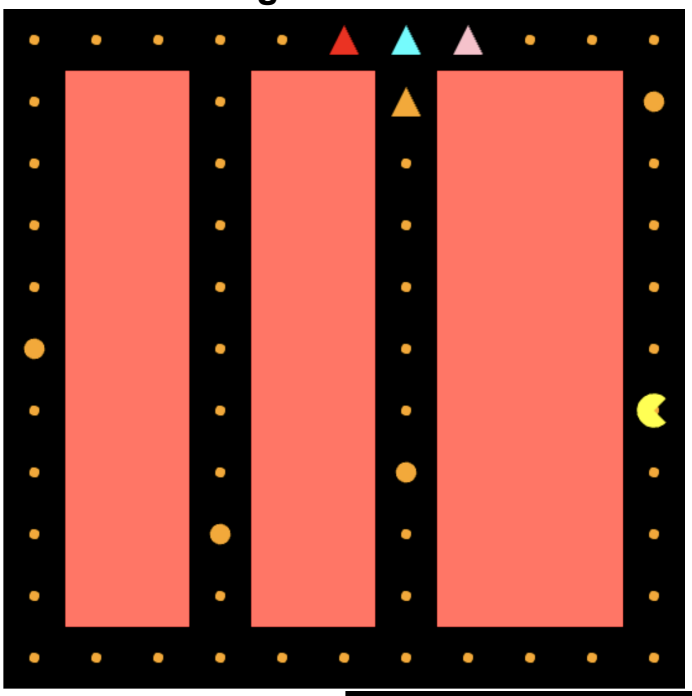
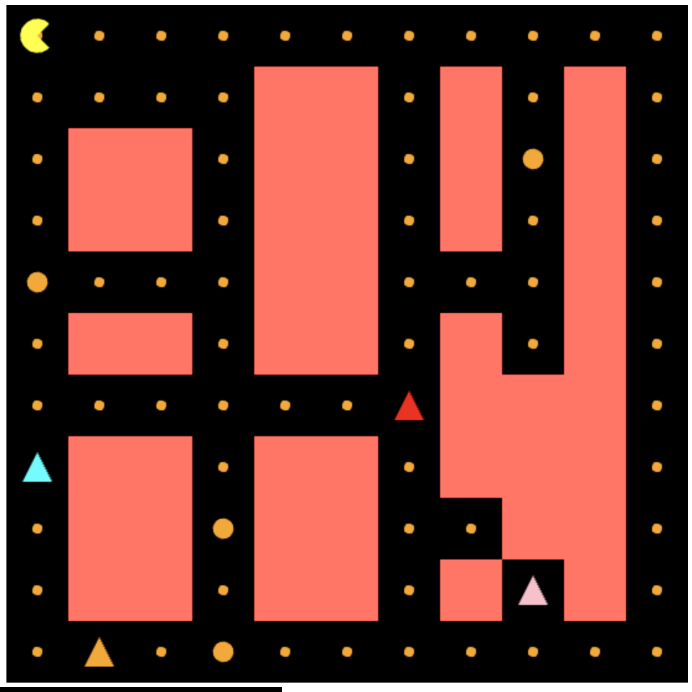
Computer Graphics
Assignment - 1

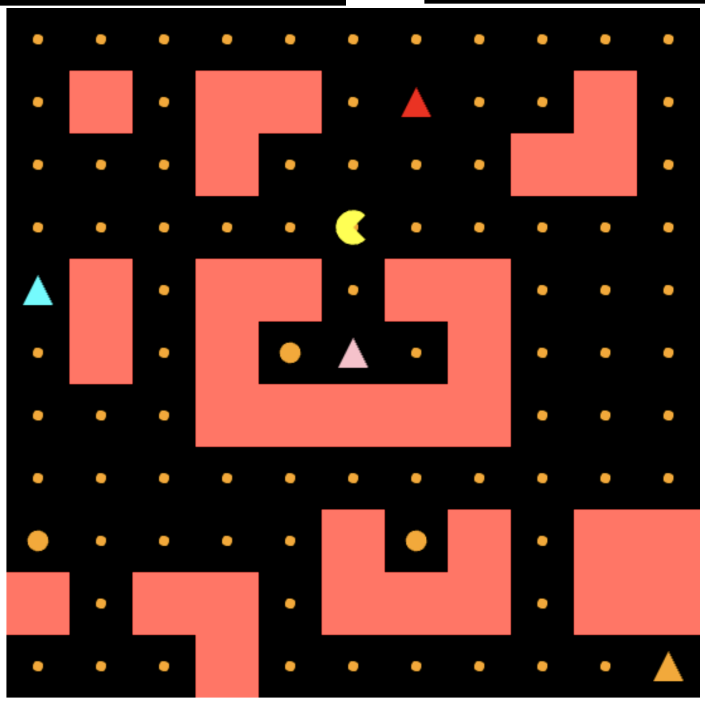
Name: Shivankar Pilligundla
Roll No: IMT2020016

In this assignment, I have implemented the Pacman game using Webgl. It includes rendering, translation, rotation, and scaling of Pacman. As per the requirements I have also implemented multiple modes, grid configurations, and rotation of the grid.

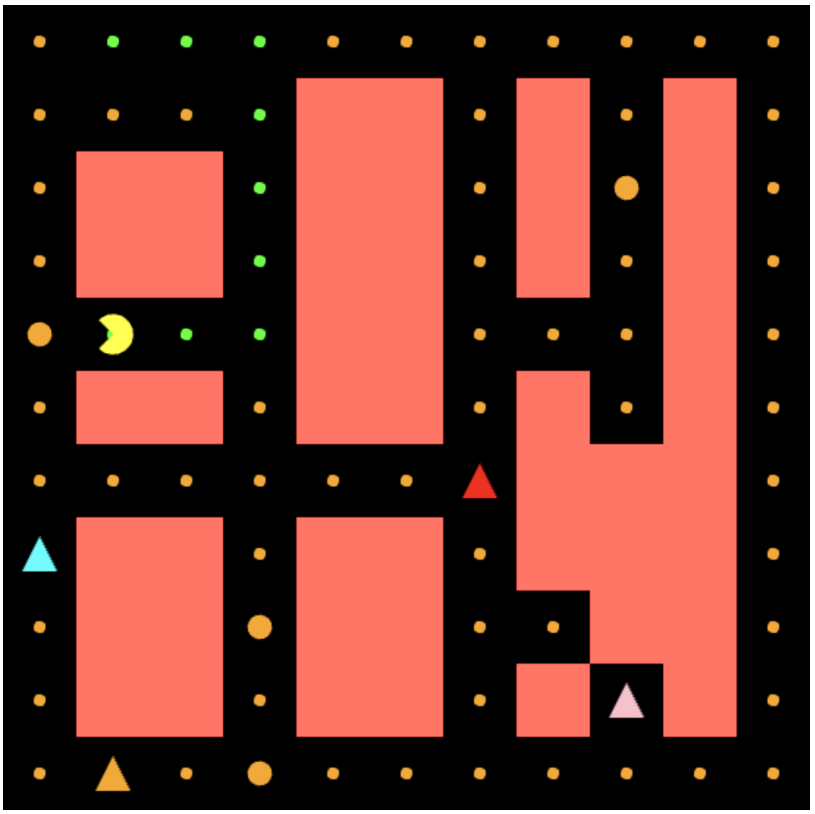
Grid configurations



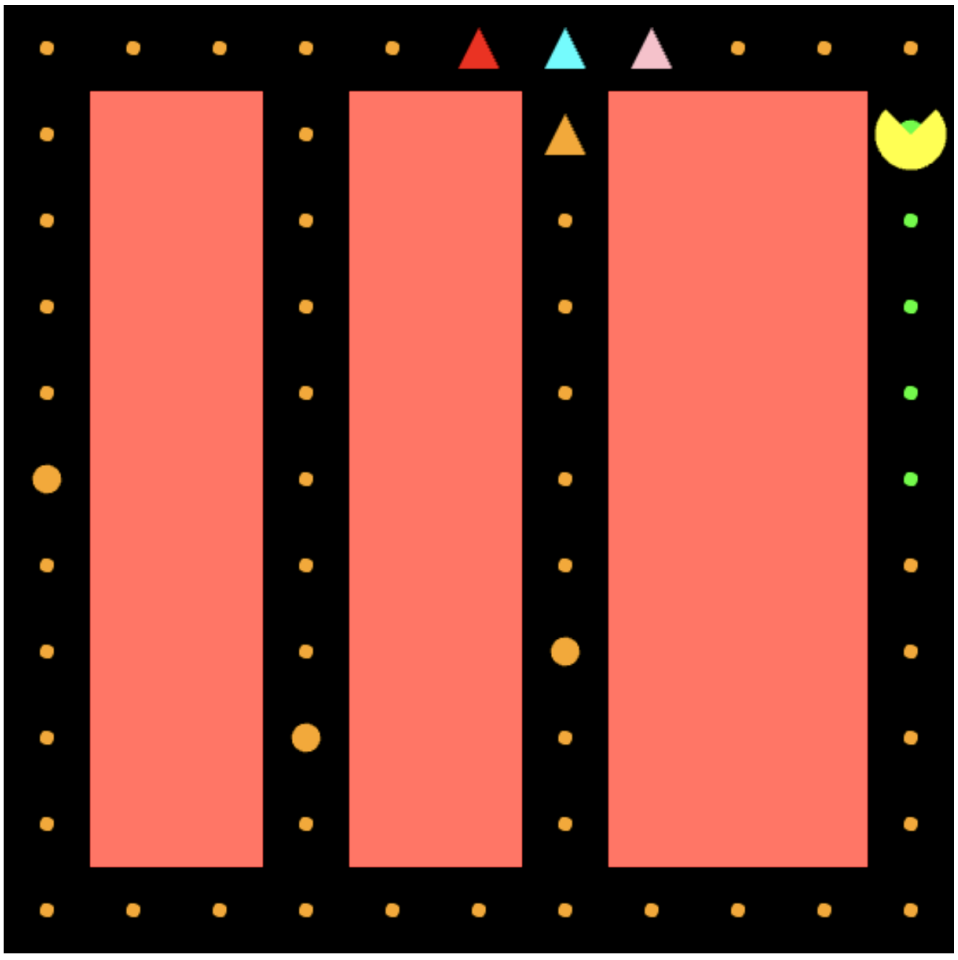




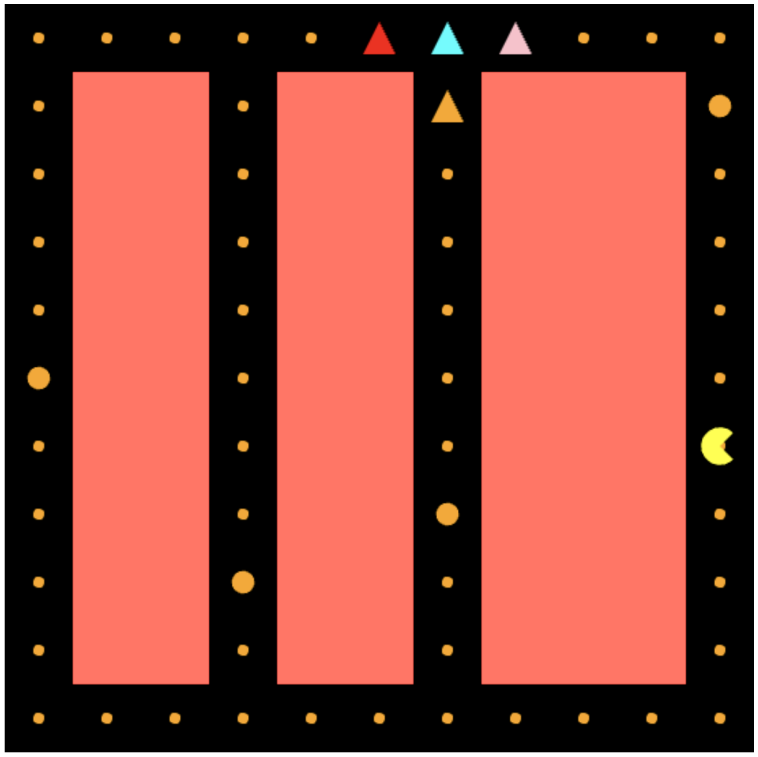
Translation:



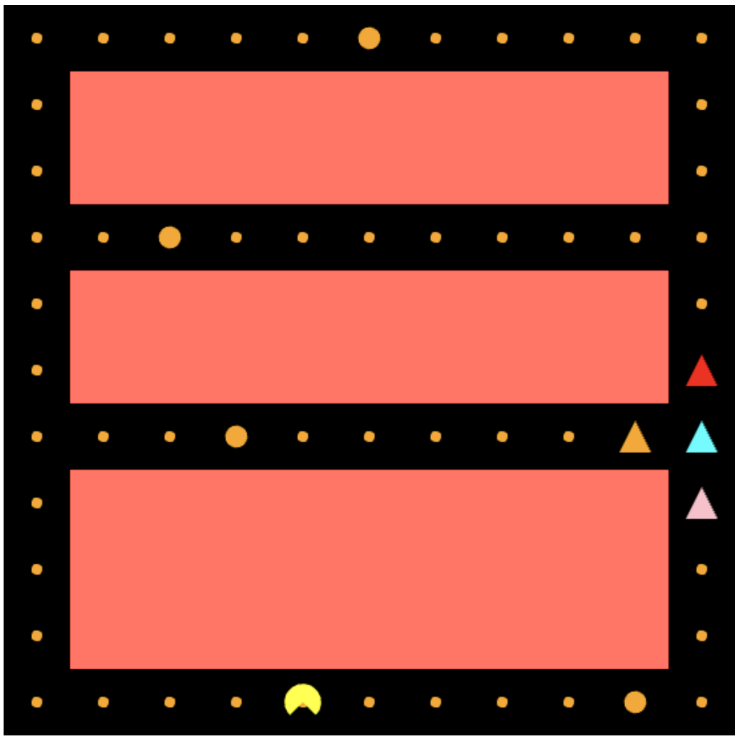
Scaling on eating Powerpellet:



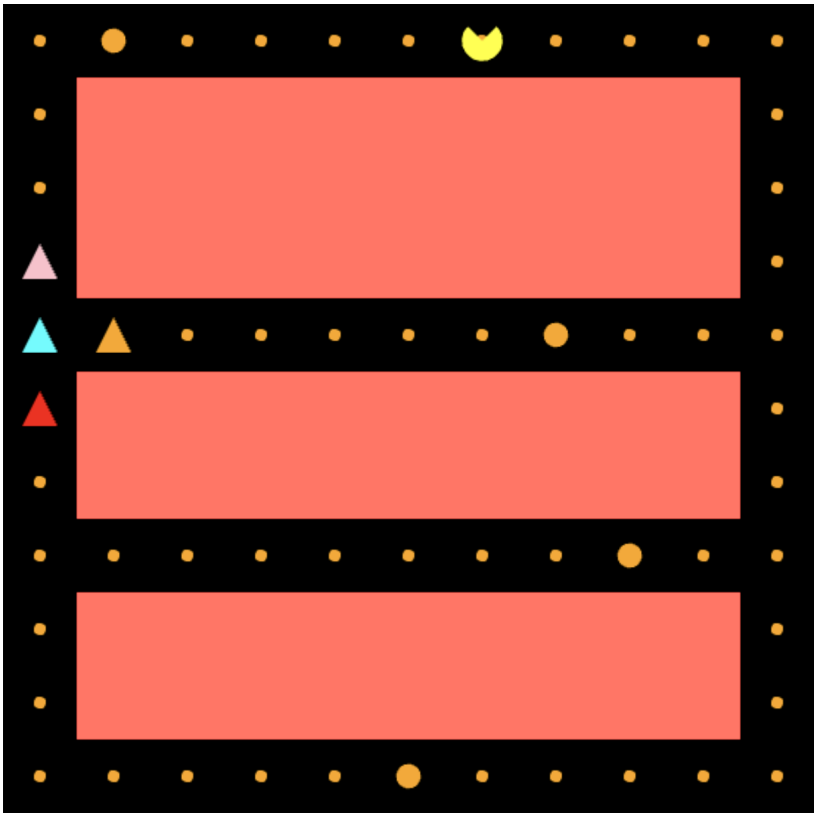
Grid Rotations:



Original Grid



Clockwise Rotation 90



Anti-clockwise rotation 90

Questions:

1. **What did you do to ensure that the objects (Pac-Man, ghosts) do not change orientation or location when the maze rotates?**

When the maze rotates by 90 degrees clockwise or anti-clockwise for ensuring the orientation of the ghosts, when I rotate the grid by 90 clockwise then the ghosts change their orientation. So after this grid rotation, I rotate ghosts by 90 degrees anti-clockwise to preserve their orientation. Similarly, when I rotate the grid 90 degrees anti-clockwise I rotate ghosts clockwise. But for the Pacman, I rotated it according to the grid rotation direction.

2. **What did you do differently when rotating the Maze vs Pacman?**

   While rotating the Pacman I just had to set the rotation axis as the z-axis and set the rotation angle then perform the rotation using glmatrix transformations.

   mat4.rotate(this.modelTransformMatrix, this.modelTransformMatrix, this.rotationAngle, this.rotationAxis);

   Here I only had to change the transform of one primitive and update it. But while rotating the grid I had to handle all the primitives in the grid separately. Also During the rotation of Pacman, we rotated it about its center. But for Maze rotation, all the primitives have to be rotated about the center of the maze. To achieve this for each primitive I have translated it to the origin, then rotated it in the required direction clock or anti-clockwise, and translated it to the previous coordinates but in the new orientation direction (This is similar to interchanging x any y's with appropriate signs).

3. **If you were asked to scale the maze what steps would you implement?**

If we just scale each primitive of the grid it wouldn't be sufficient because primitives have to be translated accordingly so that they won't overlap and fit the grid perfectly. For this firstly, the maze size has to be scaled according to the scaling factor in both the x and y directions. Then after scaling each primitive about its center it has to be translated to the center of the new grid cell which would be shifted from the initial grid cell center(as every grid cell would be scaled in the same ratio this can be found easily) and primitive can be translated to this point. This way the whole maze can be scaled properly without any overlaps.

Video link:
https://iiitbac-my.sharepoint.com/:v:/g/personal/shivankar_pilligundla_iiitb_ac_in/EUCJl0grqoVMpTGekyMvAucBwYXYWqdkmdxKnajn0Li1Rw?e=Ng9rOe

Github link:

https://github.com/shivankar-p/CG-Assgn1