CS475 Assignment 2 : Freestyle Motorcross(FMX)

Harsh Shah 200050049

Neeraj Jadhav 200050086

Contents

1 Model implementation

For implementation of the models, we created a parent class named *Shapes* having all the required primitive shapes like *Cylinder, Plane, Cuboid, Ramp*, etc. as sub-classes. These classes fill vertex array and color array(members of the class *Shapes*) with appropriate vectors, based on the corresponding shape. The vertices and color are then passed to *HNode*, which copies the data to the corresponding vbo, and sets up the vao. A class a also created for each of the objects to render: rider, bike, and track. These classes store the *HNode*(s) and create the hierarchy of the corresponding object when initialised. Below are the hierarchy trees of the objects and their rendered images.

1.1 Rider

Figure 1: Model of the rider

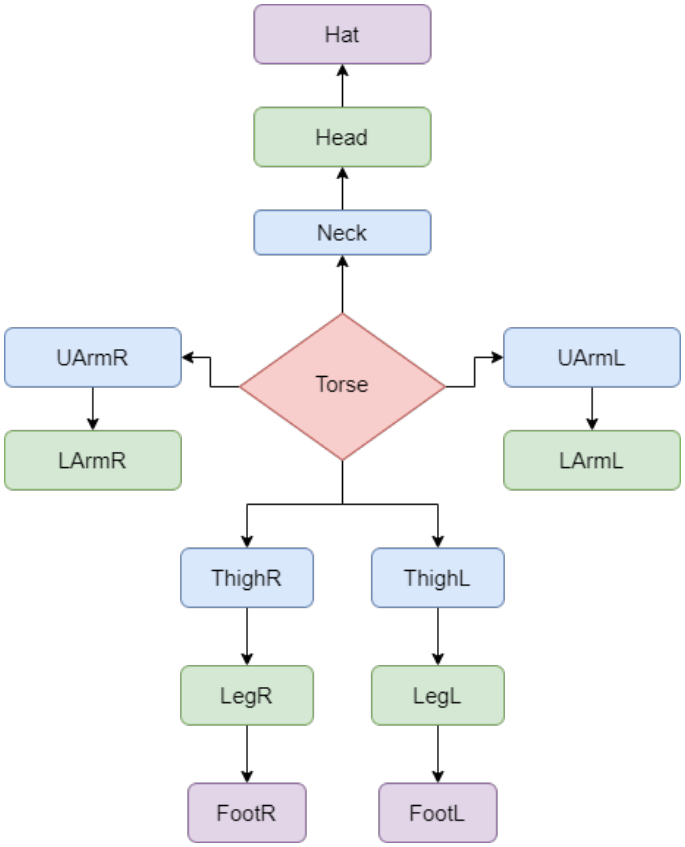

Figure 2: Hierarchical model of rider(color in indicative of depth from root)

1.2 Bike

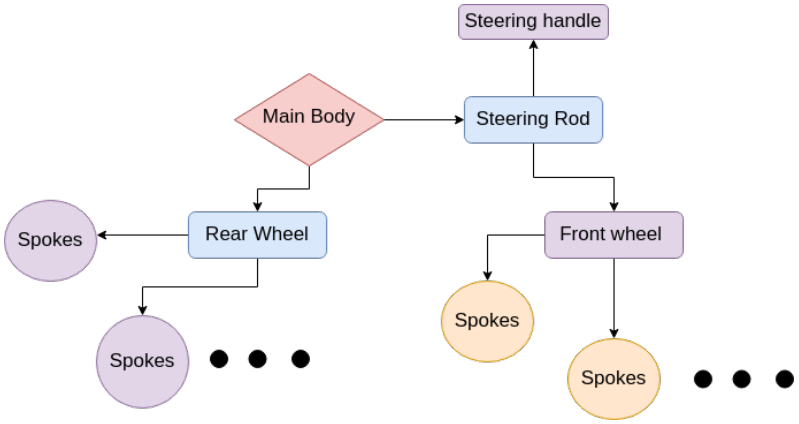

Figure 3: Hierarchical model of bike(color in indicative of depth from root)

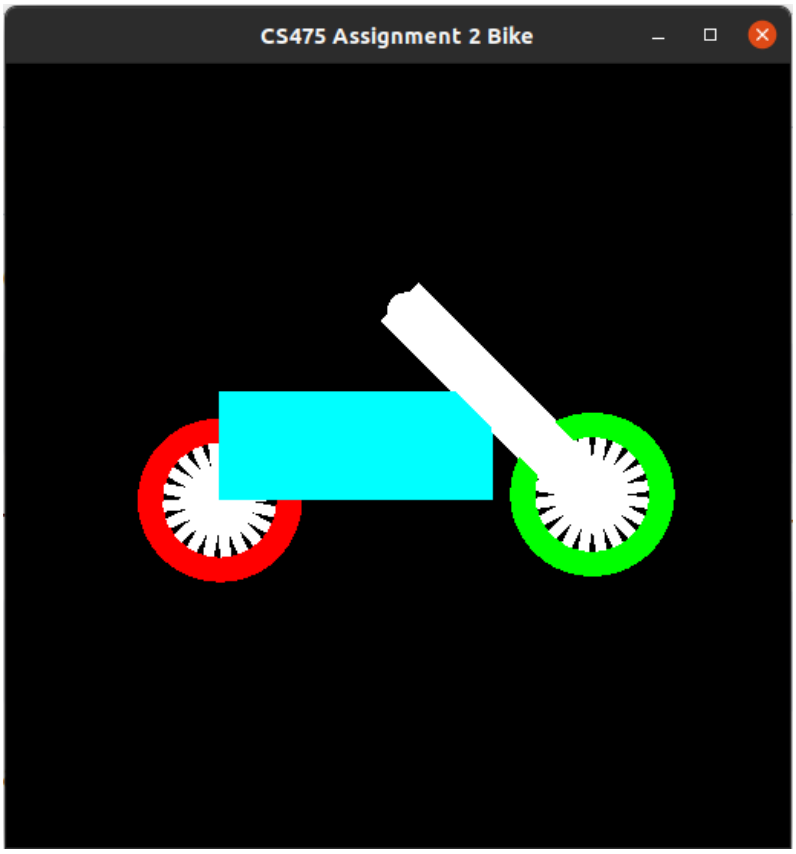

Figure 4: Model of the bike

1.3 Track

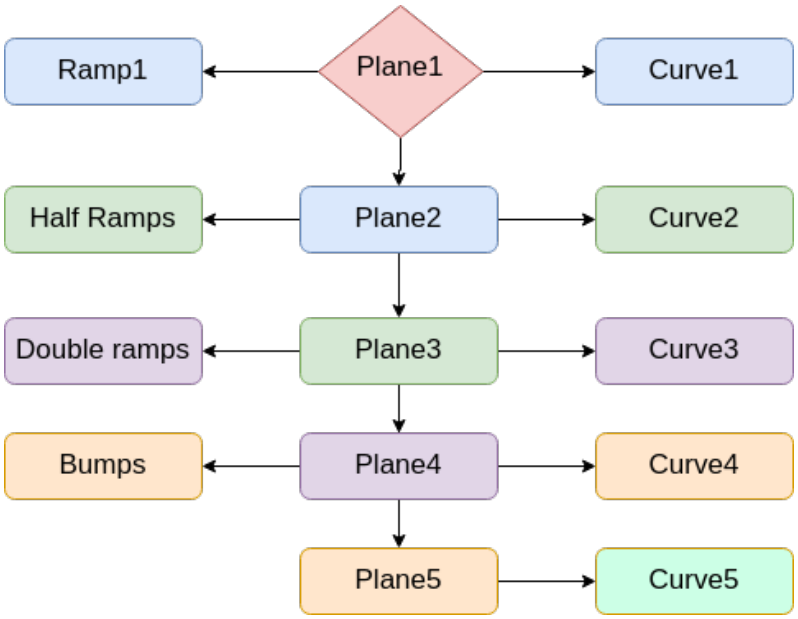

Figure 5: Hierarchical model of track(color in indicative of depth from root)

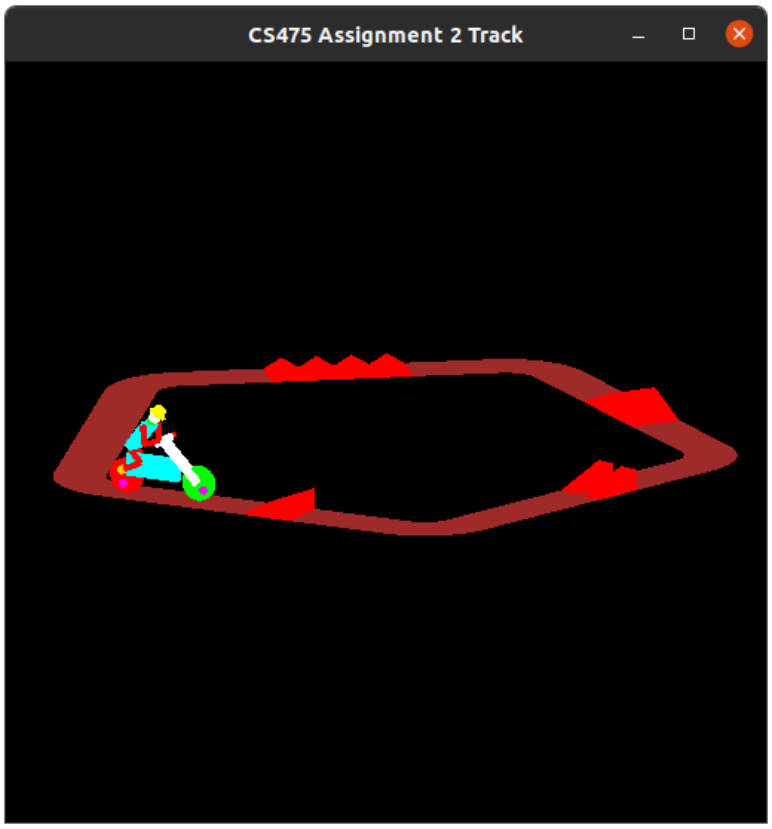

Figure 6: Model of the track

2 Keybindings

2.1 Global rotation

The keys **W, A, S, D, Q, E** have been used for global rotation. Pressing these keys change the respective Euler angles as described below. The entire model, even if rider, bike and track are present, gets rotated using these keys.
Let θ_x, θ_y, θ_z be the Euler angles then

- W : Decreases θ_x
- S : Increases θ_x
- A : Decreases θ_y
- D : Increases θ_y
- Q : Decreases θ_z
- E : Increases θ_z

2.2 Global Translation

The keys **2, 4, 6, 8, 5** have been used for global translation. They function as given below. The translation caused by pressing these keys is with respect to the rotated axes (caused by doing global rotation as described in the previous section). Note that these keys translate only the currently selected object. Details on selecting an object have been provided in the Miscellaneous section.

- 8 : Move towards +Y
- 2 : Move towards -Y
- 6 : Move towards +X
- 4 : Move towards -X
- 5 : Move towards +Z
- Shift + 5 : Move towards -Z

2.3 Local rotations

The keys **Up, Down, Right, Left, PgUp PgDown** have been used for local rotations. For the rider, they work as follows :

- Up, Down : Bend forwards or backwards
- Right, Left : Turn right or left
- PgUp, PgDown : Bend right or left

For the bike, they work as follows :

- PgUp, PgDown : Bend forwards or backwards
- Right, Left : Turn right or left
- Up, Down : Bend right or left

Similarly for the track, along its axes

2.4 Miscellaneous

2.4.1 Bike's movements

Pressing **F** and **Shift + F** rotates the front tire. Pressing **R** and **Shift + R** rotates the rear tire. Pressing **T** and **Shift + T** steers the bike.

2.4.2 Selecting Parts

Rider
First press **C** to active Rider part selection mode and then give input via the terminal for part selection.

- a : Select the torso
- b : Select the left upper arm
- c : Select the left lower arm
- d : Select the right upper arm
- e : Select the right lower arm
- f : Select the left thigh
- g : Select the left leg
- h : Select the right thigh
- i : Select the right leg
- j : Select the neck
- k : Select the head

Bike
Pressing **V** selects the bike.
Track
Pressing **X** selects the track.
Pressing **Z** selects all objects.

2.4.3 Scaling the objects

Pressing **M** and **Shift + M** scales up and down the selected object respectively.