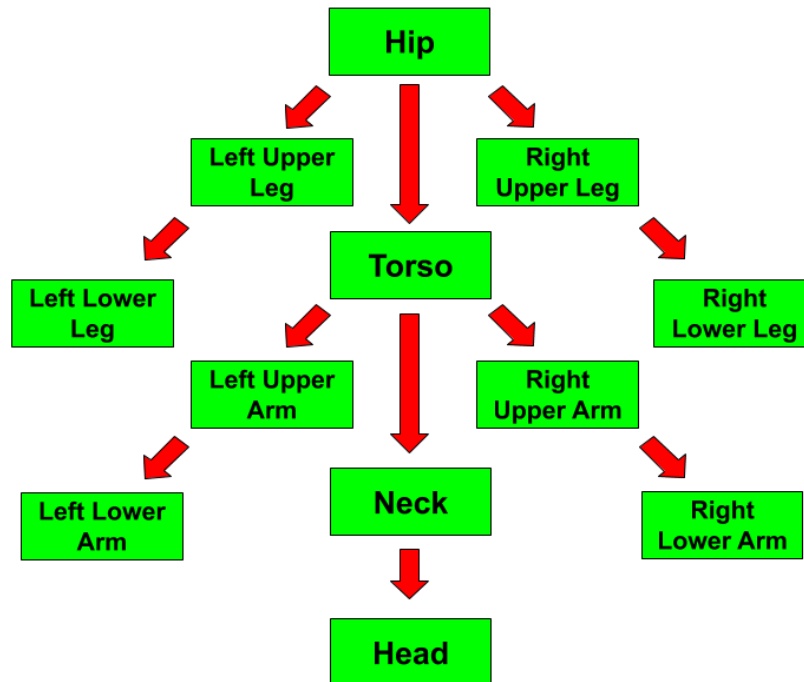# FMX Modeling
CS475 Assignment 2 Report

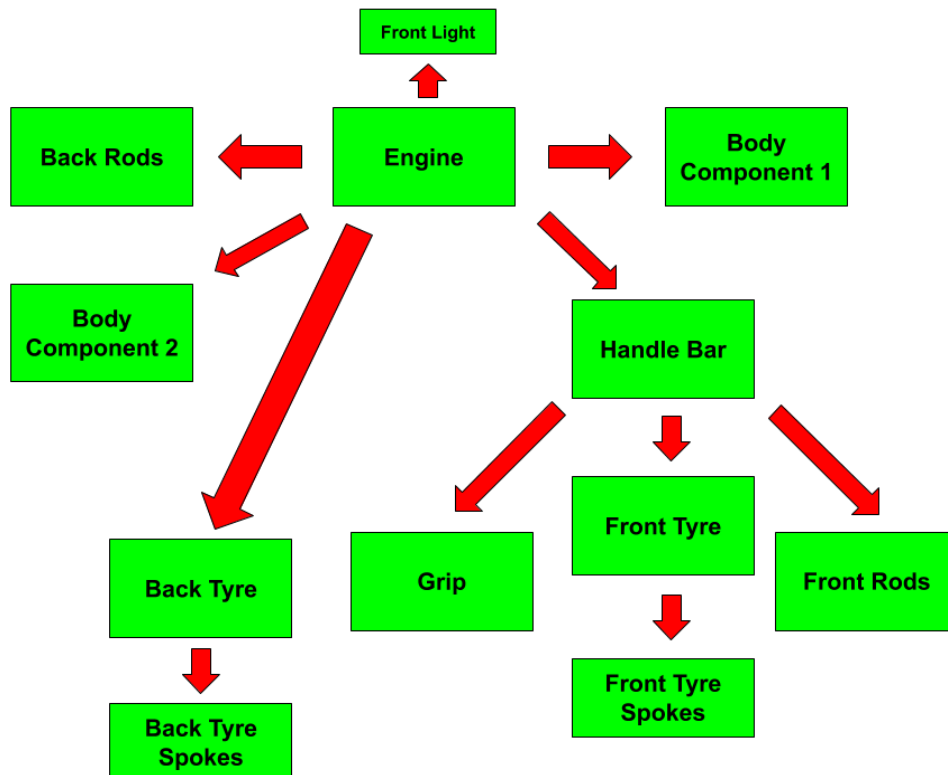**Akkapaka Saikiran (180050005)**   **Parth Vipul Sangani (18d100014)**
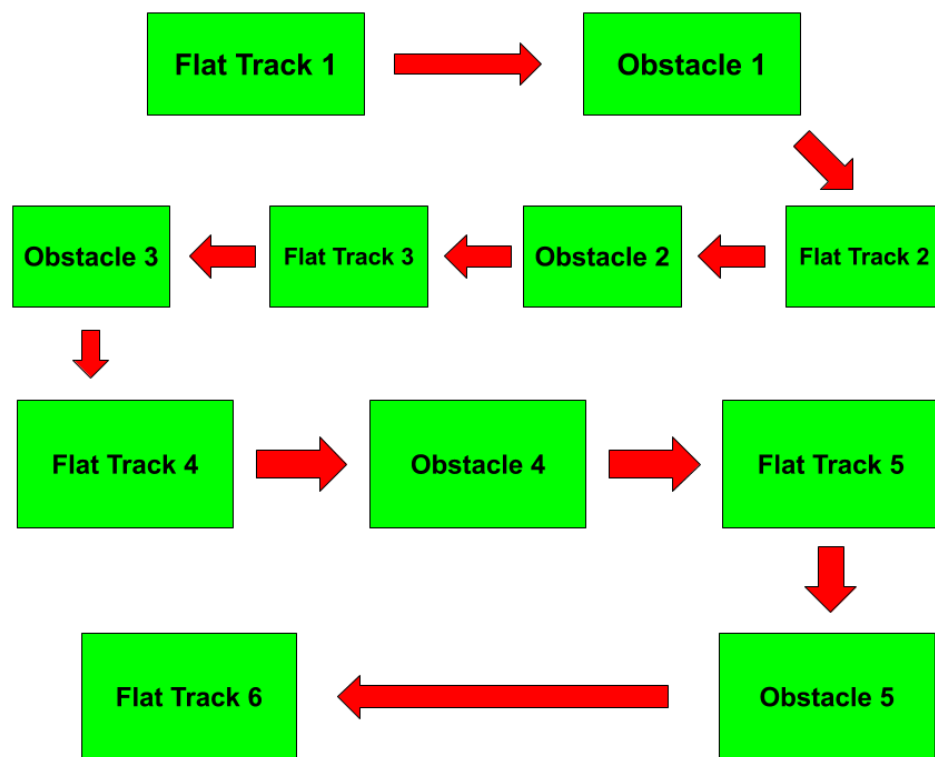
Hierarchical Models

1. Rider: The model of the rider is as follows. The Hip is a dummy node which is not visible but enables the independent motion of the torso and lower body.

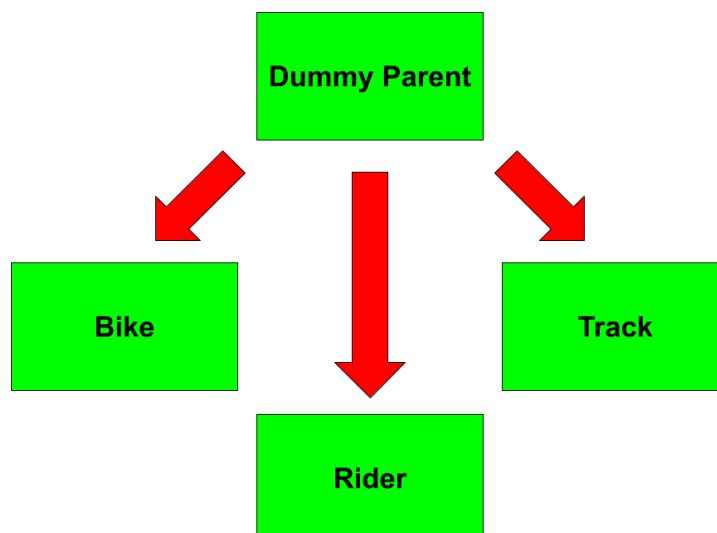2. Bike: The model of the bike is as follows.

3. Track: It has a very unique hierarchy, a linear hierarchy. It is shown in the figure as follows, much like the actual track :)

```
┌──────────────┐                    ┌──────────────┐
│ Flat Track 1 │  ───────────▶      │  Obstacle 1  │
└──────────────┘                    └──────────────┘
                                            │
                                            ▼
┌──────────────┐   ┌──────────────┐  ┌──────────────┐  ┌──────────────┐
│  Obstacle 3  │◀──│ Flat Track 3 │◀─│  Obstacle 2  │◀─│ Flat Track 2 │
└──────────────┘   └──────────────┘  └──────────────┘  └──────────────┘
       │
       ▼
┌──────────────┐       ┌──────────────┐       ┌──────────────┐
│ Flat Track 4 │ ────▶ │  Obstacle 4  │ ────▶ │ Flat Track 5 │
└──────────────┘       └──────────────┘       └──────────────┘
                                                      │
                                                      ▼
┌──────────────┐                               ┌──────────────┐
│ Flat Track 6 │ ◀──────────────────────────── │  Obstacle 5  │
└──────────────┘                               └──────────────┘
```

Note 1: The flat tracks along the curves have been implemented by breaking down the flat track into 3 smaller parts, a rectangular track followed by a semi-circular track, and finally another rectangular track.

Note 2: The rendering of all the 3 models together required us to create a dummy root node. This dummy node is the parent of all the 3 models. The final hierarchy tree looks as follows -

```
                ┌───────────────┐
                │ Dummy Parent  │
                └───────────────┘
                 ╱      │      ╲
                ▼       ▼       ▼
         ┌────────┐ ┌────────┐ ┌────────┐
         │  Bike  │ │ Rider  │ │ Track  │
         └────────┘ └────────┘ └────────┘
```

General Key bindings

- Global Translation of a model (applicable only at the root of the hierarchical model tree)

Action	Key
Move left	A
Move right	B
Move up	D
Move down	C
Move forward	F
Move behind	E

- Rotation (applicable at multiple but not all nodes)
  The axes are part of a coordinate frame attached to the node under consideration and may not be parallel to the global principle axes.

Action	Key
About x-axis	UP and DOWN arrow keys
About y-axis	LEFT and RIGHT arrow keys
About z-axis	PageUp and PageDown keys

- We have provided for a "zoom-in, zoom-out" control also.
  + (keypad) /SHIFT+EQUAL : Zoom - in
  - (keypad) /MINUS : Zoom-out
- Close the window: ESC key

Specific key bindings

1. a2-model-rider

The degree of freedom at the elbow is along the z-axis. This assumes that the palm faces upwards

Node to be chosen	Key
Imaginary Hip	0
Torso	T
Neck	N

Head	1
Left Upper Arm	2
Right Upper Arm	3
Left Lower Arm	4
Right Lower Arm	5
Left Upper Leg	6
Right Upper Leg	7
Left Lower Leg	8
Right Lower Leg	9

2. a2-model-bike

Node to be chosen	Key
Engine	0
Back Tyre	1
Front Tyre	2
Handle Bar	3

3. a2-model-track

Key R is for the dummy "root" node.
Keys G, H, I, J are for the bike controls "engine", "back tyre", "front tyre" and "handle-bar".
The keys for the rider remain the same as described in the table above for the rider.