**Traffic Simulator**

**Program Working Document**

**Specification**

The clients need a way to simulate traffic in city areas, need to simulate the car behavior with traffic light, intersection, speed limit, and roads. The program will take user input and displaying the status of the user object in the simulator. This simulator will simulate a car moving in a single lane that interact with traffic lights and intersection such as move to the second road that connected to the first road .

**Decomposition**

The problem is broken into operate object that interact with each other to get the desired behavior, this object includes:

**Car**

The car class will be holding the following attributes:

* id – a unique identifier that will differentiate each car.
* Length – the physical space the car occupies longways.
* Breadth – the physical space the car occupies width ways, half the cars length.
* Speed – how far the car moves for each simulation turn.
* Position – where the car is located on a road.
* Current Road – the road the car is currently traveling on.

The car will be move depending the speed limit in the road, when the car occurs a traffic light it will check the traffic light state before moving on , if the traffic light state is red the car will stop but if it green the car will carry on when the car reach the end of the road with no connection to other road the simulation will end

**Bus**

Bus will be described as a large vehicle that is a subclass from car and inherit the car attribute except the length will be 3x the car length

**Motorbike**

Motorbike will be described as small vehicle that is a subclass from car and inherit the car attribute except the length will be 0.5x the car length

**Road**

The road class will be holding the following attributes:

* *id* - a unique identifier that will differentiate each road
* *Speed limit* – the maximum speed that cars on that road may travel at.
* *Length* – the number of segments the road is comprised of and the physical space it occupies.
* *Start location* – the (x,y) coordinate that represents where the road begins.
* *End location* – the (x,y) coordinate that represents where the road ends.
* *Connected roads* – all of the roads that this road is physically connected to.
* *Lights on the road* – all the traffic lights that are on the ends this road.
* *Cars on the road* – all of the cars that are currently traveling on this road.

Road will only have 3 intersection (connected road) straight, 4-way, and 3-way each road has 2 lanes (right and left).  
Traffic light can only be place at the end of the road only, the car will be moving from the start location to the end location

**Traffic Lights**

The traffic lights class will be holding the following attributes**:**

* *id* - a unique identifier that will differentiate each traffic light.
* *State* - the color the light is displaying.
* *Position* - where the traffic light is located on the road.
* *Road attached to* - the road that the light is attached to

The traffic light will be simple as its only have 2 colors red and green, the light will change randomly. Traffic lights will be placed at the end of the road. The color of the traffic lights will affect the vehicle behavior if the color is red the vehicle is stopped but if it green the vehicle may continue.

**Simulator**

The simulator class will contain the simulation loop, all the object (road, car, traffic light) needed will be created here. The simulation will run the car, and the traffic light and will ended when the car reaches the destination. The simulators are different with different City. The city in a particular simulator can be saved in a file.

**CityChoose**

The CityChoose class will let user choose the city to simulate the traffic or let users customize their own city.