Java Based Traffic Simulator

Program Working Document

# Specification

The client needs a way to be able to simulate traffic in city areas; needing to simulate different vehicle types behaviour with traffic lights, roads and intersections. The program will be console based for this iteration, and will be used in the console. Taking inputs from the user and displaying the status of objects within the simulation to the user. This version of the program will be able to simulate a single car moving along a single lane road, interact with a traffic light, move to a second road connected to the first, representing a very basic intersection, and move to the end of that road.

# Decomposition

The problem can be broken into operate objects that interact with each other to achieve the desired behaviour. These objects include;

## Car

The car class will be an object that describes an average size road vehicle. 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 widthways, 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 able to move within the simulation along a road depending on its speed, the speed will be defined by the speed limit of the road the car is traveling on. When the car is in the same position as a traffic light it will check its state before moving, if the light is red it will stop, if the light is green it will move to the next road. When the cars position is equal to the end of a road and there is no connected road it will stop.

### Bus

The bus class will be a subclass of car, describing a large road vehicle. It will inherit its attributes and behaviour from Car except its *length* will be defined as being three times that of the car’s length.

### Motorbike

The motorbike class will be a subclass of car, describing a small road vehicle. It will inherit its attributes from and behaviour Car except its *length* will be defined as being half that of the car’s length.

## Road

The road class will be an object that describes a single lane road. Holding the following attributes;

* *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.

The for the first version of the program the speed will be constant and set to 1. Meaning the car will only move a single position each turn making it easier deal with traffic lights and the ends of roads. The length of the road will be variable depending of user input. Roads will interreact with other roads by being connected to them. Cars will move along the road from the starting position (1) to the end position, that depends on the road’s length. Traffic lights can be placed at only the end position of the road.

## Traffic Light

The traffic light class will represent a simple red or green traffic light. Holding the following attributes