# CP2406 Assessment Task 1 – Working Document

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## Problem Specification

A car simulator is to be implemented using road objects that interact with each other. There needs to be at least a road, traffic light and vehicle object with a Main class acting as the simulator. The program is to be coded in java.

## Problem Decomposition

The objects that will be used are a Road, Traffic Light, Car and various graphic objects. A Main class is used to have these objects interact with each other.

## Class Design

#### Road:

A Road object is needed for each of the other classes to be simulated. Each Road object stores its length in a member field and other objects (such as a Car object) uses a segment of that length to track its position on the Road. Length is private so that other objects cannot change its value. The only member field in this class is length.

#### Traffic Light:

A Traffic Light object is used to tell a vehicle object (e.g. Car) passing the road to stop or go. Traffic Light keeps track of its position which is taken by the last Road length segment. The constructor will take a Road object as a given value and use its getter method to obtain the Road length and set the value as its position. The Traffic Light class keeps track of the Road it is on, position and its signal to go (boolean where true equals go and false is stop).

The class also has a method that will be used to randomly change the boolean signal value repeatedly in the simulator. It will be public as Main class repeatedly calls this method.

#### Car:

A Car object travels between one or two Road objects. Its position is tracked using Road segments. The class stores the Road it is on and its position. A driving method that increases its position by one is also within the class. This is used so that the simulator can repeatedly tell the car to move. It is public as the simulator repetitively calls it.

#### Main:

The Main class will act as the simulator.

#### Car Rectangle:

A graphic object representing the car in the GUI for the simulator. It is a subclass of JPanel.

#### Road Rectangle:

A graphic object representing a road in the GUI. It is a subclass of JPanel.

#### Traffic Light Rectangle:

A graphic object representing a traffic light in the GUI. subclass of JPanel.

#### Frame:

The frame class will act as the frame window for the GUI. It is a subclass of JFrame.

## Method Design

#### Traffic Light:

The method in the Traffic Light class randomly changes the boolean signal value based on a percentage. It generates a percentage that is compared with a change rate to determine the probability of the signal value changing. The algorithm it uses is that if the random number is less than the change rate, the signal will change from true to false or vice versa.

Another method added is to display a string output stating the colour of the traffic light based on boolean values. In this scenario, true is green whereas false is red.

#### Car:

The Car class method is used repeatedly in the simulator to make the Car object move. The method adds one to the position member field.

#### Car Rectangle:

The class contains a move method that updates the GUI with the car moving forward. It also contains an override method that to edit the graphic components of the class.

#### Road Rectangle:

The class contains an override method to edit graphic components of the class.

#### Traffic Light Rectangle:

The class contains an override method to edit graphic components of the class.

#### Frame:

The Frame class contains methods for actions to be performed such as dialogue box popups and exiting the window.