**Project working report**

1. **Problem specification**

The purpose of this project is to design a traffic simulator, which is able to implement GUI and event programming behaviors to demonstrate how the cars move on different types of roads according to the colors of traffic lights. There are three types of vehicle, which are Car, Bus and Motorbike, and the length of a car determines the length all other vehicle types. Furthermore, there are three road intersection shapes: straight, 4-way and 3-way, and each road has left and right lanes. Australian road rules should be applied to the simulator. The traffic light has two colors such as red and green. And the simulator can be used to show people how the car works in different roads.

In the assignment 2, I am going to develop my car traffic simulator with GUI and event programming and make improvements based the assignment 1. When the programming is running, the straight road, cars and traffic light will be displayed initially and they start running, there are three buttons included one-way model, three-way model and four-way models, users can click the buttons on the bottom to select the type of roads shown by simulator. In addition, as car moves to the front of traffic light, the color of traffic light changes between red and green. If the traffic light is green, cars will go through traffic light and other cars will stop, if the traffic light is red, the cars will stop, and other cars go through the traffic light. And the cars that pass through the traffic light will appear on the second road and continue to move to the end of the road, and finally disappear.

1. **Problem decomposition using UML class diagrams**

The problem is decomposed into 3 objects, which are Vehicles, Roads, Traffic light. And 7 classes included Main class, VehicleMoving class, CarInFourWays class, CarInThreeWays class, CarInOneWay class, Roads class and TrafficLight class are created to solve the problem.

* The “VehicleMoving” class is mainly responsible to control the direction of vehicles moving. For example, Move, MoveToLeft, MoveToTop, MoveToBottom method can make car moving by changing the X and Y value of position of car. Furthermore, the Draw method can help to draw and set the position, length, width and colors of cars.
* The Road class has three methods, which are paintOneWay, paintThreeWays, paintFourways. Each method is used to draw different types of roads in JPanel, and JPanel will be added to JFrame, so that the roads can be displayed in the frame.
* The TrafficLight class uses Paint method to draw the different colors of traffic light and set the size of traffic light.
* The CarsInOneWayRoad, CarsInThreeWays and CarsInFourWays class uses paintComponent method to help drawing the cars, roads and traffic lights, and place these objects together in one frame.

The Main class has 4 methods such as oneWay, threeWay, fourWay. It mainly manages the GUI, and how does our program work. For instance, each method in Main class manages the movement of all the cars, color changes of traffic light in different type of roads. In addition, the JLabel, JPanel, JFrame, JButton and ActionLisener are implemented in Main class. Main class also sets three buttons in the program, when users press “One-way model”, “Three-ways model” or “Four-ways model” button, the ActionListener will call the corresponding method. Finally, Timer and Repaint are placed in main class to quickly redraw all the objects and make these objects moving.

Below is UML class diagram:

