The GitHub link:

<https://github.com/YangChingYu/CP2406_Programming3_Assignment_2>

**Problem specification:**

The hassle is that a traffic simulator is needed for you to simulate traffic in accordance with Australian avenue rules. The application that resolves this hassle could be used through an interface that permits a person to specify sure factors of this system so that you can allow it to simulate a wider variety of scenarios. The application will utilize training that allows you to divide and conquer the trouble and allow for efficient running.

**Problem decomposition using UML class diagrams:**

A close up of text on a white background

Description automatically generated

**Problem decomposition:**

In regard to get admission to Simulator, map, traffic light and car have private member fields. Running this application, Simulator need to returned using, get methods for each member field.

**What roles do this object this class perform?**

Road:

* Class design
  1. What roles do this class perform?

This class will include where the traffic lights are and the all the information about the road, such as the width and the length of the road. Moreover, the orientation and the colours of the road also be provided in this class.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| private | TrafficLight |
| private | numOfSegments |
| private | roadWidth |
| final | roadYPos |
| final | roadXPos |
| final | endRoadYPos |
| final | endRoadXPos |
| private | lightColor |
| private | orientation |
| public | trafficDirection |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | paintComponent |
| public | paintLight |
| public | paintRoad |

* Method design
  1. What should this signature be?

paintComponent: Set the colour of the car and the orientation.

paintLight: set the colour of the traffic light.

paintRoad: Set the colour of the road including the middle white line.

* 1. What task will it perform? What algorithm will it use?

In these class I am using the “for loop” and “if…else”.

Map:

* Class design
  1. What roles do this class perform?

This map class will include adding the road, the car and the traffic light on

the layout.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | addRoad |
| public | addCar |
| public | addTrafficLight |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | addRoad |
| public | addCar |
| public | addTrafficLight |

* Method design

* 1. What should this signature be?

addRoad: adding more roads on the simulator.

addCar: adding more cars on the simulator.

addTrafficLight: adding more traffic lights on the simulator.

* 1. What task will it perform? What algorithm will it use.

The java application will take both from car class and the map class to manipulate the information.

TrafficLight:

* Class design
  1. What roles do this class perform?

This trafficLight class will control the move permission of the cars, the traffic

light will be located in the front of the road.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| private | rateOfCharge |
| private | currentColor |
| private | redTime |
| private | greenTime |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | getCurrentColor |
| public | operate |

* Method design

* 1. What should this signature be?

getCurrentColor: obtain the real-time information of the traffic light colour .

operate: Setting the parameter of the traffic light including the green light and redlight time. The traffic light changing rate also along with this class.

* 1. What task will it perform? What algorithm will it use.

By setting down all the parameters in this class and let the simulator class to use this class.

sedan:

* Class design
  1. What roles do this class perform?

This trafficLight class will control the move permission of the cars, the traffic

light will be located in the front of the road.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | carwidth |
| public | carheight |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | paintMeHorizontal |
| public | paintMeVertical |

* Method design

* 1. What should this signature be?

paintMeHorizontal: set the sedan which in the horizonal direction in blue colour.

paintMeVertical: set the sedan which in the vertical direction in blue colour.

* 1. What task will it perform? What algorithm will it use.

Set the parameter and as a class extend to the car.

Bus:

* Class design
  1. What roles do this class perform?

Inherent from the bus class and the sedan class including the width, colour, height and the orientation of the vehicles.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | buswidth |
| public | busheight |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | paintMeHorizontal |
| public | paintMeVertical |

* Method design

* 1. What should this signature be?

paintMeHorizontal: set the bus which in the horizonal direction in blue colour.

paintMeVertical: set the bus which in the vertical direction in blue colour.

* 1. What task will it perform? What algorithm will it use.

Set the parameter and as a class extend to the car.

Car:

* Class design iv. What roles do this class perform?

This trafficLight class will control the move permission of the cars, the traffic

light will be located in the front of the road.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | closestYPosition |
| public | yPos |
| Public | xPos |
| Public | otherRoadEndXPos |
| public | otherRoadEndYPos |
| public | height |
| Public | width |
| Public | otherRoadXPos |
| Public | otherRoadYPos |
| Public | currentRoadXPos |
| Public | currentRoadEndXPos |
| Public | currentRoadEndYPos |
| Public | num |
| Public | Num2 |
| Public | currentRoadYPos |
| Public | index |
| Public | index2 |
| Public | Difference\_1 |
| Public | difference\_2 |
| public | closestXPosition |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | paintMeHorizontal |
| public | paintMeVertical |
| public | getRoadCarIsOn |
| Public | getCarYPosition |
| Public | getCarXPosition |
| public | getCarWidth |
| public | setCurrentRoad |
| Public | checkIfAtEndOfRoad |
| Public | canMoveForward |
| Public | getIndexOfCurrentRoad |
| Public | nextRoad |
| Public | move |

* Method design

iii. What should this signature be?

paintMeHorizontal: set the vehicles which in the horizonal direction in blue colour.

paintMeVertical: set the vehicles which in the vertical direction in blue colour. getRoadCarIsOn: let the car running on the road.

getCarYPosition: set the y coordinate of the car on the map. getCarXPosition: set the x coordinate of the car on the map. getCarWidth: set the width of the car on the map. setCurrentRoad:

checkIfAtEndOfRoad: make sure the road that user set is not out the boundary. canMoveForward: move the car forward. getIndexOfCurrentRoad: count how many roads are there on the layout. nextRoad: add a one more road on the layout. move: moveing the road.

iv. What task will it perform? What algorithm will it use.

Set the parameter and let the simulator class(main) control. The length of a car will be used to determine the values of length for all other objects.

simulator:

* Class design iv. What roles do this class perform?

This is the main class which all the classes are under this class to control.

* 1. What member fields do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | rafficLights:ArrayList |
| public | roads:ArrayList |
| public | cars:ArrayList |

* 1. What methods do object of this class need? Should they be public or private?

|  |  |
| --- | --- |
| public | addRoad |
| public | addCar |
| public | addTrafficLight |

* Method design

* 1. What should this signature be?

addRoad: add the road on the layout. addCar: add the car on the layout. addTrafficLight: add the traffic light on the layout.

* 1. What task will it perform? What algorithm will it use.

The main class, all the programmer running under this class.