CP2406 Programming 3

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Task 2 – Working Document

# Problem specification

From the client’s perspective, the program should be able to simulate traffic with multiple vehicle types, road lengths, traffic lights and road configurations. The program should be able to take input from the user and show the vehicles interact with each other and traffic lights on a 2d map of the road.

For the first iteration of the program, it will be able to simulate a car(default) moving between two roads with a traffic light between them, stopping at the end of the second road.

# Problem decomposition

As a developer, I would break the problem into simulation and map objects.

Simulation objects: Car (Sedan), Bus

Map objects: Road, Traffic Lights

### Car

Attributes:

Id: unique identifier to differentiate each car

Length: the size of the car

Speed: distance the car moves in each tick

Position: where the car is on the road

Current Road: which Road the car is on

Method:

move(): the car will move along the current road using the speed limit of the road. If the car is in the same position as a traffic light, it will check the state of the light, stopping if the light is red. The car will also stop if another car in front of it has stop. When the car is at a end of the road with no connected road, it will stop.

### Bus

The bus class will be a subclass of car with three times its length.

# **Map**

### Road

Attributes:

- Id: unique identifier that will differentiate each road

- Speed limit: the maximum speed that cars on that road may travel at.

- Length: the size of the road

- Start location: coordinates where the road begins

- End location: coordinates where the road ends

- Connected roads: all the roads connected to

- Lights on the road: all the traffic lights that are on the ends this road.

-Cars on the road: all the cars that are currently traveling on this road.

### Traffic Light

Attributes:

- id: a unique identifier that will differentiate each traffic light.

- State: the colour 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.

Method:

operate(): determine if the traffic light turns green or red randomly using randomly generated numbers.

# UML diagram

Diagram

Description automatically generated

# GitHub