**CP2406 Programming 3 Assignment 2**

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**Problem Specification**

The problem provided was to design and create a functioning car traffic simulator designed to at least use Cars, Motorbikes and Buses. The program must showcase the road with working traffic lights along with the various vehicles moving along the road and pass through. Not only that but must also allow timing duration for each of the traffic lights to work and allow cars to move through the intersection segments within the simulated road.

**Problem Decomposition**

As the problem requires us to create a traffic simulator, the following must be used to allow the simulation to run nicely and fulfill the task at hand.

* Vehicle (Model [Abstract]): This class is used as the main characteristics for each subclass model and to program the rules for each subclass. This class has the following attributes:

1. ID – The unique identifier that differentiates each vehicle subclass
2. Length – The physical space of the vehicle length and size
3. Breadth – The physical space of the vehicle width and half the size of the vehicles’ length
4. Speed – The distance the vehicle moves for each simulation run
5. Position – The location of where the vehicle is placed on the simulated road
6. Current Road – The identity of the road the vehicle is currently on
7. Color – The graphical color assignment for each vehicle subclass

* Car (Model): The subclass of Vehicle and an object with an average size for a road vehicle
* Bus (Model): This subclass of Vehicle is used to describe large vehicles in a simulation. This subclass will inherit the attributes and behavior from Car except it is 3 times the size of the Car’s length.
* Motorbike (Model): The motorbike model is the subclass of Vehicle and that this model is used as a representation of small road vehicles. This subclass will inherit the attributes and behavior from Car, but its length is a half of the car’s length
* Road (Model): This class is to describe a single lane road for the simulation. This class contains:

1. ID: Unique Identifier for each road
2. Speed Limit: The maximum speed that any vehicle on the road may travel
3. Length: The size and number of road segments along with any physical space the road occupies
4. Start Location: Coordinates of where the road will begin in the simulation
5. End Location: Coordinates of where the road will end in the simulation
6. Connected Roads: The physical space where the various roads are connected to
7. Traffic Lights on the road: The number of traffic lights found on a particular road
8. Cars on the road: The number of vehicles that are currently travelling on a particular road
9. Orientation: The graphical direction of the simulated

* Traffic Light: This class represent a simple red or green traffic light that will allow vehicles in the simulation to know when to move or stop at any made intersection within the simulation. This class has the following attributes:

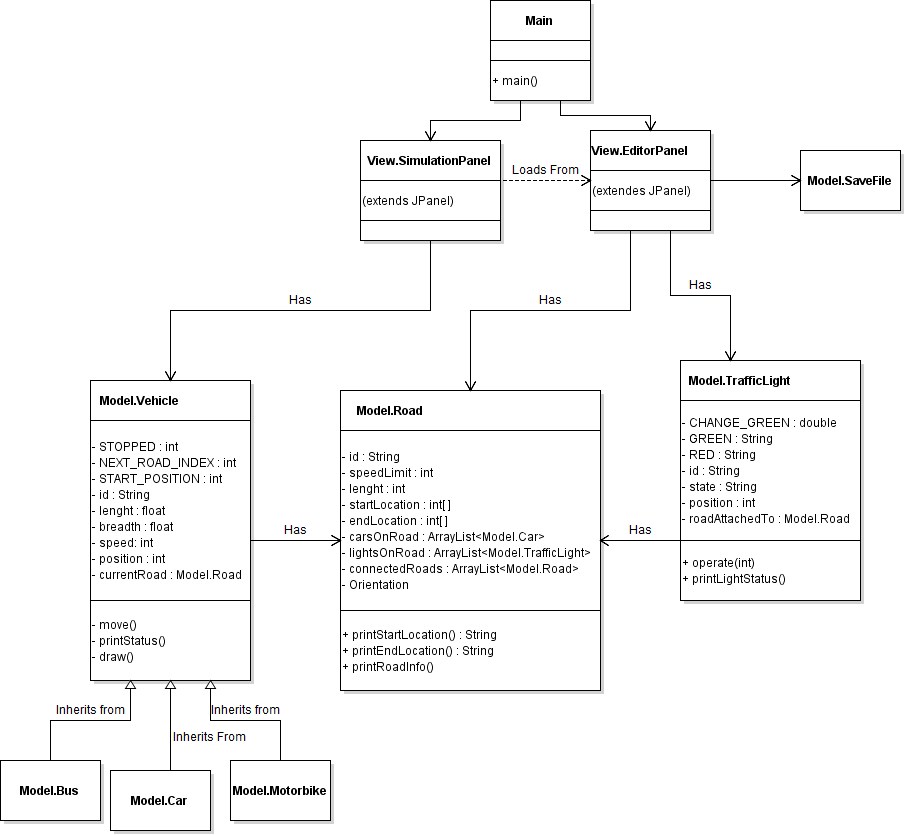
1. ID: The unique identifier that can easily identify each traffic light
2. State: The color of the light and what it is displaying either red or green
3. Position: The location of where the traffic lights are placed on the road
4. Road: The road id of where the light is attached to

* Simulation Panel: This panel is to allow the user to be able to see the simulation and all the added variables to work with the program. Not only will this panel show the other class models but will run the simulation on a timer. This View Panel has the following attribute:

1. Vehicles to Spawn: Total number of vehicles that will spawn in the simulation
2. Vehicles Spawned: The number of vehicles currently spawned inside the simulator
3. Vehicles Removed: The number of vehicles that have reached the end location and has been removed
4. Number of cycles: Number of simulation cycles between the vehicle spawns
5. Scale: The scale of the objects visualized

* Editor Panel: This panel is to allow the user to customize the map and use as a city editor to simulate their own versions of the road the user wants to simulate. This panel comes with the scale to help display the size of the road within the simulation
* Save File: This class will be handling save the simulation files
* Main: The main class will call upon the simulation and editor panel and will have the menu used for user navigation but also setup the simulation to run

**UML Class Design**



**User Stories**

1. Person 1:

|  |  |
| --- | --- |
| Name: | Adrien Agreste |
| Age: | 18 |
| Purpose: | The user has approached our team and said that while he is willing to purchase a car for his 18th birthday, his father is not willing to allow his son to test cars until he finalizes his decision on which car to purchase. |
| Priority Level: | High |
| Test: | The user will describe the vehicle specifications for the simulation to determine how fast, how far, how big and how it is able to perform on the road simulation. |

1. Person 2:

|  |  |
| --- | --- |
| Name: | Ryan Sterling |
| Age: | 34 |
| Purpose: | The user has asked our team for assistance. As the head of a car production company, he asks that our team for a program that can determine the speed of vehicle of his choosing when these specific vehicles are on the road |
| Priority Level: | Medium |
| Test: | When the user asks for a specific speed for a vehicle, the program will showcase the speed for the vehicle and demonstrate the speed in the car simulator |

1. Person 3:

|  |  |
| --- | --- |
| Name: | Christina Everlore |
| Age: | 25 |
| Purpose: | This user approached our team with the issue related to the algorithm of traffic algorithms. She was tasked with overseeing construction of a newly built road and needed guidance for how long the traffic system turns red to green, vice versa. |
| Priority Level: | Medium |
| Test: | When using the simulation, check the duration of the traffic lights from switching depending on the lane, no. of cars, etc. |

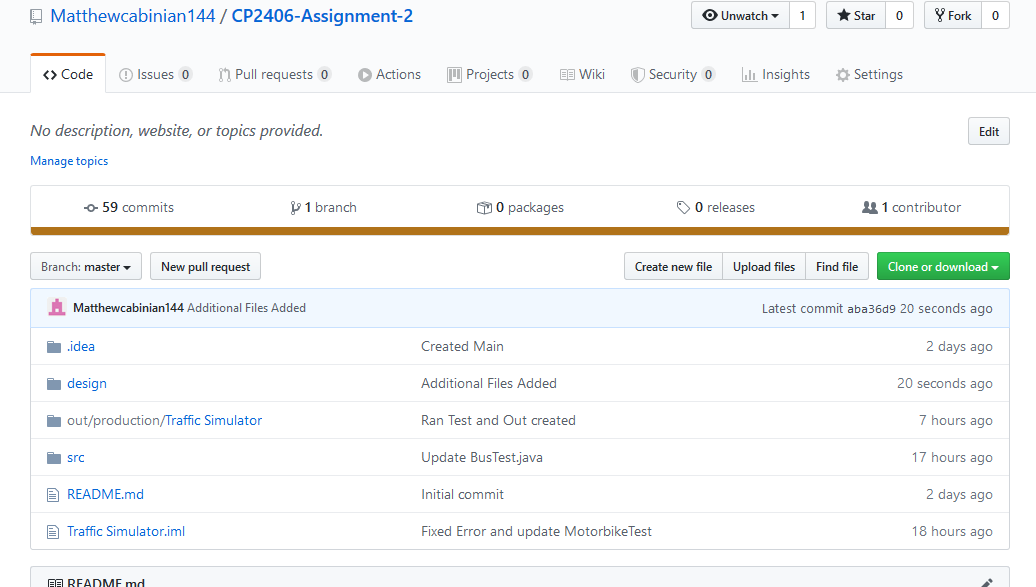
1. Person 4:

|  |  |
| --- | --- |
| Name: | Marinette Dupain |
| Age: | 30 |
| Purpose: | The user asked our team for assistance as she is currently a recently appointed driving instructor but from another country and will move to Australia for her occupation. She requested to understand the traffic flow and direction of the traffic in Australia to be able to adapt and learn and readjust her teaching methods when she relocated to Australia |
| Priority Level: | Low |
| Test: | The simulation must have at least showcased the direction for the road and where the vehicle goes when moving along the road. |

**Github Repository URL**

<https://github.com/Matthewcabinian144/CP2406-Assignment-2>

**Screenshot of Github Repository**

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