**Research Question**

Traffic jam is a common problem as well as a hot research topic that every driver has to face at least once in their lifetime. Multiple factors are involved in the cause of this issue e.g. driver’s behavior, quantity of vehicles, weather…etc. To avoid such inefficient and time-wasting circumstance, the driver normally prefers to stay informed about the traffic situation before they depart. However, the information is not always up-to-date due to the fact that traffic jam is not absolute predictable and is usually not timely reported. If the newest information can be delivered to every driver/vehicle in real time, the ongoing traffic can then be diverted to the other route, instead of all arriving at the same jam. Therefore, how to construct an ideal updating and communicating system which helps the vehicles with avoiding the traffic jam in advance is the main goal of this project.

**State of the Art**

More popular models include to follow. Models such as the cellular automata model designed by Nagel and Schreckenberg treats the vehicles as individual agents with a set of given rules, also exhibit the complex phenomena associated with real traffic [1][2]. The interactions are largely governed by car-following and lane-changing logic [3][4][5]. One well-known model, among various vehicle following models, which attempt to describe vehicle following based on anti-collision concept is the “Gipps model”, developed in 1981 [5][6]. In this model a vehicle always aims to be able to stop safely if the vehicle it is following performs an emergency stop [6]. Another class of models, known as the “Psycho-physical” vehicle models attempt to capture both the physical and human components of vehicle control. They do this by maintaining a vehicle state, where the current state is determined through the differences in speed and distance to the leading vehicle [4].

Chen and Zhan evaluate simultaneous and staged evacuation strategies in their paper related to urban evacuation. This problem is analogous to our goal to evaluate the time taken by all attendees of a concert to reach their home/destination. In the paper Chen and Zhan, models the roads as links and junctions as nodes with two different types of networking – ring and grid as they are widely used in many cities. They modeled the agents to know the shortest route to reach their destination and also had a timing plan implemented for the agents leaving the site. However, the paper only evaluates two types of driver – aggressive and conservative, thus simplifying the real world scenario. There was no best evacuation strategy found using simulation, but for high population density in a grid networked city staged evacuation works better. For free flow traffic situation with no traffic, the simultaneous evacuation strategy yielded better result [11].

**Methods**

Since the design and development process for multi-agent simulations is different to traditional systems, literature suggests that the modeling is essentially a 7-stage process: brainstorming, theory, hypothesis, flowchart, code, analyze and publish [5]. Although complex design and development methodologies [8] like MESSAGE, PASSI, Tropos, Prometheus, MaSE etc. exist, for the purpose of this project, existing methodologies such as the Agent UML will be incorporated also keeping in mind the 7-stage process. The idea is to write the Multi-agent traffic system in an OO language like C++ or Java. This is mainly because agents can be considered as an extension to objects.

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**Timeline**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | April | | | May | | | | | June | | |
| 4/10 | 4/17 | 4/24 | 5/1 | 5/8 | 5/15 | 5/22 | 5/29 | 6/5 | 6/12 | 6/19 |
| Expose |  |  |  |  |  |  |  |  |  |  |  |
| - Research questions |  |  |  |  |  |  |  |  |  |  |  |
| - Project timeline |  |  |  |  |  |  |  |  |  |  |  |
| - Research State of the art |  |  |  |  |  |  |  |  |  |  |  |
| - Project structure |  |  |  |  |  |  |  |  |  |  |  |
| Model the system |  |  |  |  |  |  |  |  |  |  |  |
| - UML-diagrams |  |  |  |  |  |  |  |  |  |  |  |
| Implementation |  |  |  |  |  |  |  |  |  |  |  |
| - Set up platform |  |  |  |  |  |  |  |  |  |  |  |
| - Implement the world |  |  |  |  |  |  |  |  |  |  |  |
| - Implement a single car |  |  |  |  |  |  |  |  |  |  |  |
| - Test run |  |  |  |  |  |  |  |  |  |  |  |
| - Expand the population |  |  |  |  |  |  |  |  |  |  |  |
| Project Report |  |  |  |  |  |  |  |  |  |  |  |
| Project Presentation |  |  |  |  |  |  |  |  |  |  |  |