Modeling of Optimized Traffic Patterns Using GPS and Wireless Communications Between Traffic Lights and Vehicles

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In the last few years GPS navigation systems as well as wireless communications systems, such as bluetooth, wireless internet, and cell phones, have becoming increasingly popular and accessible. The marriage of these two systems could allow for more efficient traffic patterns as traffic could be dynamically regulated by wireless communication between vehicles and/or traffic regulators such as lights. Vehicles could be automatically routed the fastest route based on the volume of traffic on given roads and highways. Traffic lights could be optimized to be more efficient by knowing the exact location of nearby vehicles, and where those vehicles are going, if their navigation systems transmit that data. Speed limit signs could be dynamically adjusted based on the volume of traffic on the road, and the conditions from a local weather report. By implementing systems such as these, people could reduce travel time, and in turn reduce the use of fossil fuels that waste natural resources as well as pollute the environment.

This project's goal would not be in the designing of a system such as this, but in the modeling of a similar system. An analysis of this system could show the benefits that could be gained.

Last year two TJ students studied traffic patterns and their work could be used as a foundation or a point of comparison if the project were to be completed. J. Hurley did research on highways and G. Tabot did research in the Simulation and optimization of traffic patterns and lights. My project would merge the two of theirs and add the intercommunications component described above.

The visualization of traffic models could be done using NetLogo, which was used in previous students projects. The artificial intelligence to route cars based on distance, speed, volume and estimated time will probably be written in python as it lends itself well to applications of this sort. As I learn more fortran in my supercomputing course, I may implement some of that knowledge, but at this point I don't know if that would be valuable or not.

Breaking the project into several chunks to be worked on in short intervals is very possible. One of the first tasks would be to find or create a way to setup and visualize existing traffic patterns. Next I would need to code something to allow the cars to communicate between one another so that traffic volume could be calculated. Writing the AI of routing vehicles to their destination could be another. Optimizing a heuristic value could take a few class periods also. This project really lends itself well to being broken up into several smaller chunks.

If this project can be completed in a year, I expect to find that vehicles could reach their destination more quickly especially when the traffic density is higher. I would also like to analyze gas consumption and analyze how reducing stop and go situations by routing away from traffic could increase gas mileage and make travel more environmentally friendly.

The results of this project would best be presented through a graphical comparison between existing systems, and the model created through the year. This could be included in a power point presentation as well as a poster. It would also I think be valuable to run the visualization program to demonstrate the capabilities of the model.