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Data Structures

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Final Report

**Traffic Simulator**

There were several challenges we encountered during the design and implementation of our simulator. One of the first challenges we had to overcome was figuring out what data structure to use for the roads. We initially thought that we could use a queue to model a road, but quickly found out that you can’t insert values into the middle of a queue which we needed to do to accurately simulate a road. Since each car has a different exit time for each road due to the different speed, we needed to be able to remove cars off the road that were ready to move on to the next road. The data structure we eventually picked to represent the roads was a multi-map with a key of the individual car’s time left on the road and data value of the car itself. Also for our road class, we initially thought it would only need one departure and arrival queue, but later found out that each road actually needed two arrival and departure queues to accurately represent multi-directional traffic.

The question that needed to be answered by our simulator was: what is the correlation between road capacity and travel time. Setting a fixed arrival rate of 60 cars per hour and running the simulation for a week, the data that we received showed that as road capacity increased the average travel time through the city decreased. Also, our simulation showed that for a road capacity of 3 or smaller, there were no cars exiting the city i.e. there was a major traffic jam. Upwards of a road capacity of 9, there was essentially no changes in the number of people leaving the city i.e. there was no congestion on the roads.