Road Race

New Mexico

Supercomputing Challenge

Final Report

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Team 49

Melrose High School

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Executive Summary:

Our project is a simulation of traffic around our town during lunch hour as high school drivers leave the school to head to one of two possible off campus lunch sites. As these students have a limited amount of time, and want to spend it as much of it as possible with their friends while eating, they are always trying to find the fastest ways to get to their destinations.

As with any traffic model, there are numerous possible routes to take between any two destinations, and each route will have its pros and cons as to why it should or should not be taken. Many outside variables can come into play that can alter the situation on a daily basis and keep the situation fluid and dynamic. With all of this being said, we decided that it would be a fun thing to simulate, and a model that can be useful to us in the future.

Our model is intended to look like an aerial view of our hometown of Melrose, New Mexico. We are going to make playable cars in which you can control the direction they move using the keyboard. We have included stop signs where you will have to stop, speed zones, random village traffic along the roads being travelled, and a large amount of random vehicles along the local highway. A police vehicle and its line of sight will be used to make sure that traffic rules are being followed, or you will have to restart.

We want our program to be both a simulation and a game to play. You will use all the visual clues and knowledge of the streets to find the best way to your lunch area for the day.

We are using NetLogo as our programming language, as we are all first year programmers, and this is our first major computer project that we have done. The amount of material that it has available to help new-comers to programming has been very beneficial.

Problem Statement:

Our project is about traffic in Melrose and how students go about getting food for lunch, at one of two of our local restaurants: Allsup's or Dale's. The aim of the model is to find out the quickest and safest travel routes and times from the school parking lot to get lunch and return.

We made our simulation of this process in our town in the form of a game. In our interface we have located all the roads, parking lots, and major significant areas in our town. We drew the roads by creating an agent to follow a set of commands and change the color of the ground below them. These lines that they make resemble and represent the roads in our town. The black roads are the main highway. The gray roads are the town roads. Lastly, the brown roads are the dirt roads. Each type of road has varying speeds depending on the color.

The cars and vehicles are made to stay within a set range of speeds, and the player's vehicle is controllable using keyboard commands. The player makes decisions about the route to take, and responds to other traffic in order to make the trip as quickly and safely as possible.

Agents that represent the village constable and random local traffic will be generated and controlled by the computer. If any traffic violations are in the line of sight of these agents, a report will be sent to the school, and will result in a '**No score – driving privileges revoked!**' message upon completion of the trip. The violations being monitored are: Use of stop signs; not cutting off oncoming traffic; and proper speeds in controlled zones.

Method Description:

To create our simulation, we used a computer program called Netlogo. This is an agent based modelling program that allows you to create groups and sets of agents that follow specific

commands to simulate a driver going to lunch. This program allows us to determine the best and fasted routes for students.

This is a traffic control exercise. We have located the important stop signs, yield signs, and speed zones around the town. We have also timed the distance from the school parking lot to Allsup's and the time it takes to get to Dale's under different conditions. We used this information to build our model.

Verification and Validation:

We validated our project by taking every route possible to Allsups and Dales in both real life and on our simulation. There are many ways and different scenarios that can happen when going to lunch. A few options to be mentioned are: 1) Going down Main Street and either getting on the highway or taking the side roads to either Allsups or Dales. This has fewer stops, but also the most other traffic to negotiate. Or 2) Use side and back streets. Even though they are more of a straight line, they have more stop signs along the way. Any path utilizing option 3) Using the highway with its higher speeds and NO stops is also heavily favored. These options are similar to how it works in real life.

We found that our model represented real life best on the major routes that kids normally drive, and that the reports from the community to the school about bad driving habits mimicked well how kids get turned in for poor driving practices.

Results:

The results from our program gave us the fastest routes to Dales and Allsups. The fastest routes from the parking lot to Dale's is to go east to the dirt road and then south all the way to the highway, then right turn into the restaurant. The fastest route to Allsup's is to go down Main Street and turn left then right just before you reach the highway. This route is faster because it has less stop signs. Alternate routes in taking the back roads have less traffic and traffic violation messages, but there are many more stop signs and turns to slow your average speeds..

Conclusions:

Although some of these routes are efficient, there may be some unprecedented encounters that can occur. For example, some students may fear going on the highway and would prefer going the slower, safer route while some students may be in a hurry and would rather go the faster route with more oncoming traffic. Another conclusion that we have is that the time it takes to go on each route in the simulation, is similar to the time it takes in real life.

Significant achievement:

Our most significant achievement has been figuring out how to program and learning the many different codes to create a variety of scenarios. We learned some of the Netlogo language and procedures, making it easier to understand the programming necessary for a project like this.

Our model didn't prove anything that we didn't already expect… In that way, we feel that it was also validated.

People and originations:

Our Science Technology teacher introduced us to the Netlogo program and taught us how to use it. We also gained a lot of information from the materials provided by Netlogo websites. During February evaluation we had a zoom meeting where we discussed our project and where it was going. The judges gave us some advice on our project that helped to make it more realistic.

Software, references, and tables. Citations:

A website that we are using to help us out on the traffic flow is www.sciencedirect.com. This site gave us some information we can use.

Netlogo Models Library: Traffic Programs. Showed us how others have represented traffic problems.

Netlogo dictionary – our main source of information on coding and the use of NetLogo.

Personal interviews - Information from student drivers about their routes and times.