Computer Traffic Simulation

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Abstract

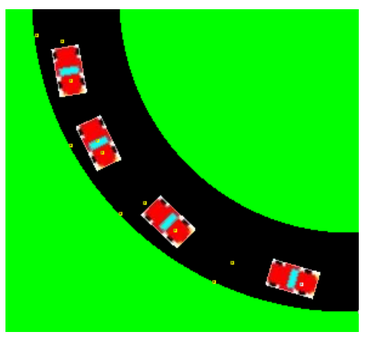
Traffic flow is an extremely complex procedure and is near impossible to figure out equations for. The best that can be done is to have complex simulations of the traffic in order to get a semi-realistic view of the traffic that can be controlled and experimented on at will. Simulating similar situations and behavior patterns closely results in other behaviors that can be studied and that can also be applied to real life as well.

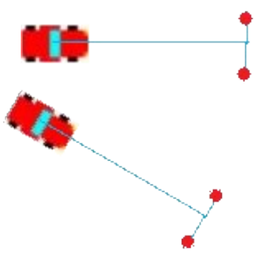
Ideas

The purpose of this project is to simulate traffic, so the cars have to be set up in a fashion that makes sense. This requires a few things: Pathing detection, Car detection, and a way to induce Wave Patterns.

Pathing Detection

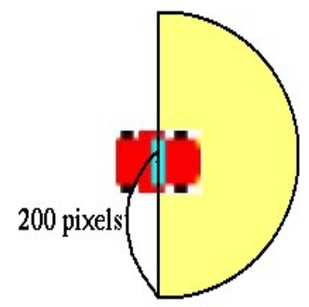
For the car to stay on the path, it looks at 2 points a little bit of distance away from its midpoint, and determines if it is looking at road or grass. If one of the dots read grass, turn away from it.





Car Detection

In order to look for other cars, the car checks an arc of 180 degrees in front of it with a radius of 200 pixels. If multiple cars are there, the car will the distance formula to determine the closest one.



Wave Patterns

Traffic wave patterns is stop and go traffic to an individual car, but as a whole it looks like a spot where the cars have stopped, and slowly acclerate ahead, yet come to a sudden stop behind, thus making the pattern move backwards. This is what the simulation aims to emulate because it is the main factor for slowing down traffic, as well as increasing the amount of acceleration that cars have to do in order to get around the lap, on average.

Results

Wave patterns are bad for traffic. Not only does the stop and go traffic create more acceleration (and thus more gas) but it lowers the total flux of the traffic flow greatly. Running the simulation with variable car amounts, but changing the Car's Max Speed value, or speed limit, indicates that sometimes its better to use a lower speed limit to get both faster speeds and lower gas costs.

The graph below on the left shows the average time with cars going through a point on average. The lower the number means more cars going through, or more traffic flux. The interesting number is at 16 cars, when the simulation run with half the maximum speed gets better gas acceleration and traffic flow. The graph below on the right shows the gas used. This is important because you can see how much wave patterns are being formed because they are the only reason gas is used.