Navier

Lane-Based Navigation for Autnonmous Vehicles

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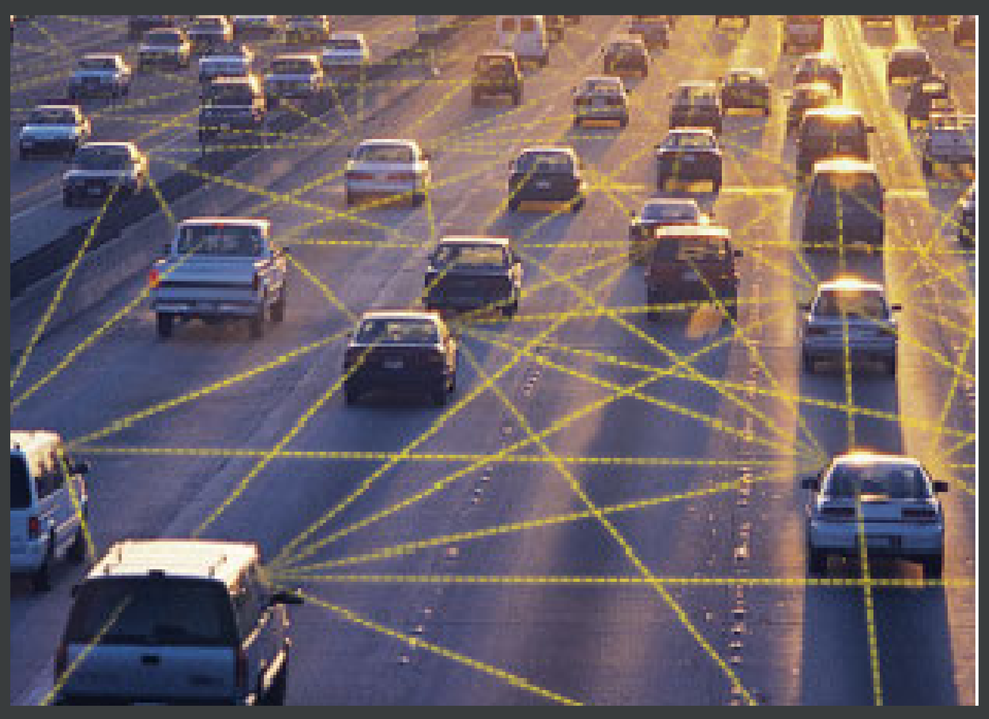
What is it Trying to Solve?

As populations grow, cities cannot simply build wider roads and more infrastructure. Rather, we propose changing the dynamics of how people drive upon existing infrastructure. When cars accumulate in one space, such as during rush hour, one maneuver, be it a lane change or sudden deceleration, can have a lasting effect. This is due to a lack of communication between drivers: drivers cannot detect a slow down until the car directly in front reacts because drivers are currently only aware of the car behind them and the car in front of them. However, if we had a system of inter-car communication built upon existing protocols such as V2V, we could inform drivers of slow-downs much earlier, thus avoiding the sudden reactions that lead to traffic jams.



Our Proposed Solution

We propose a new system of navigation for both drivers and autonomous vehicles that facilitates the flow of cars, there in turn reducing traffic. Our lane-based navigation system is designed to reduce traffic or eliminate it entirely through the pooling of cars based on the distances to their respective exits rather than their speeds.It in essence is going to create a digital layer on top of existing freway architecture so cities can focus their efforts on progression into the future rather than minimal iterations among the past.

Simulation

In order to test our system's feasibility we created a statistical model using Python and numerical computing libraries in order to analyze how our system will improve traffic through decreasing lane changes.

Pre-Navier: 2028 lane changes*
With Navier: 495 lane changes*

We then recorded how the speed changed accordingly within the system and with Navier speeds improved by 27% which will allow for a faster commute along with making it more sustainable.

*based on 2500 cars within a 2 mile stretch of freeway during rush-hour

PHASE 1

First, we will focus on implementing our pooling algoritim across widely used navigation software(Google Maps, Waze), which will suggest drivers as to what lane to drive in depending on the distance to their next direction and the direction itself. This will allow AVs and non-AVs to be able to interact with the system before AVs are commonplace.

PHASE 2

Secondly, we will implent it in fully autonmous vehicles that will be dynamically connected on a decentralized network which can alert self-driving cars of upcoming acrions to adjust speed accordingly. Secondly. with fully AV roads we can then utilize distance between cars to improve their aerodynamic efficiency and gas consumption

In order to for the system to start showing improvements in speed and slow-downs, using the same statistical model/simulation we were able to calculate that only around 3% of the cars had to be actively using Navier's system.

Github
https://github.com/rdf004/Navier

Slides
goo.gl/5zDFBT

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