The Optimization of Future Urban Mobility
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Research Question
Given a set of useful information related to a public transportation system, is it possible to optimize the efficiency, safety, and reliability of that urban mobility using software?

Background
- The future is autonomous.
- Public transportation benefits all. A better urban mobility system facilitates societal opportunity, choice, freedom, and access.
- Perception of public transportation is low in the United States.
- Increased trust and use of public lowers CO₂ emissions.

Plan of Approach
Using a data set of bus information (Bus ID, Bus Route #, Latitude, Longitude, Time, Velocity), investigate the potential use of software techniques (Artificial Intelligence, Machine Learning, Data Mining, Multi-Agent Coordination) to optimize the urban mobility system. Prove increased system efficiency.

Step 1: Visualize and Analyze
Using a data set from busses in Rio De Janeiro it is possible to visualize the system and identify potential patterns. By analyzing busses in similar routes and within the same route we can determine inconsistencies and inefficiencies that are hindering the system’s efficiency, safety, and reliability. Furthermore, those findings can be used as guiding information when addressing and investigating the potential optimization of the problem. Examples of specific busses and the routes they belong to are shown below:

Step 2: Simulate Data Set
Using the same data set, it is also possible to simulate the busses as they go through their route utilizing a programming environment such as Unity. Doing so we can observe the system in action, expose patterns, and monitor the implementation of software as the research progresses.

Step 3: Design
The next step was to create an algorithm that could utilize the dataset in a way where I could actively improve the simulations and optimize the bus travel times. I did this by creating a bus network so that the busses communicate with each other to make the best possible choices.

Step 4: Simulate Design
I applied my written algorithm onto the busses and simulated it. I was able to make it so that when the busses came to an intersection, they were able to ask busses with the same or similar routes about alternative routes. This was able to help the bus lines runs smoothly at times that they were having noticeable speed drop off.

Future Work
Unfortunately due to the coronavirus, the following were unable to be completed, but remains possible future work:
- Complete proof of concept using robotic demonstration in the React Lab
- Publish research, submit to Robotics Conference

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References: