Smart City Traffic Simulator

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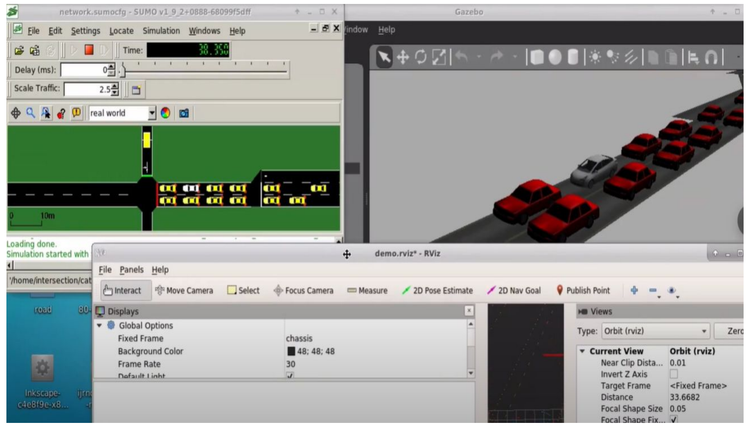
Project Overview

Our project was to develop a smart city intersection for the model intersection in the ORBIT lab, where tthere is a model replica of the intersections of 120th and Amsterdam Avenue and 120th and Broadway in New York. The simulation is a testbed for self-driving research and we hope to emulate human driving.



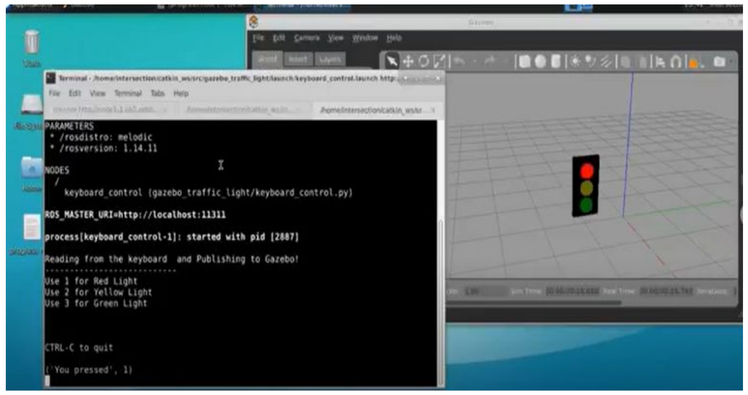
The sumo simulation (left) dictates what happens in the gazebo world (right)

Intersection Model and Explanation

The intersection model was designed from input data from technologies employed such as SUMO which was mentioned earlier. Gazebo reads the information given by SUMO, such as 3D coordinates for street intersections, cars, pedestrians, stop lights, and even stop signs. More information on the projection of some of these objects is yet to come. You can also see Rviz being employed, which is a 3D visualization tool for ROS applications. It provides us with camera data about the movement of the simulated cars. After Gazebo reads the information from its input client, the software creates a 3D simulation of the input data in real time. It should be noted that these plug in values do not control the execution of the simulation-this must be done in the simulation itself.

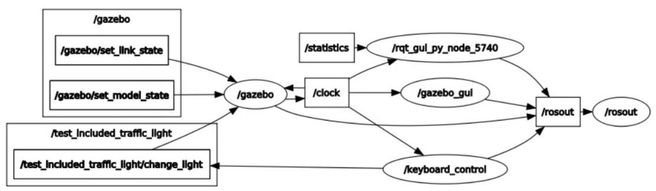
Project Goals

We wanted to feed real-time data from SUMO to Gazebo to create a virtual model of traffic in a dense city. The Gazebo software will provide a 3D robotics simulation of the data collected from SUMO. We also wanted to create object within the simulation such as a traffic light, this will demonstrate the ability to add more variables to the simulation to more accurately emulate the actual city intersection



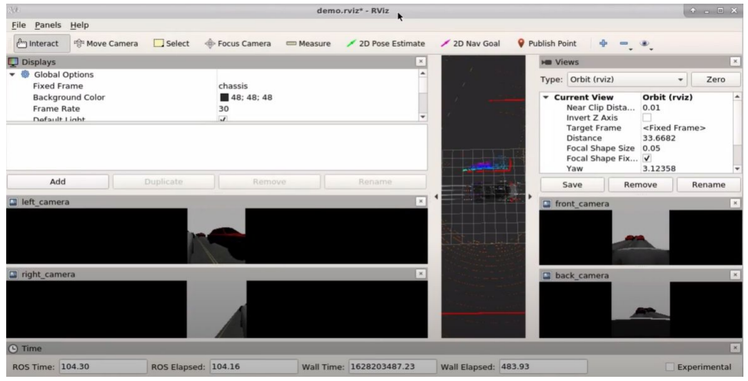
Stoplight Simulation

To create this stoplight we had to draw up a model, create a publisher node, a gazebo plugin, and ros topics. A node is an executable that uses ROS to communicate with other nodes. As you saw The publisher node took keyboard commands, and the plugin allowed us to see the lights change in Gazebo. Topics bridge the gap between both the publisher node and the plugin. The overall purpose of making this was to show that we can add more variables within this simulation such as people and that we would be able to feed the simulation more accurate data about the intersection.



Methodology and Equipment

To create a realistic simulation we used three main programs, the first is SUMO - Simulation of Urban Mobility, which was used to create our traffic models. Secondly we used gazebo, a robotic simulator to build the entire world which shows the roads and cars. We wanted to connect this world to SUMO so we can have the traffic models built in sumo be seen in Gazebo, so we used ROS to communicate between SUMO and Gazebo.



RVIZ allows us to see different perspectives within the gazebo simulation

Future Plans and Acknowledgements

In the future we hope to create a more detailed, such as including street parking and predestrians. Adding these would prove useful in generating more realistic simulations and gathering more accurate data. We would also like to incorporate the Self-Driving Car from another project into our simulated world.

We would like to thank Jenny Shane and Ivan Seskar for their guidance.

References

https://github.com/marioney/hybrid_simulation
https://github.com/CPFL/osrf_citysim

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