Development of LTU ACTor (Autonomous Campus TranspORt) Vehicle Model (Polaris GEM e2) using ROS GAZEBO

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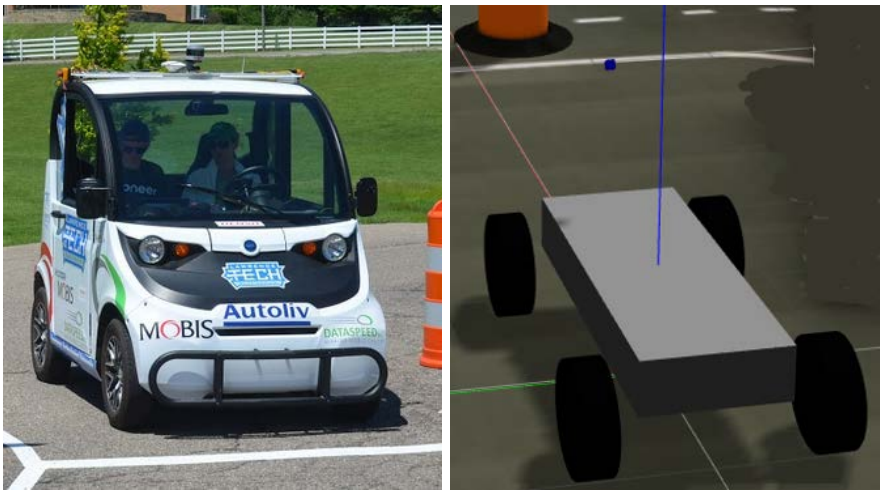


Repository location for the model:
https://github.com/LTU-AutoEV/actor_gazebo_model.git

This project models the physical properties and sensors of the ACTor research platform vehicle, Polaris GEM e2, using Gazebo robot simulator, a system that has good support within the ROS community. The simulated model receives Twist messages on topic /twist_to_ackermann. Camera output goes to /camera1/image_raw and LiDAR point cloud data goes to /velodyne_points.

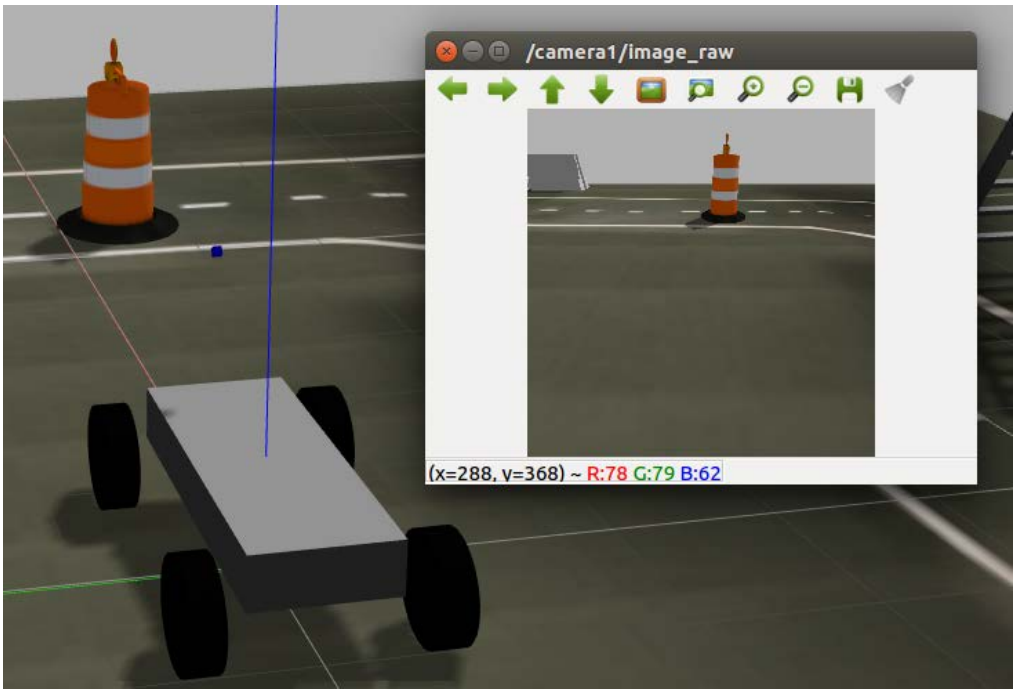
To launch the vehicle with the LiDAR sensor, launch ackermann_vehicle_lidar.launch from the ackermann_vehicle_gazebo package. To launch without the LiDAR use ackermann_vehicle.launch

Sensors

Currently, my emphasis is on the forward-facing camera and three-dimensional LiDAR system. Adding additional cameras, such as a camera dedicated to lane following or searching for curves in the road, can be easily added. However, the combination of simulating the vehicle and processing the input from the single LiDAR system is a heavy computational task and often results in crashing nodes.

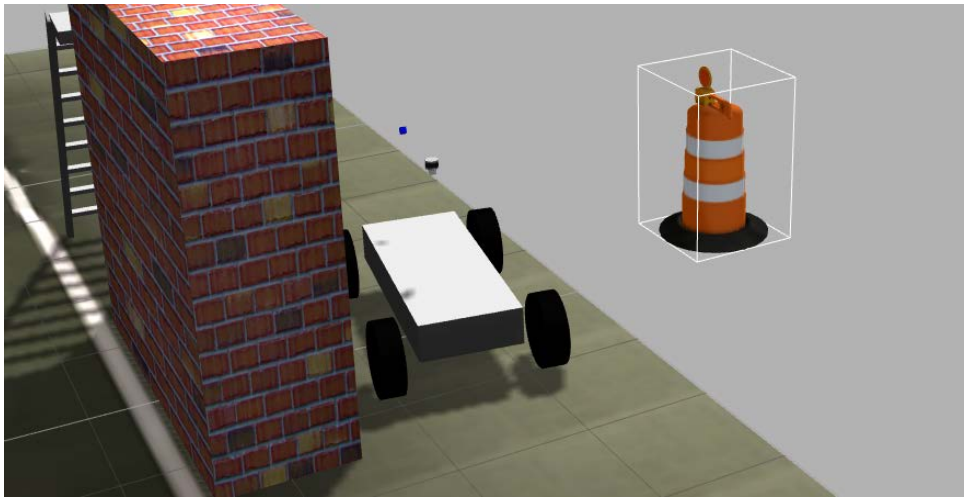
Camera

Here we see the forward-facing camera, places approximately where the camera is mounted on the actual vehicle, displaying its output to an image box. This camera output is the same required by our actual camera nodes.

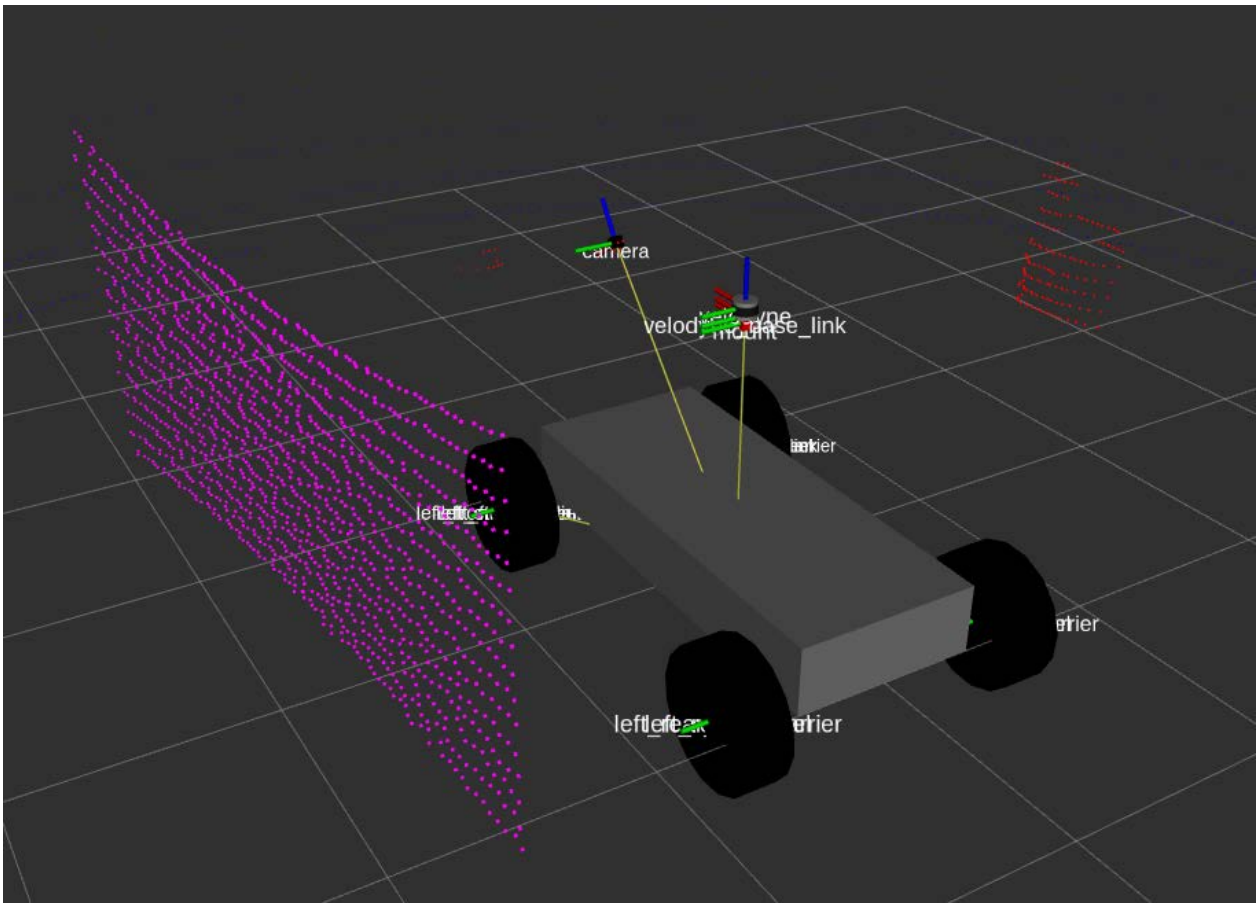


LiDAR

As with the camera, the simulated LiDAR system renders point cloud data just like the actual sensor. Here it is likewise arranged similar to the actual vehicle, displaying its output in RVIS visualization tool.

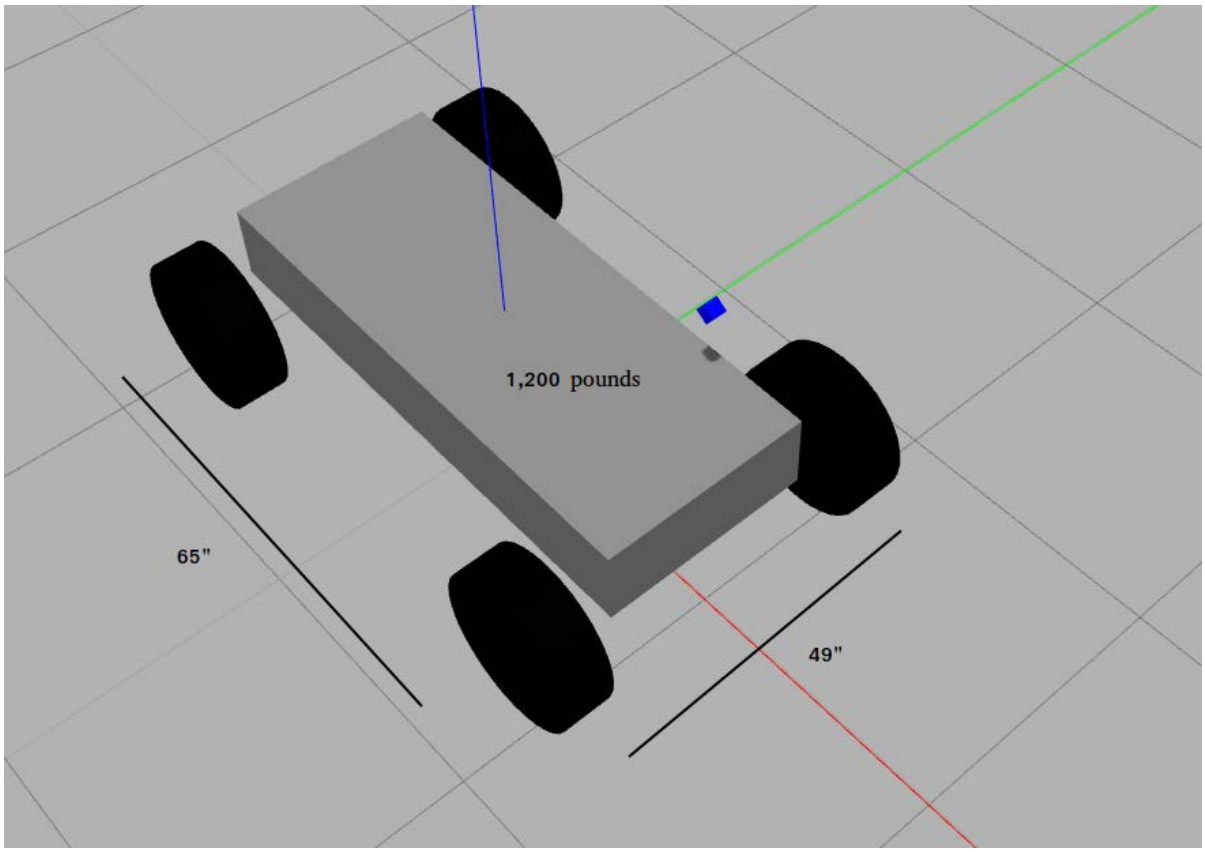


RVIZ



Model

The model attempts to simulate the dimensions, physical properties, and capabilities of the actual vehicle using Ackermann steering model. This includes weight, wheel base dimensions, tire size, and turning radius.



Simulation Example

A simulation of ACTor lane following can be watched on this video at: https://youtu.be/1nUtrs9Nmr0

Acknowledgement

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