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F-1 Tenth Car

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F1-Tenth Car System Architecture

- Perception
- GPS
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- Controller

Project Demos

- Lane Following
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F1-Tenth Car



Perception
Sensors

Hokuyo UST-
10LX LiDAR

Realsense
D435i Camera

NVIDIA Jeston
NX Computer

Metal Shock
Absorber

Remote
Controller

Vicon Markers

WIFI Antennas

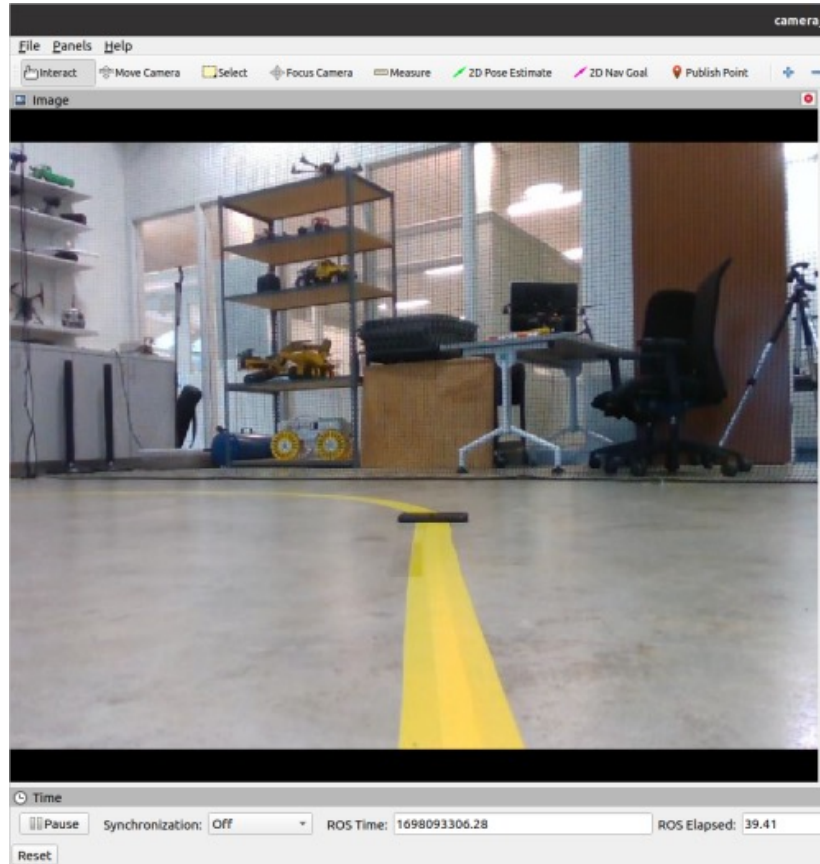
GPS

VESC 6 Speed
Controller

Lipo Battery



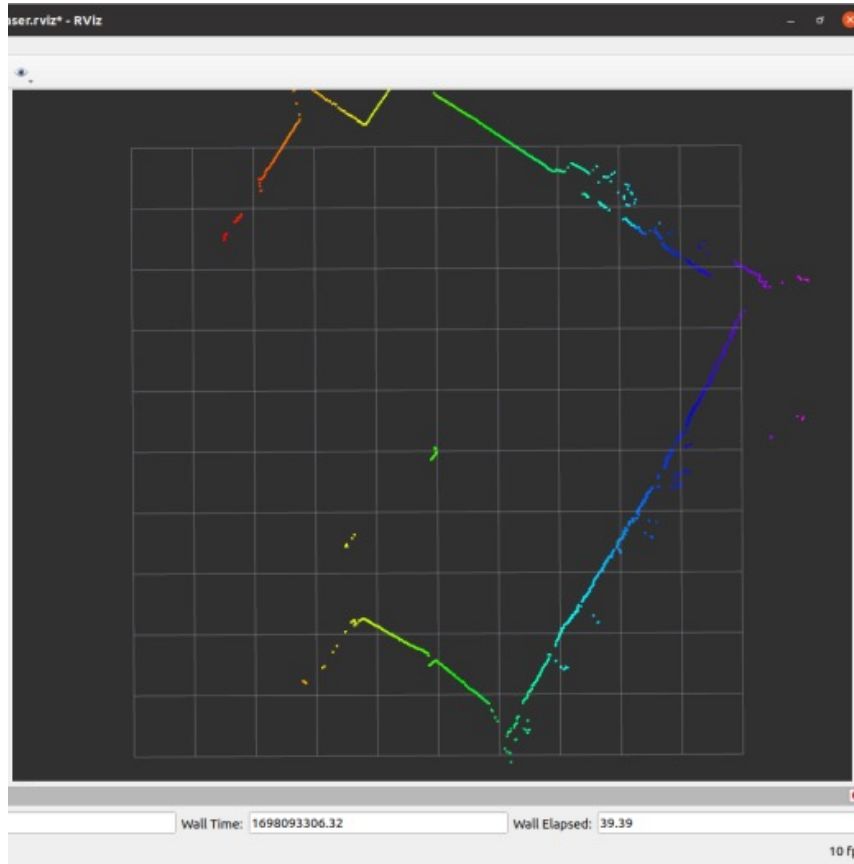
Perception (Camera)



Realsense D435i camera

- RGB camera + Depth
- RGB
 - Resolution: 1920x1080
 - FOV (HxV): $69^{\circ} \times 42^{\circ}$
 - Frame rate: 30 fps
- Sensing range: 0.3m~3m (ideal)
- IMU

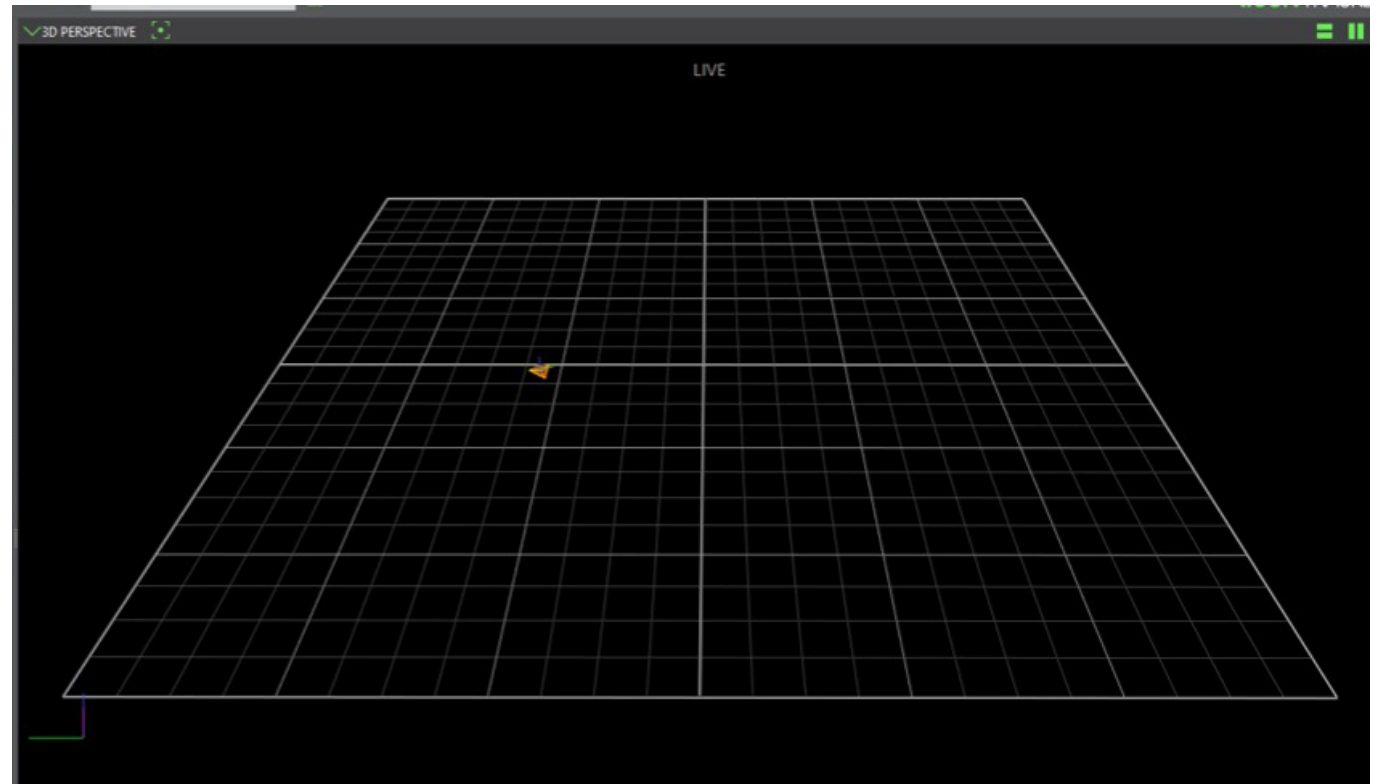
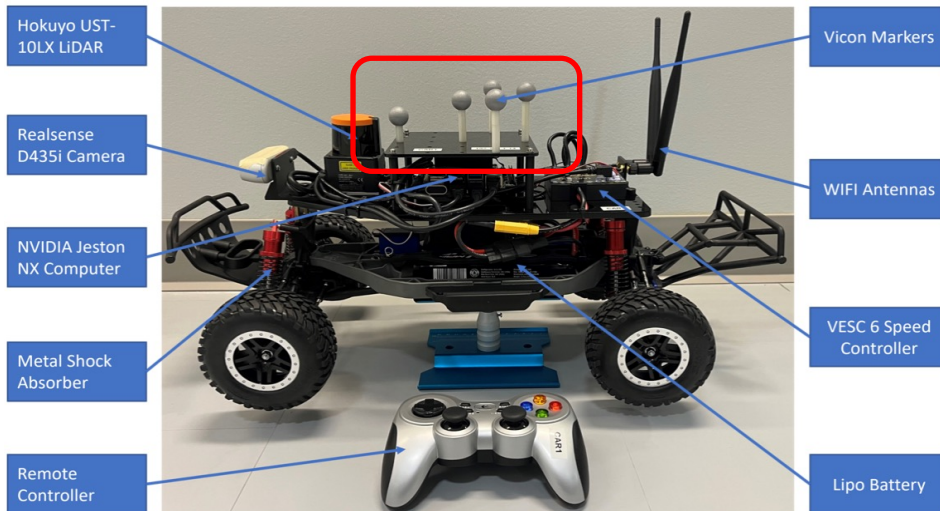
Perception (LiDAR)



Hokuyo UST-10LX LiDAR

- 2D LiDAR sensor
- Detection range: ~30m
- Detection Angle: 270°
- Angular Resolution: 0.25°
- Scan speed: 25ms
- 12V battery

GPS - Vicon



Controller



VESC 6 Speed Controller

- Provides precise and dynamic motor control.
- 11.1V LiPo Battery

Nvidia Jetson



Nvidia Jetson NX Computer

- GPU
- 6-core NVIDIA Carmel ARMv8.2 64-bit CPU
- Memory: 8GB
- Storage: 16 GB
- 12V battery

Software Setup



- Ubuntu 20.04 with ROS Noetic
- CUDA 11.4
- OpenCV 4.5.4
- CUDNN 8.6

DEMO - Lane Following



DEMO - Obstacle Avoidance



Time for a live demo!