UC San Diego

Autonomous Driving in Real Traffic

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Goals

Must have

Autonomous Lane Tracking

Stop at a Safe Distance

Object Recognition

Nice to have

React Based on Object Type

- If person - Wait until path is clear
- If object(e.g. bottle) - find new path

Demonstration

Challenge 1: Person + Bottle

Challenge 2: Multi-Object

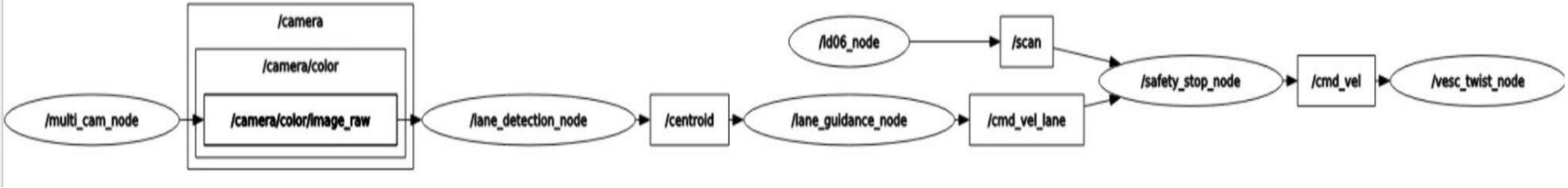
rqt_graph - Outside Dangerous Range

lane_detection_node: Detects lane lines and publish centroid of the lane

lane_guidance_node : Applies PID control on tracking error to compute steering and throttle

safety_stop_node: Subscribes to LiDAR scan and stop the car in certain range

vesc_twist_node: Converts values into motor commands for the VESC

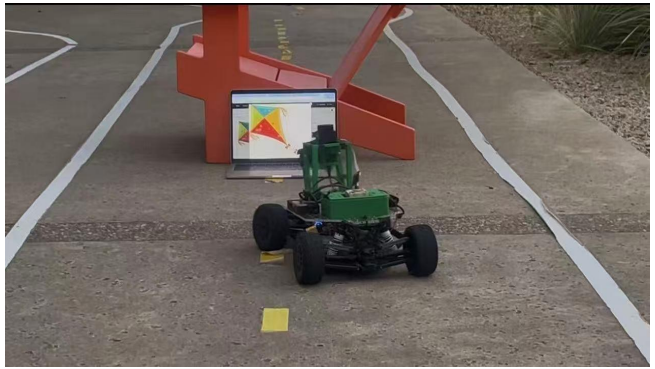


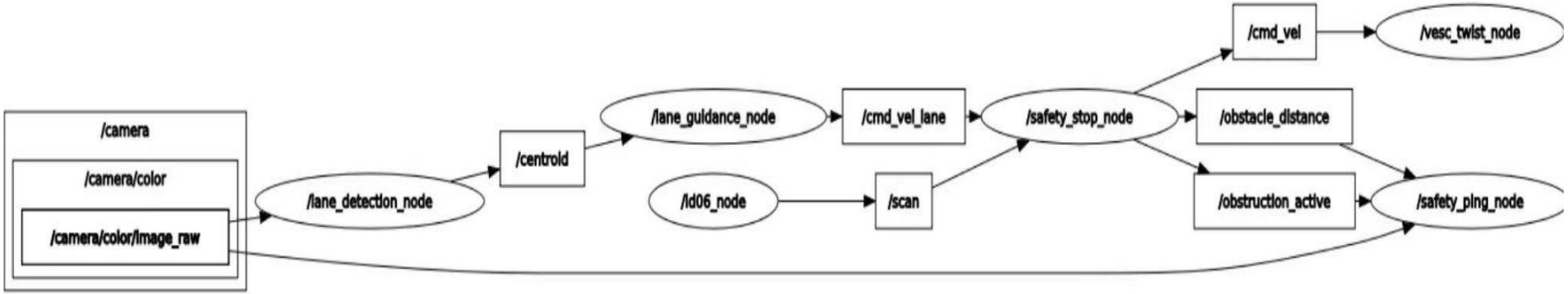
rqt_graph - Inside Dangerous Range

ld06_node: Publish Lidar scan data to safety_stop_node

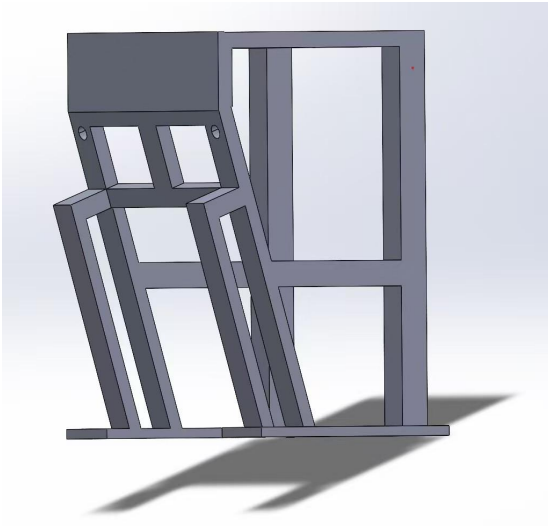
safety_stop_node: Send message to vesc_twist_node stop. Tell safety_ping_node to run object detection.

safety_ping_node: Subscribes to image_raw, if obstruction_active, run objection detection model.

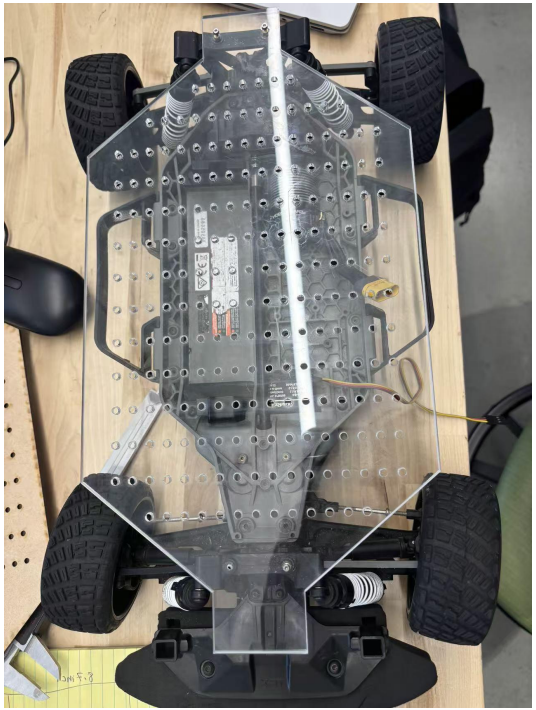




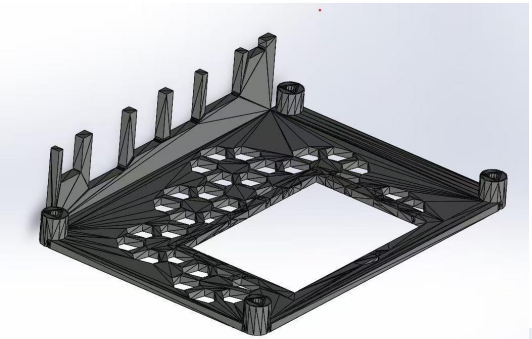
Hardware

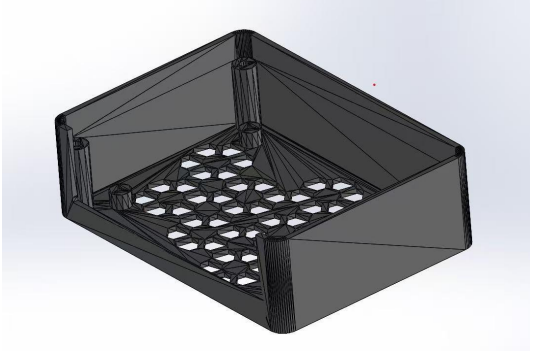


20° Camera Mount with
GPS/LiDAR Stand



Mounting Plate
20×10mm Hole Spacing





Jetson Nano Case

Discussion

Camera Angle

Angle > 15 degree improves lane detection

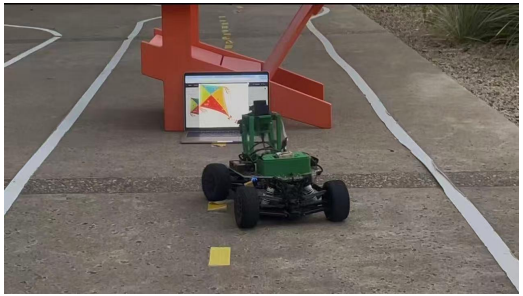
But limits object recognition due to height and range

Lane visibility vs Detection accuracy

960x960 (no detections),

Model Accuracy

LiDAR Position



If We Have More Time (or Money)

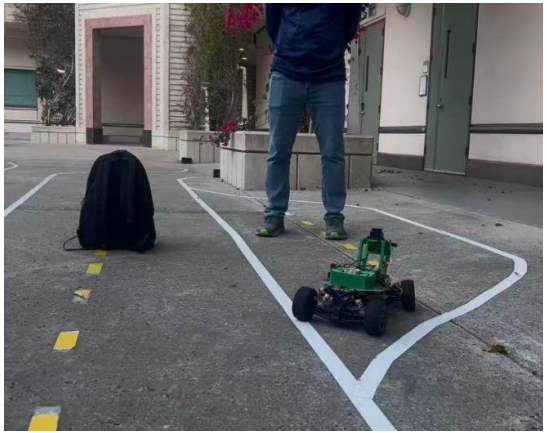
Add Camera

1 for lane following

1 for object recognition

LiDAR Reposition

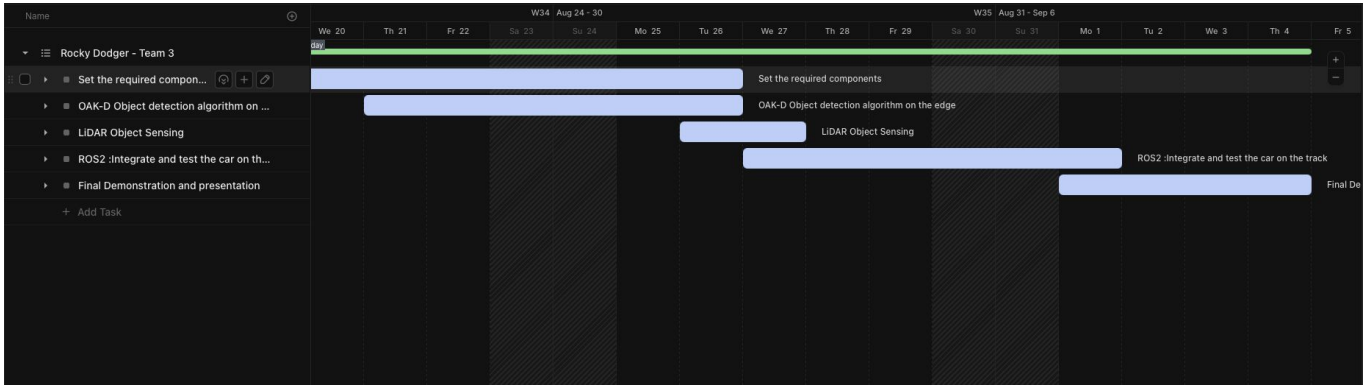
Adjust height and angle

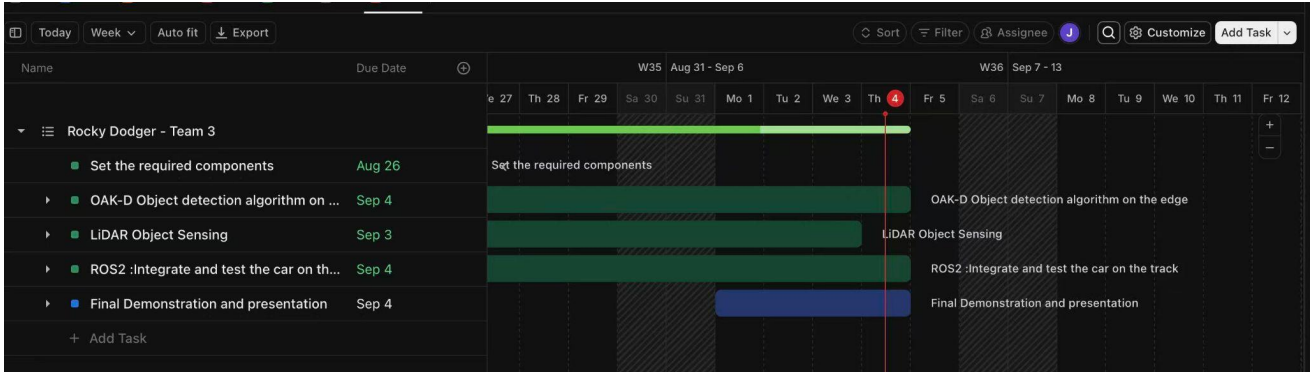


React Based on Object Type

Find new path, change lane

Gantt Chart - current status





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Thank you!