UC San Diego

JACOBS SCHOOL OF ENGINEERING

Seal Team 6 - Final Project

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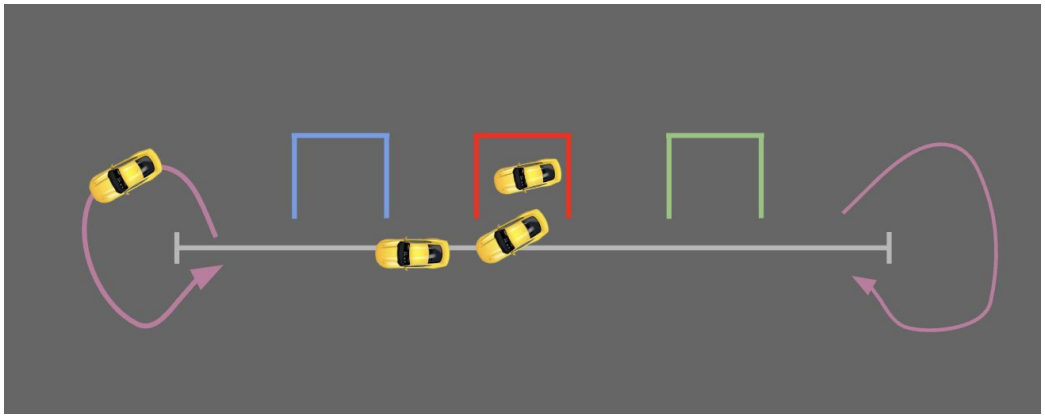
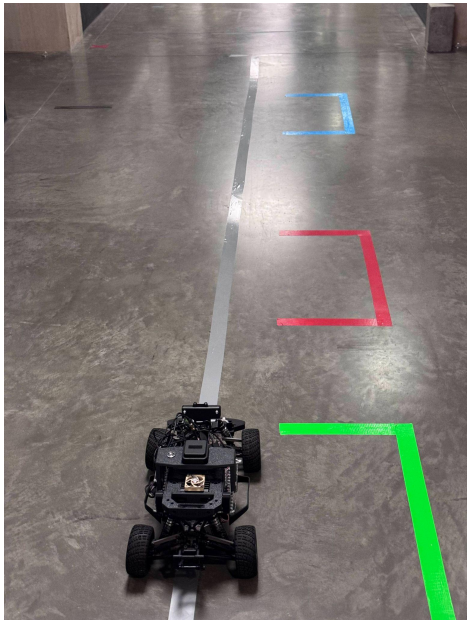
Fall 2024

MAE ECE 148

Promise: A parallel parking robot.

- Travels continuously along center line
- Parks in desired spot via controller button
- Returns to centerline





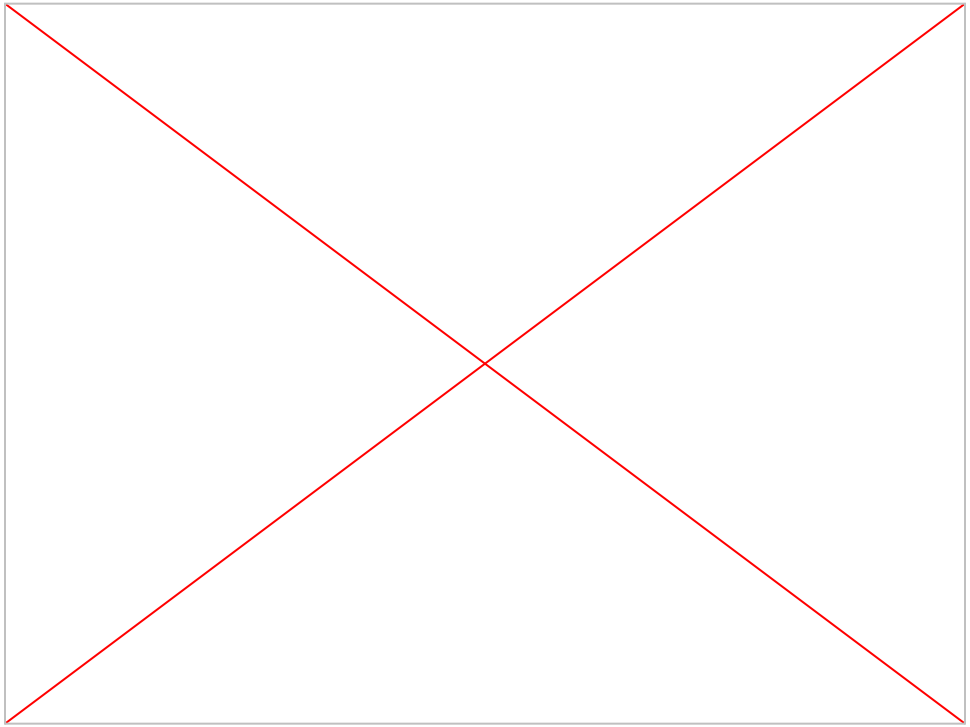
Must haves:

- Leaving start position and get into parking spot with one input directly from the controller
- 3 Different parking spot choices
- Must start a distance away from the parking spots

Nice to haves

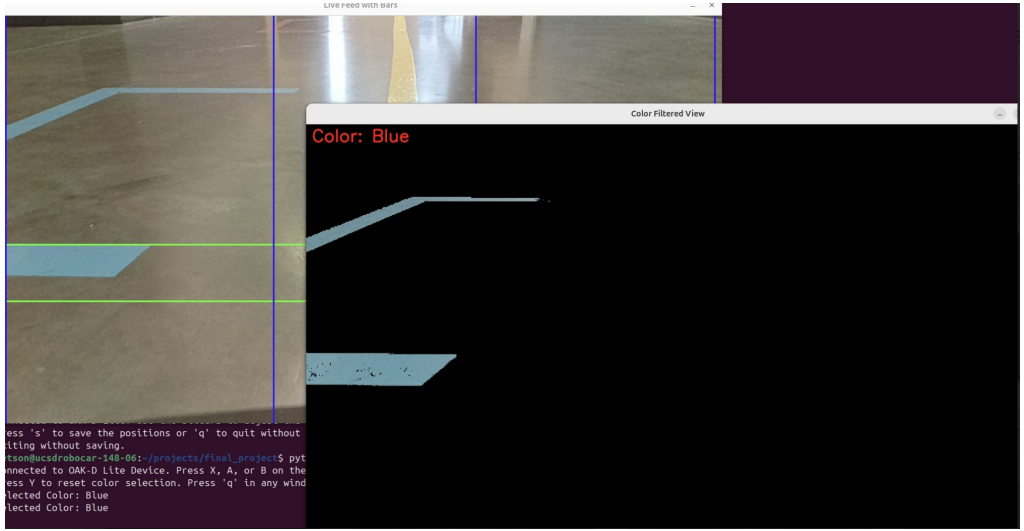
- Logitech controller input giving parking choice to operator (instead of keyboard)
- Lidar detecting if there is something parked in spot
- Object Avoidance
- Measure Length of parking spots

Video:



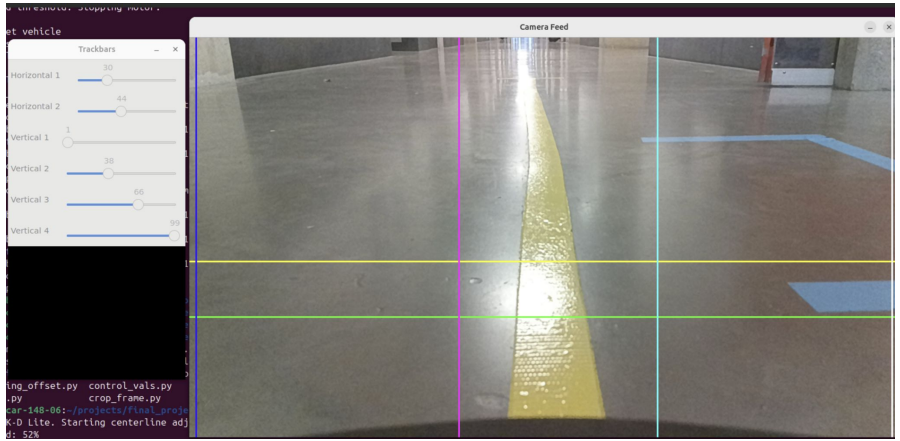
Parking spot recognition

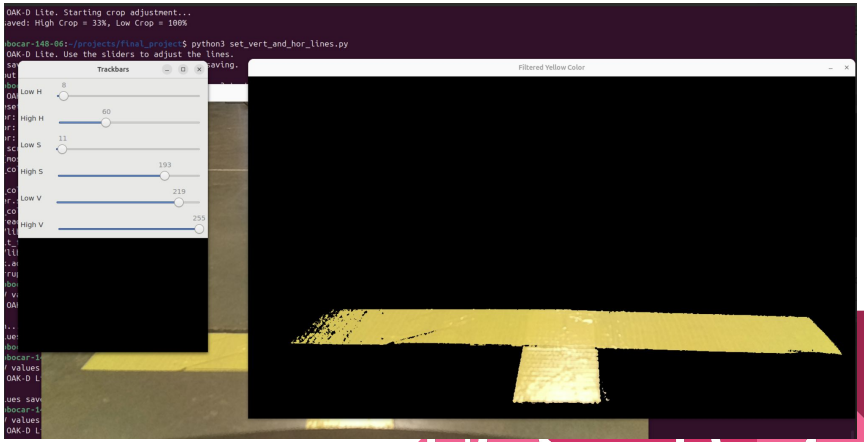
- Using OpenCV, recognized central line to drive alongside
- Recognizing all 3 different parking spots and end of lines
- Associated parking spot to respective color



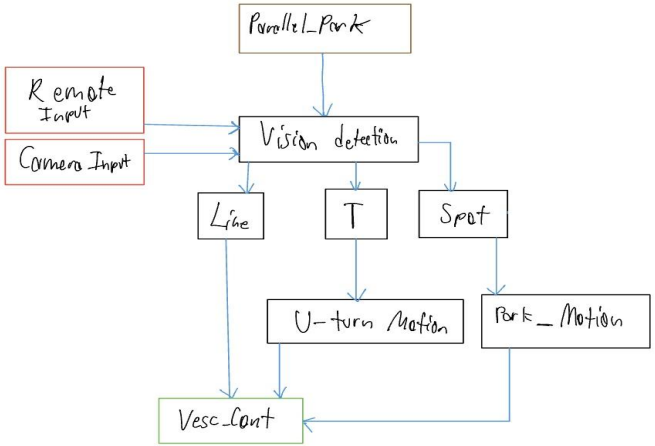
Lane Following

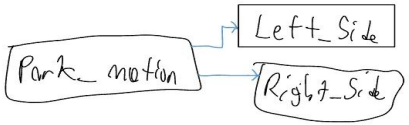
- Follow a central line passing through all parking spots, used a Kp value of 1.2
- Trained to do a U-turn motion with VESC
- Used this to continuously travel back and forth along line, and perform U-turn motion at ends.





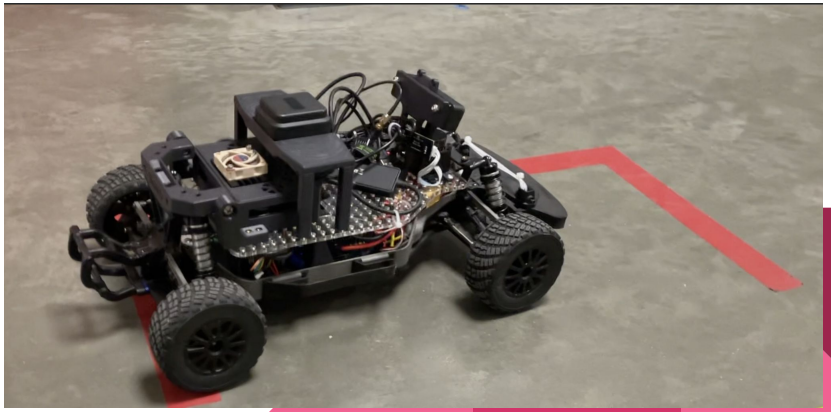
Flowmap/Framework





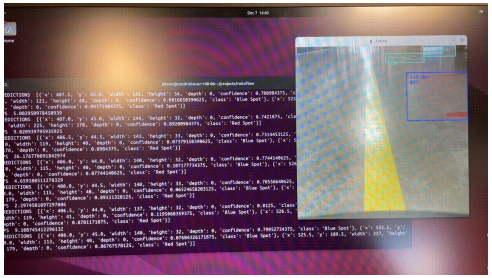
Maneuver training

- Associated desired parking spot to respective color on controller
- Trained parking maneuver motion for both sides of central line
  - Tracked RPM levels and Servo as we controlled it with the controller
  - Normalized input values to the rpm and servo values
- Trained parking exit maneuver motion for both sides of central line
- Detected line to continue central line motion



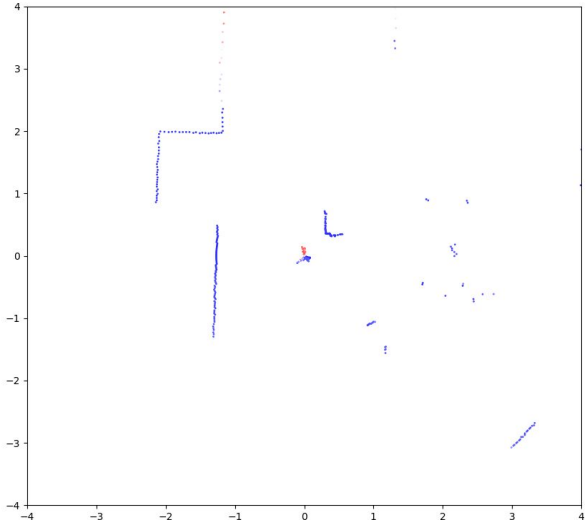
What did not work as expected? Why?

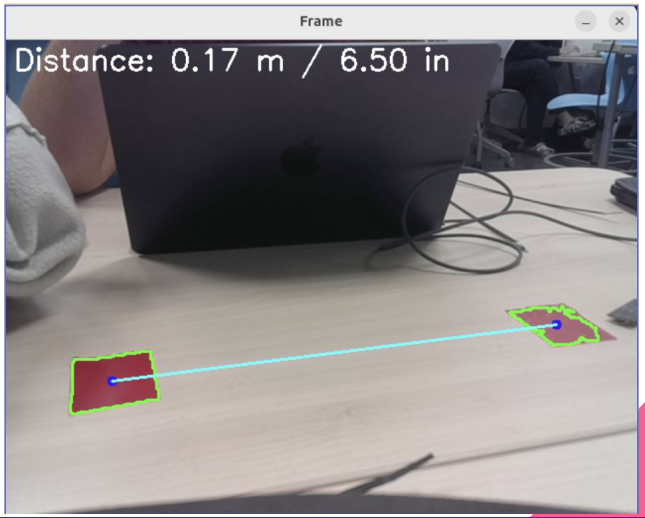
- Could not get LiDar to work well enough, so ended up not using it
  - Our hypothesis was it was too close to other objects on our robot
- Logitech controller kept losing connection during movement
  - Power demand from other objects
- The turning radius!
  - It’s huge! Caused problems with parking and u-turn movements
- Using RoboFlow images for parking spot/box recognition
  - Too many things, didn’t have time to figure it out



If we had another week we would

- Integrate Lidar Support
- Reduce the number of stops the robot experiences
- Use camera to measure the parking spot size





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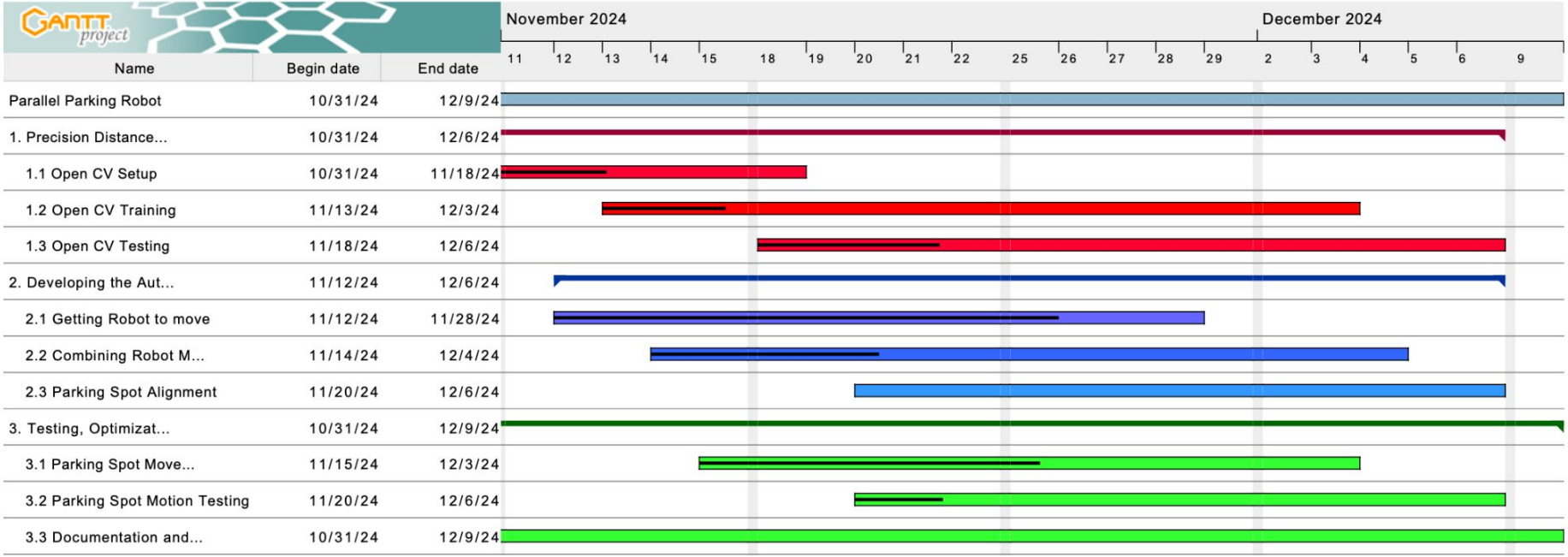

Name	Begin date	End date
Parallel Parking Robot	10/31/24	12/9/24
1. Precision Distance...	10/31/24	12/6/24
1.1 Open CV Setup	10/31/24	11/18/24
1.2 Open CV Training	11/13/24	12/3/24
1.3 Open CV Testing	11/18/24	12/6/24
2. Developing the Aut...	11/12/24	12/6/24
2.1 Getting Robot to move	11/12/24	11/28/24
2.2 Combining Robot M...	11/14/24	12/4/24
2.3 Parking Spot Alignment	11/20/24	12/6/24
3. Testing, Optimizat...	10/31/24	12/9/24
3.1 Parking Spot Move...	11/15/24	12/3/24
3.2 Parking Spot Motion Testing	11/20/24	12/6/24
3.3 Documentation and...	10/31/24	12/9/24

Thank you