System Description
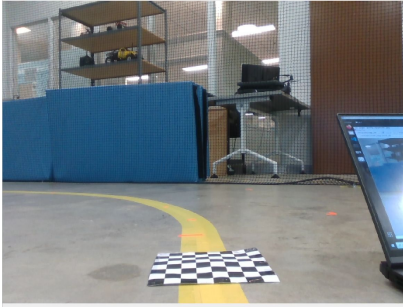

∷ROS#

Lidar → Obstacle avoidance

RGBD camera → Lane Following
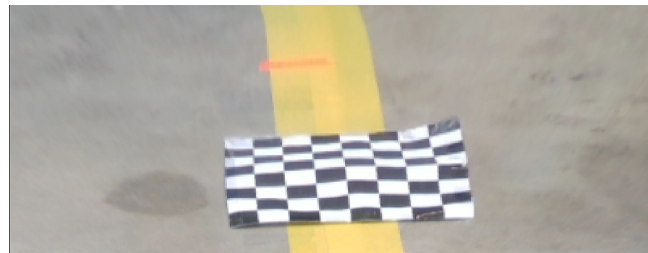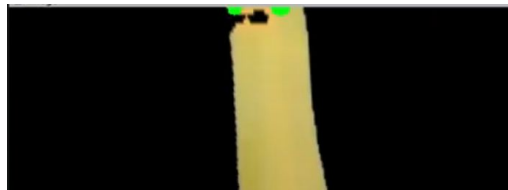
Perception

Planning & Control
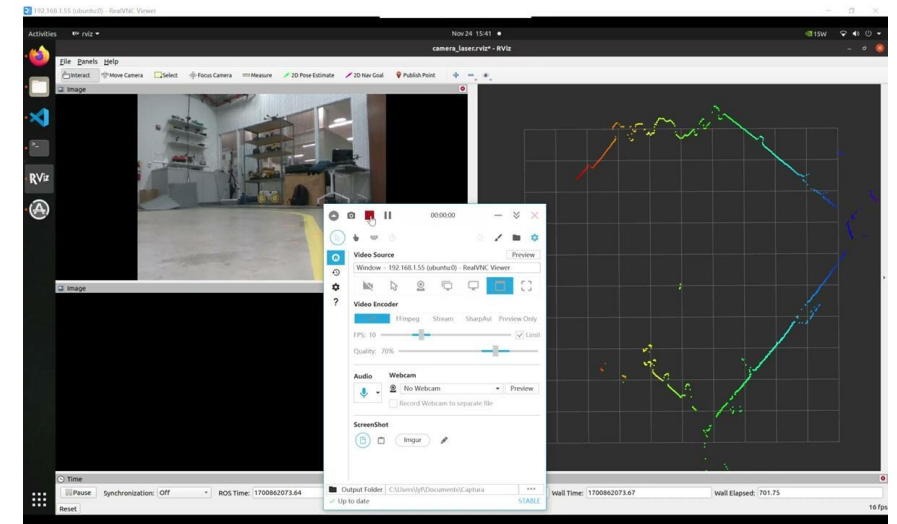
Lane Detection
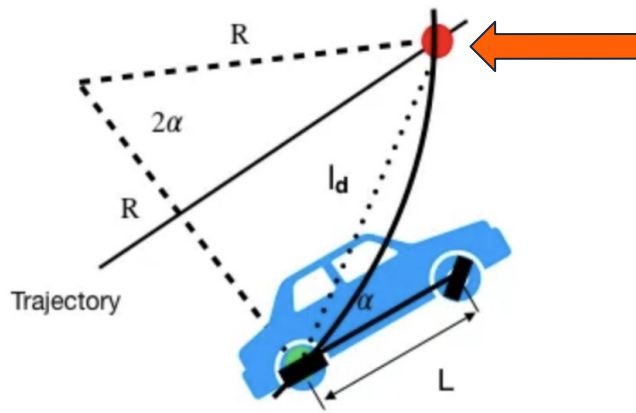

raw image

cutting image

bird's eye view

color threshold/ top pixels

demo video
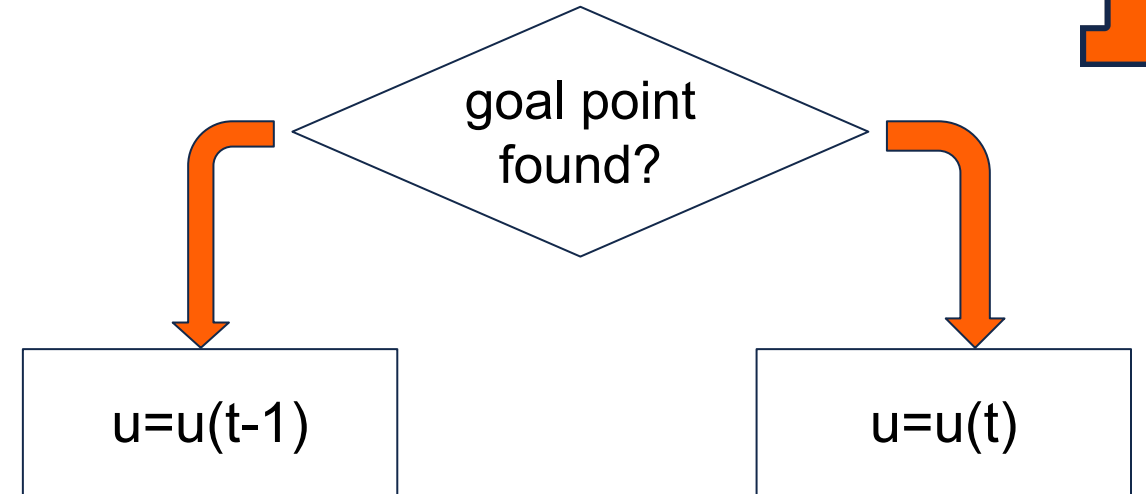
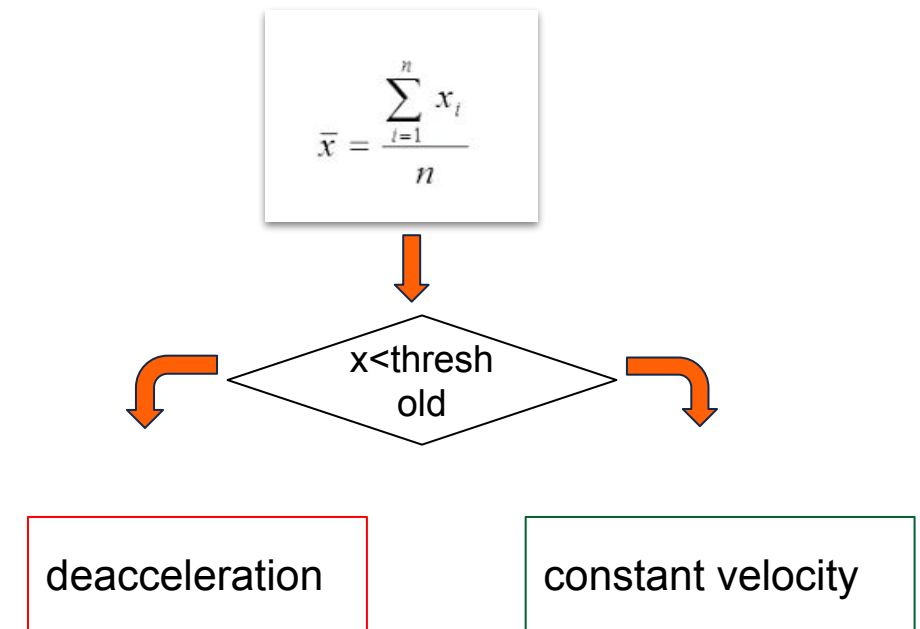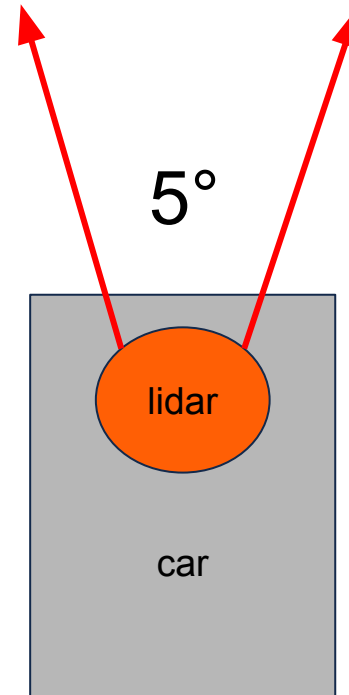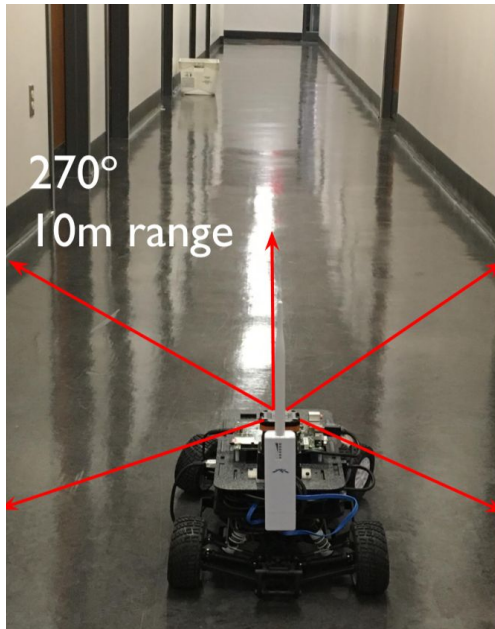# Lane Tracking

pure pursuit

goal point found?

u=u(t-1)

u=u(t)

lane out of view

lane in the view

Automatic Emergency Braking
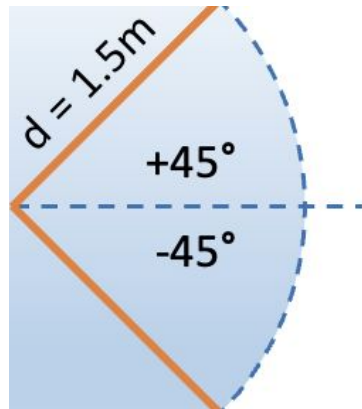

270°
10m range

5°

lidar

car

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

x<threshold

deacceleration

constant velocity

picture source:https://f1tenth.org/learn.html

Obstacle contour reconstruction

Lidar data process	Contour reconstruction	Behavior clone

- Calibrate orientation of Lidar
- select ±45° region
- Set a distance threshold of 1.5m

- Change to obstacle avoidance mode
- Draw obstacle contour with yellow
- Default target point finding method
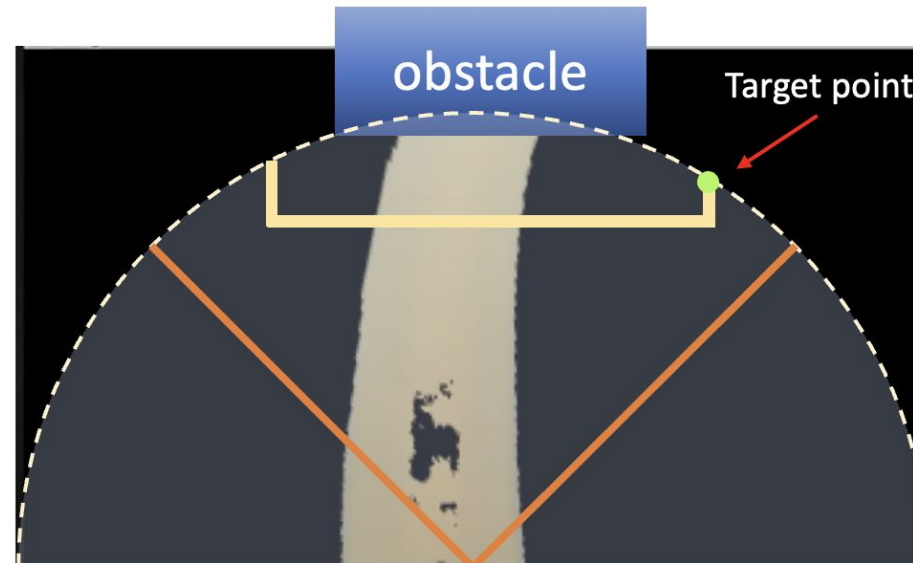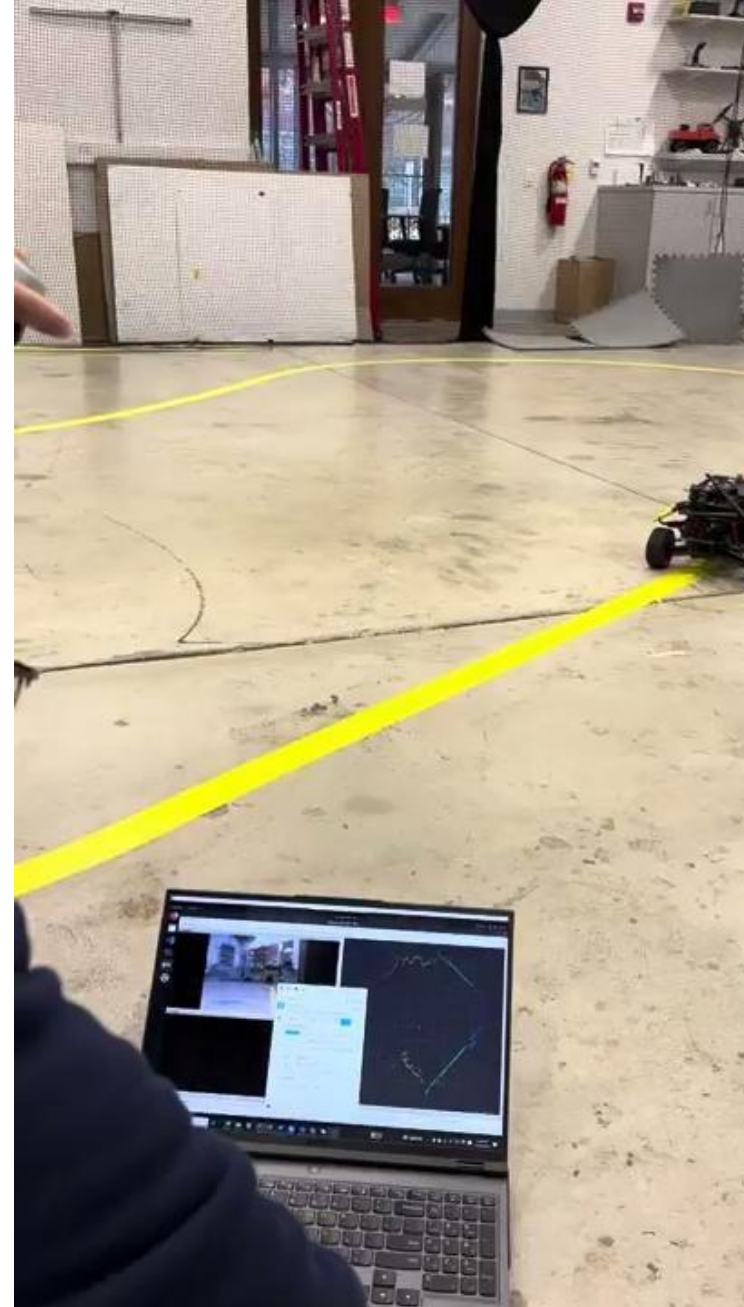
- If the waypoint lost
- Use the reverse list of steering angle to go back to lane

Results

- longitudinal velocity set: 1.3m/s

- Lap time:
  1st: 16s
  2nd: 15s
  3rd: 15s

- Average Brake distance(AEB): 1.35m

References

[1] Zohaib, M., Mustafa Pasha, S., Javaid, N., and Iqbal, J., "Intelligent Bug Algorithm (IBA): A Novel Strategy to Navigate Mobile Robots Autonomously", <i>arXiv e-prints</i>, 2013. doi:10.48550/arXiv.1312.4552.

[2] F1TENTH, https://f1tenth.org/learn.html