Homework #08
Spring 2023
Line Following

MRE/EME 5983 Robot Operating Systems

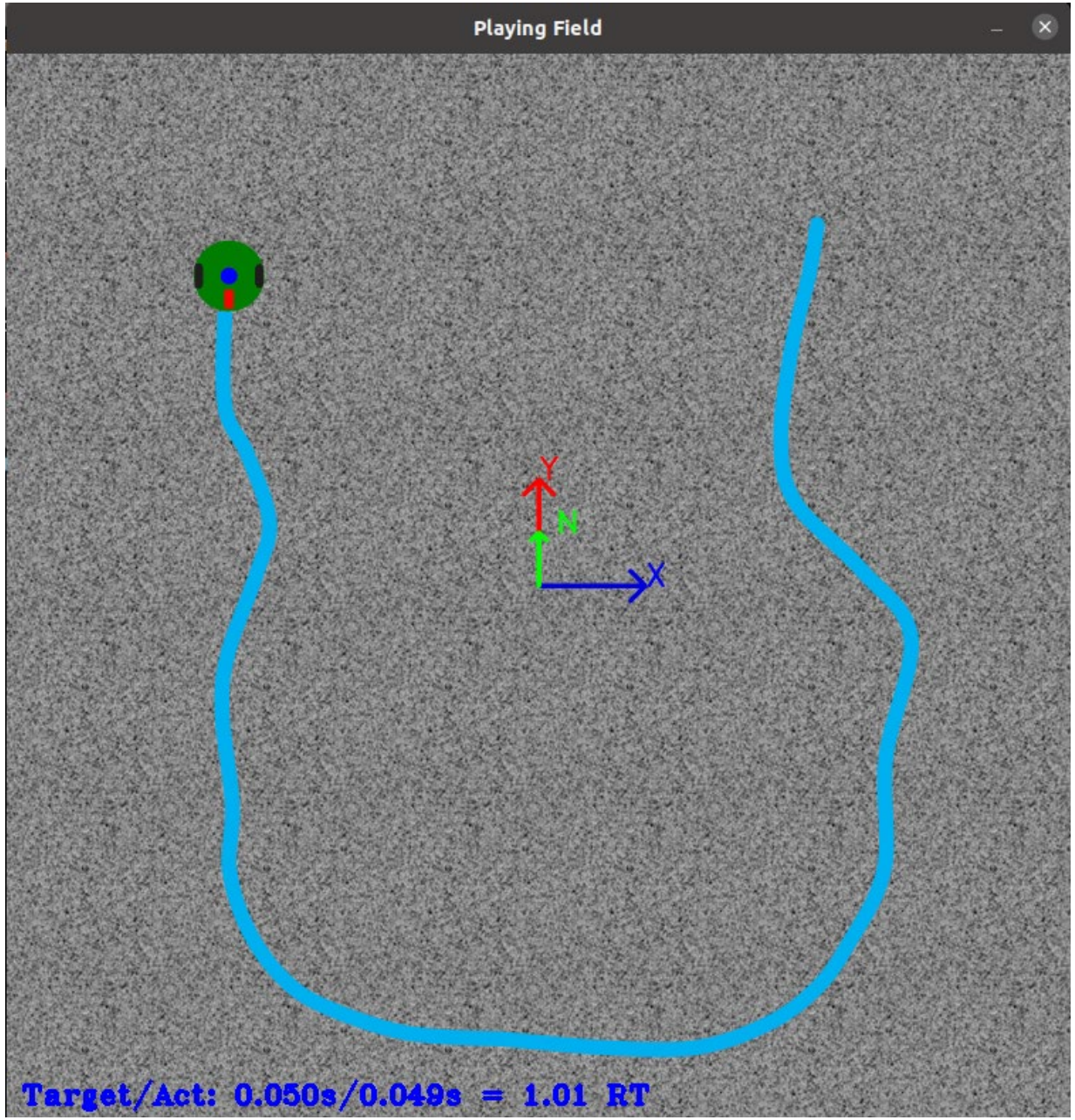
Line Following – Overview

- Develop and test one of the line following algorithms:
  - Zig-zag
  - Binning
  - Proportional control

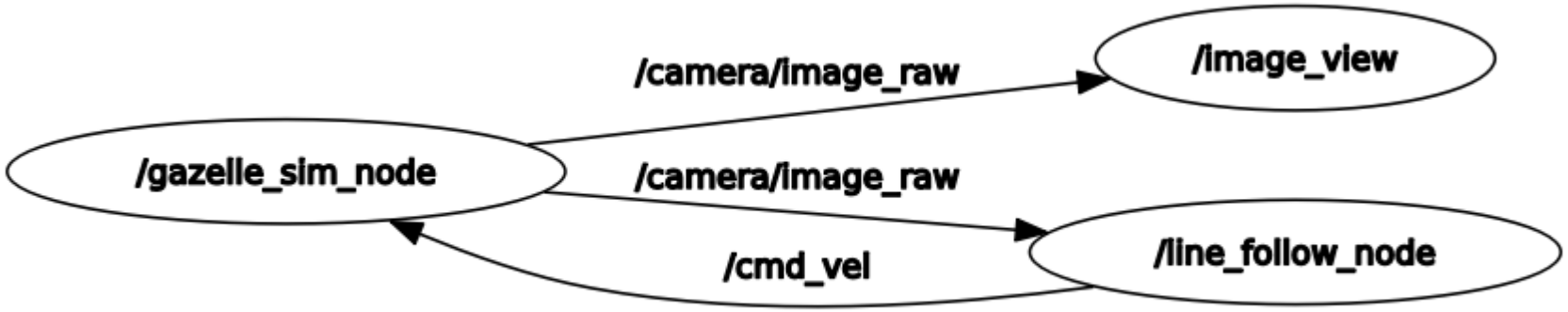
- Assess the path of the robot center of gravity vs. the center of the line

Line Following – Overview

- Program robot to perform “infinite” line following
- Once the end of the line found, turn robot and continue line following
- Suggestion
  - Use the percentage of the line pixels observed to determine the end of the line
  - Once found, rotate until the line is found again



Line Following – ROS Network

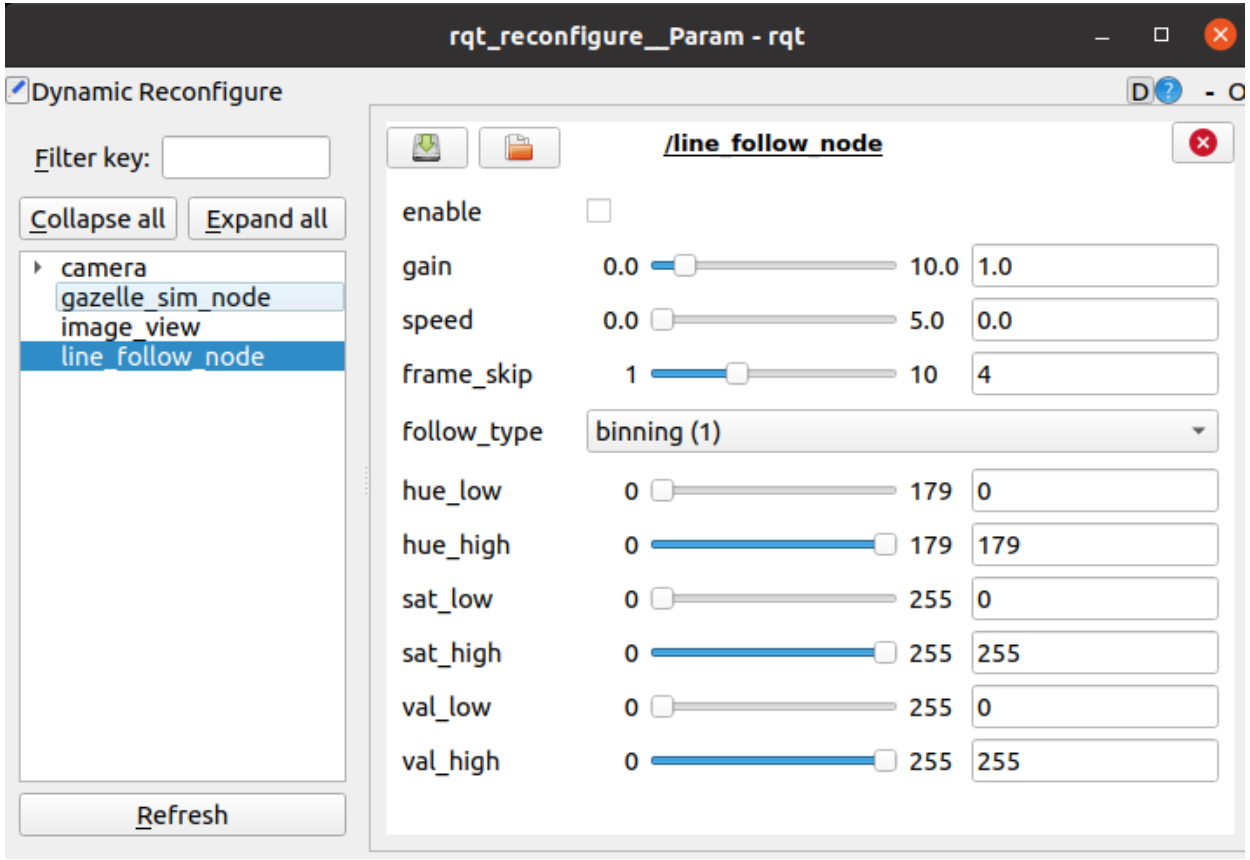


ROS Network

- gazelle_sim_node: Simulator node
- image_view: Node to visualize camera output image
- line_follow_node: Python node to follow the blue line
  - Subscribes to camera image
  - Publishes twist message on /cmd_vel to drive robot

Line Following – Tuning (Dynamic Reconfigure)

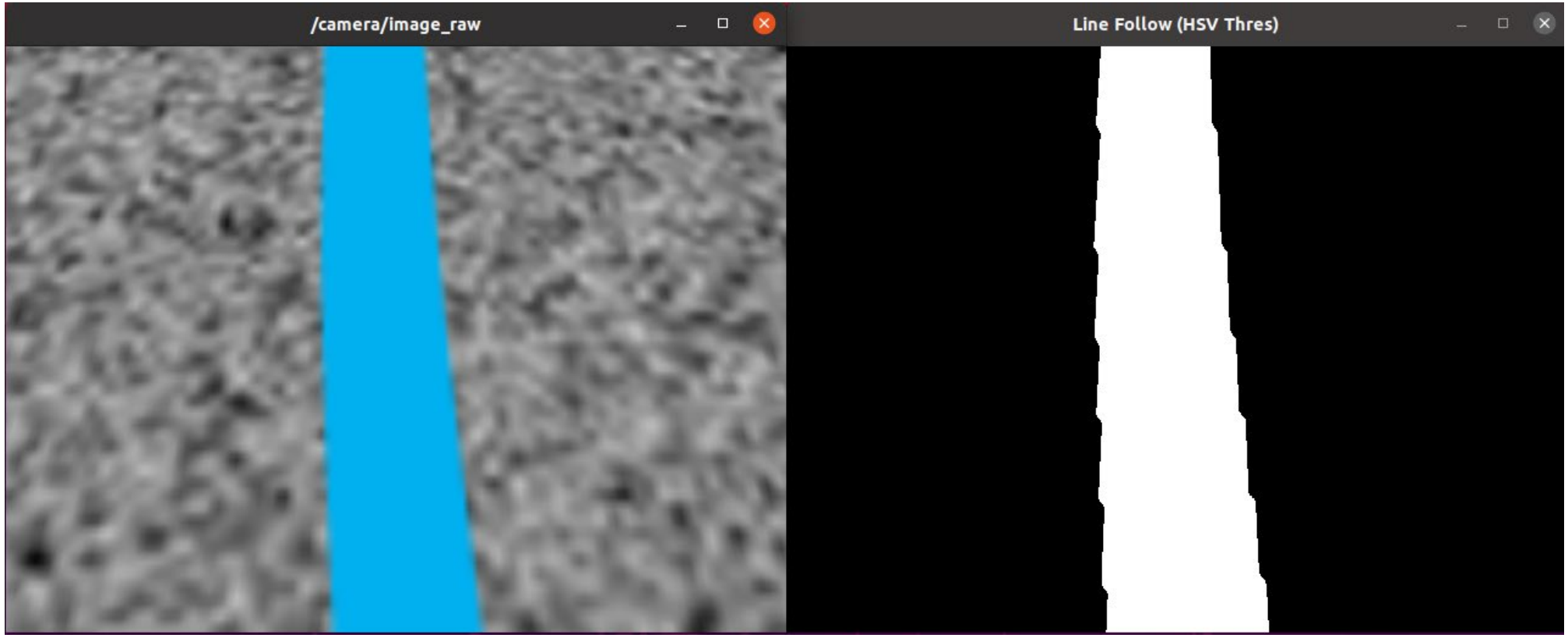
- line_following_node must use the following dynamic reconfigure variables
  - enable
  - gain
    - Steering gain
  - speed
    - Robot speed in m/s
  - ~~follow_type~~
    - ~~Line following algorithm~~
  - frame_skip
    - Images frames to skip
  - HSV
    - hue, sat and val ranges



The line following algorithm "follow_type" is no longer necessary. Implement one of the line following algorithms

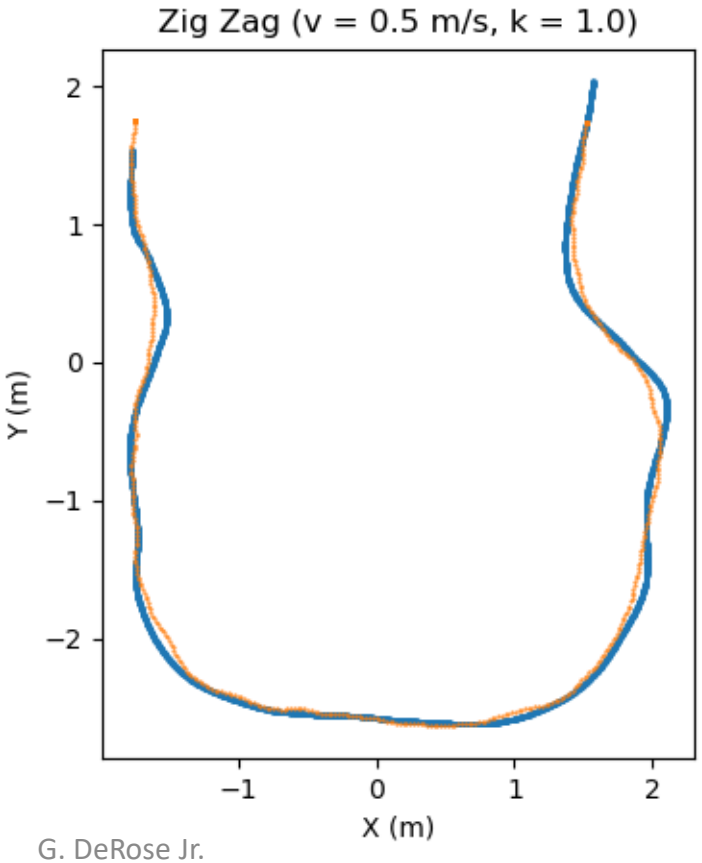
Line Following – Method

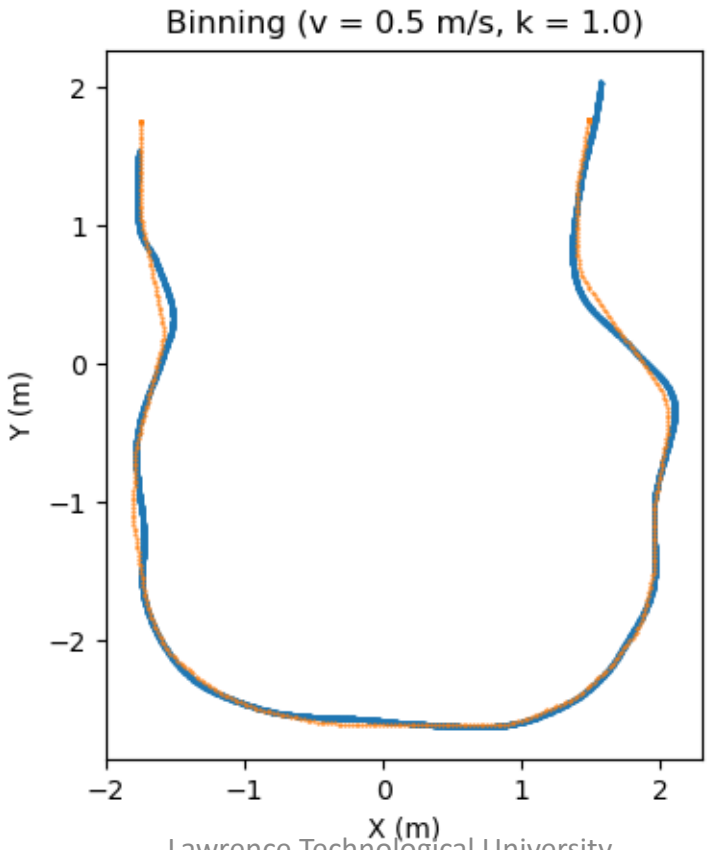
- Use the methods reviewed in class to line follow
- Find the line to follow using HSV and grayscale color spaces

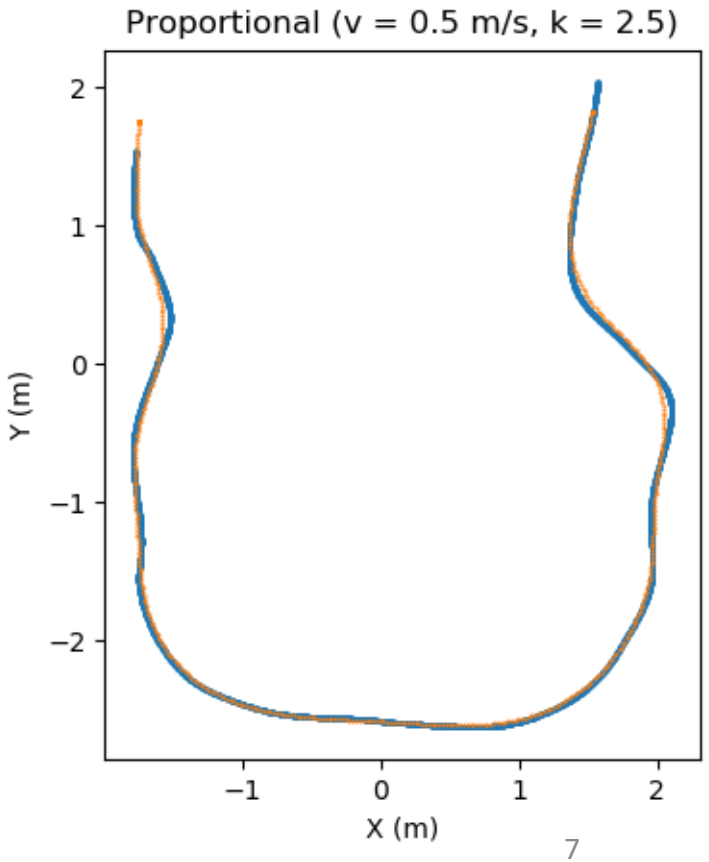


Line Following– Post Processing

- Graphically assess the performance of the line following algorithm
- Complete the analysis for robot velocity of 0.5 m/s and 1.0 m/s
  - Find the necessary gains to complete the course successfully
  - Plot only from start to line end (do not include return portion of run)







Homework Instructions / Submissions

- Homework content
  - Create a working directory called hw08_lastname (ex. hw08_derose)
  - Use a launch file hw08_lastname.launch to execute the ROS network
  - Place all post processing scripts and images in a **post** directory in your package
  - Record a video of your script executing (.mpg or .webm) and place it in the post directory

- Homework submission
  - Use tar and gzip to create a single, compressed file with the working directory and all its contents
  - Upload this file to Canvas for your homework submission