RUTGERS
WINLAB | Wireless Information Network Laboratory

Remote Control Robot Car

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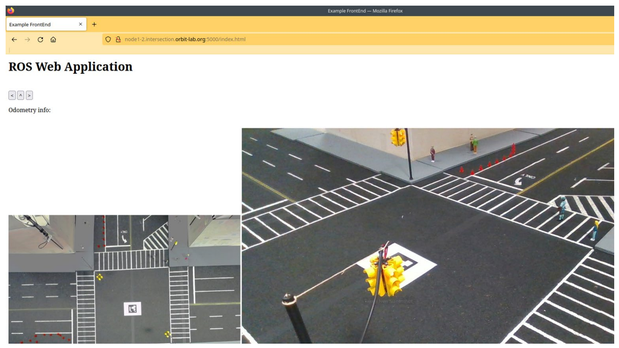
Overview

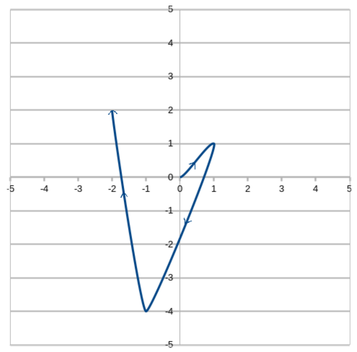
- Created user interface to remotely control robots integrated with ROS (Robotic Operating System)
  - Installed ROSARIA libraries for odometry data
  - Built Flask 1.1 web server to stream robot camera footage, control robot movements, and measure odometry



- Improved Pioneer 3-DX robot through hardware and software upgrades
  - Implemented waypoint path following through Hermite Spline Interpolation
  - Eliminated variance in drift via replacement of back wheel with ball bearing
  - Calibrated robot through ROSARIA parameters: DriftFactor, Ticksmm, and RevCount

Spline Path Following

- Generate Spline Path with Hermite Spline Interpolation
  - Given a set of waypoints, creates parametric differentiable path connecting points
- Follow waypoints through velocity commands
  - Calculate forward and angular velocity through path derivative and curvature of path respectively
- Pure Pursuit waypoint following uses odometry to adjust robot movement back to generated path

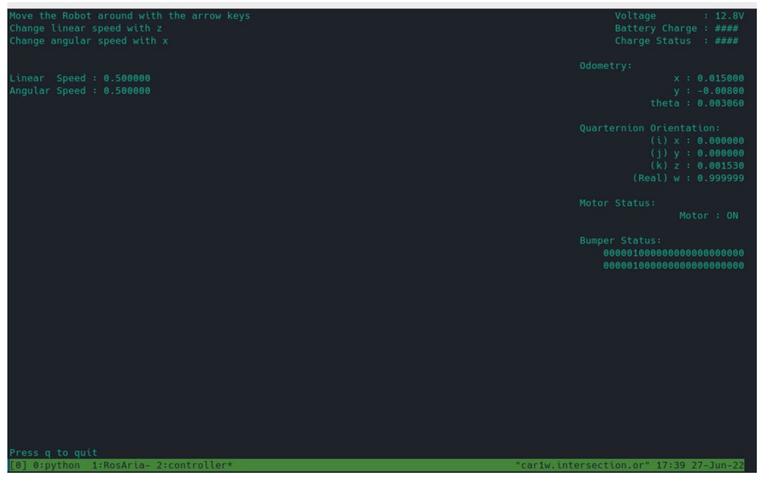


Webserver

- Users can view and control ROS topic information in browser
  - Uses Flask 1.1
  - Accessible using ssh tunnels and browser SOCKS proxy
  - Allows for the creation of GUIs without remote desktop
- Can send commands to Pioneer through browser
  - See through RealSense Camera attached to Pioneer
  - Move Pioneer with buttons on site

Pioneer 3DX CLI

- Command Line interface to control the Pioneer 3DX and view odometry/battery information
  - Uses ncurses for nice UI
  - Accessible via ssh terminal



Pioneer 3DX Calibration

- Discovered need for calibration after closed-loop test (move Pioneer in square repeatedly to see drift)
- Adjusted parameters within ROSARIA libraries
  - ticksmm - distance accuracy
  - driftFactor - minimize veer left/right when moving in a straight line
  - revCount - turning accuracy
- Minimized variance by replacing backwheel with ball bearing roller wheel
  - Designed and 3D printed connector between wheel and Pioneer

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