

EL2425 - Slip Control - Meeting agenda 2016-11-16

November 15, 2016

1 Done

- Microcontroller messaging. Teensy was flushed with new firmware that allows only messages of type `slip_control_communications/input_drive` to be passed to it. (Previously, a message type of `fitenth_msgs/drive_values` was hardcoded into Arduino's firmware, making communication within package `slip_control` impossible.)
- Time constant for velocity found, although significant differences between time constants have been found for different velocity references.
- ROS infrastructure set.
- MPC python package found: `cvxopt`. It seems to capture the essence of what our goal is. See http://nbviewer.jupyter.org/github/cvxgrp/cvx_short_course/blob/master/intro/control.ipynb

2 Ongoing

- Theoretical solution involving MPC and traveling in the middle of two walls found. The problem can be decomposed into two separate and independent components involving a translation and a rotation of the vehicle. Given the pose of the vehicle at time t as (x_c, y_c, v_c, ψ_v) , two range scans at -90° and $+90^\circ$ with respect to the longitudinal axis of the vehicle which are denoted as CL and CR respectively, the error in translational terms is

$$e_x = \frac{CR - CL}{2} \sin \psi \quad (1)$$

$$e_y = \frac{LC - CR}{2} \cos \psi \quad (2)$$

In other words, at time t the vehicle should have been at point

$$x_o = x_c + \frac{CR - CL}{2} \sin \psi \quad (3)$$

$$y_o = y_c + \frac{LC - CR}{2} \cos \psi \quad (4)$$

With regard to rotation, given the pose of the vehicle at time t as (x_c, y_c, v_c, ψ_v) , three range scans at -90° , 0° and $+90^\circ$ with respect to the longitudinal axis of the vehicle which are denoted as CL , CF and CR respectively, the heading angle error is

$$\phi = \frac{\pi}{2} - \tan^{-1} \frac{CF}{CR} \quad (5)$$

In other words, at time t the vehicle should have a heading angle of

$$\psi_0 = \psi + \frac{\pi}{2} - \tan^{-1} \frac{CF}{CR} \quad (6)$$

3 Issues

- The ethernet adapter for the lidar is broken and needs to be replaced. This means that packages `circular_mpc` and `centerline_mpc` cannot be tested until communication with the lidar is fixed.
- The SML lab is booked for the week 14/11-18/11 (What about the weekend?), hence no MOCAP. This means that packages `circular_pid` and `centerline_pid` (gains need adjusting) cannot be tested until at least Saturday 19/11.
- Package `circular_pid`, which was to be working out-of-the-box, does not work. The fault lies somewhere inside ROS: it appears that when ROS_MASTER runs outside Jetson, sometimes communication between Jetson and the nodes running outside it is not established. When it is established, no messages are getting through to teensy.