Steering Node

The Steering node is responsible for taking the desired velocities from the velocity planner, the desired path from the path planner, and the current position to determine correction factors to the velocity command such that the robot does not stray from its desired path.

Theory of Operation

Input/Output

Listener	Information
command_velocity	Desired speed
path_planner	Desired path
odom	Current location

Table 1: Input

Publisher	Information
cmd_vel	Velocity vector

Table 2: Output

Steering Algorithm

We will use the linear steering algorithm. This algorithm takes a number of inputs such as:

- The x and y coordinates of the destination.
- The current x and y coordinates.
- Tuning parameters K_d and K_θ

First we use the path segment coordinates to calculate the desired heading with the following: $atan(yf - ys, xf - xs)$. Next we find a d_θ by subtracting $heading_{dest} - heading_{curr}$. We can prevent turning the long way by checking to see that d_θ is less than or greater than π. Finally, we take the vector components of the desired heading $tx = cos(heading_{dest})$, $ty = -sin(heading_{dest})$ and dot these with the vectors from the start point to the current point $xrs * nx + yrs * ny$. We take this product and add it to d_θ to get the final corrected heading $-K_d * offset + K_\theta * d_\theta$.

Observations

Coding Procedure

The `steering_example.cpp` sample code was tweaked to include a file reader to allow us to easily modify constants K_d and K_θ.