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MTRN3100

Micromouse - Tips and Tricks

Introduction

The Micromouse challenge can be difficult with a lot of loose ends. If an initial idea does not work out treat it as a learning opportunity and get excited about trying a new idea.

Don’t spend too long on an single idea, Rather it is a better strategy to fail fast and learn how to improve next time.

Here are some tips and tricks to try out if you are having problems.

Control

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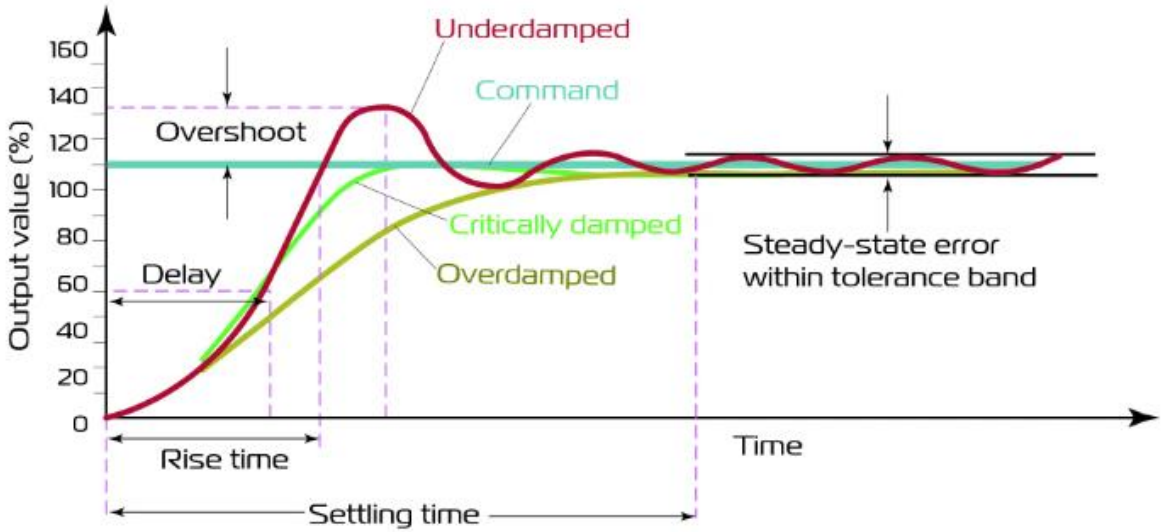
Stopping the PID controller

It is a bad idea to stop the controller as soon as it hits the goal. If the robot is on a different surface or has a more charged battery your system may be underdamped causing overshoot. Your PID system should correct this however it can only do that if it continues and is not immediately terminated.

Rather than stopping your controller once the goal has been hit, wait until the gradient of the controller output is within a threshold band.

Alternatively, dynamically update the setpoint and the controller should handle moving to the next setpoint.



Trajectory

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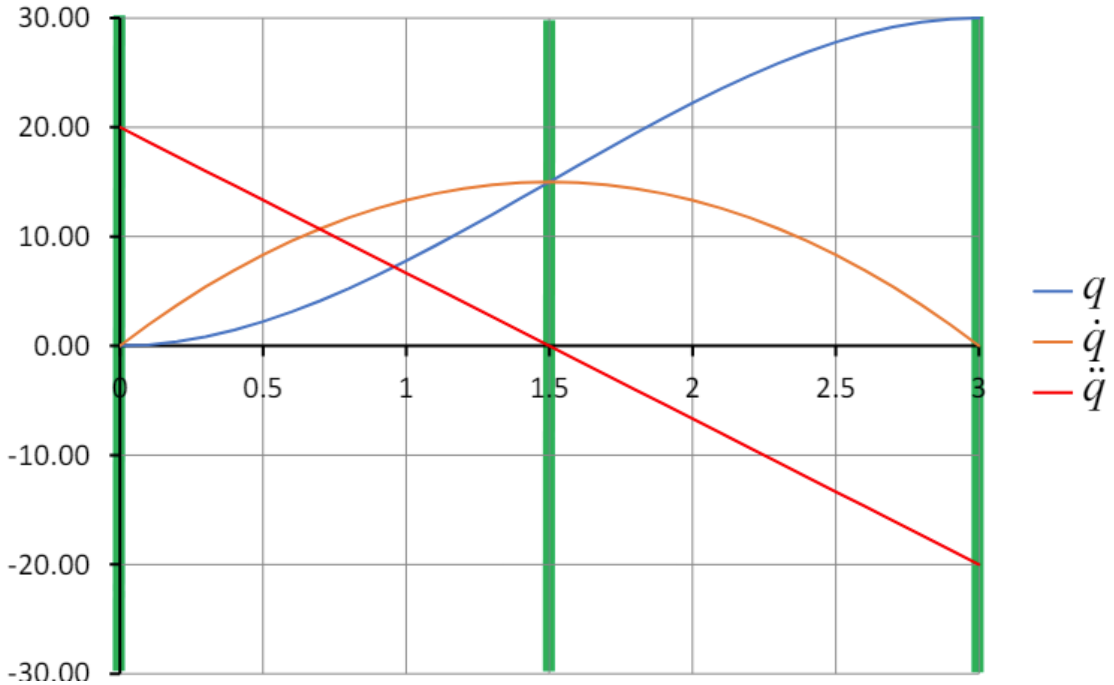
Cubic trajectory

You may find it beneficial to generate a cubic trajectory between your initial state and your desired state for a set period of time. At each timestep your controller returns a control output based on where it is currently and where it should based on the trajectory.

The advantage of this approach is that your systems response may be smoother and have less jerk behavior when moving from stand still.



IMU

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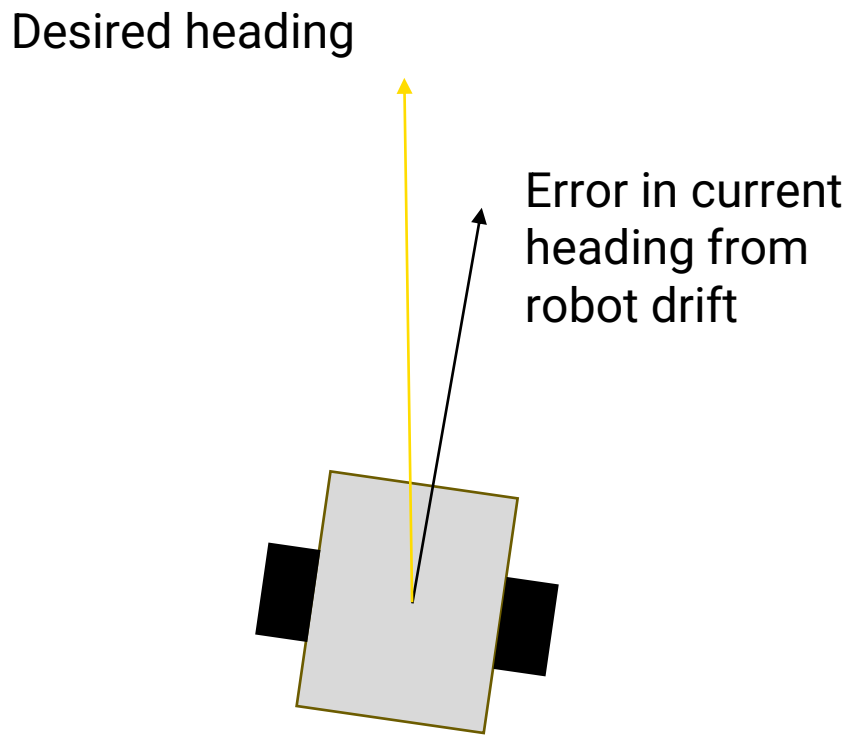
IMU

IMU yaw can be powerful for ensuring accurate turning and straight driving.

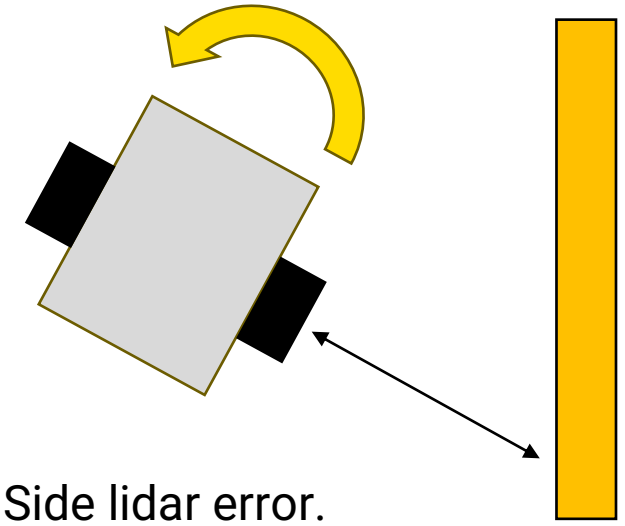
NOTE: The IMU may be noisy.



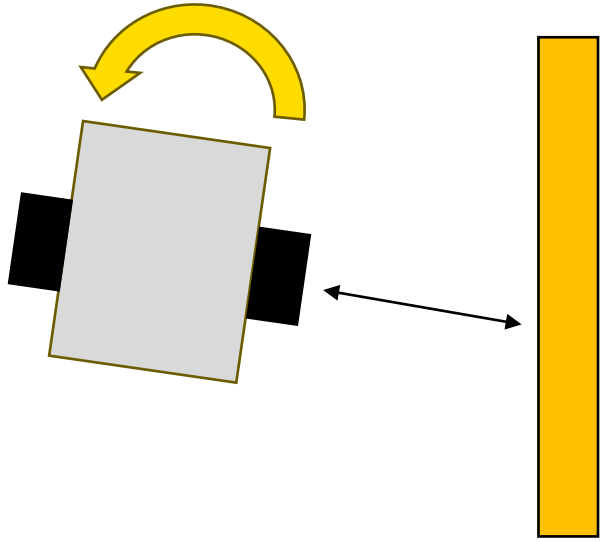
Yaw controller takes in the error between the desired heading and current heading. Returns offset motor commands to fix the heading.

IMU Resetting

IMU can accumulate error over time. Rather than recording your error from the start try resetting your zero reading after each movement.



Side lidar error.



Allignment

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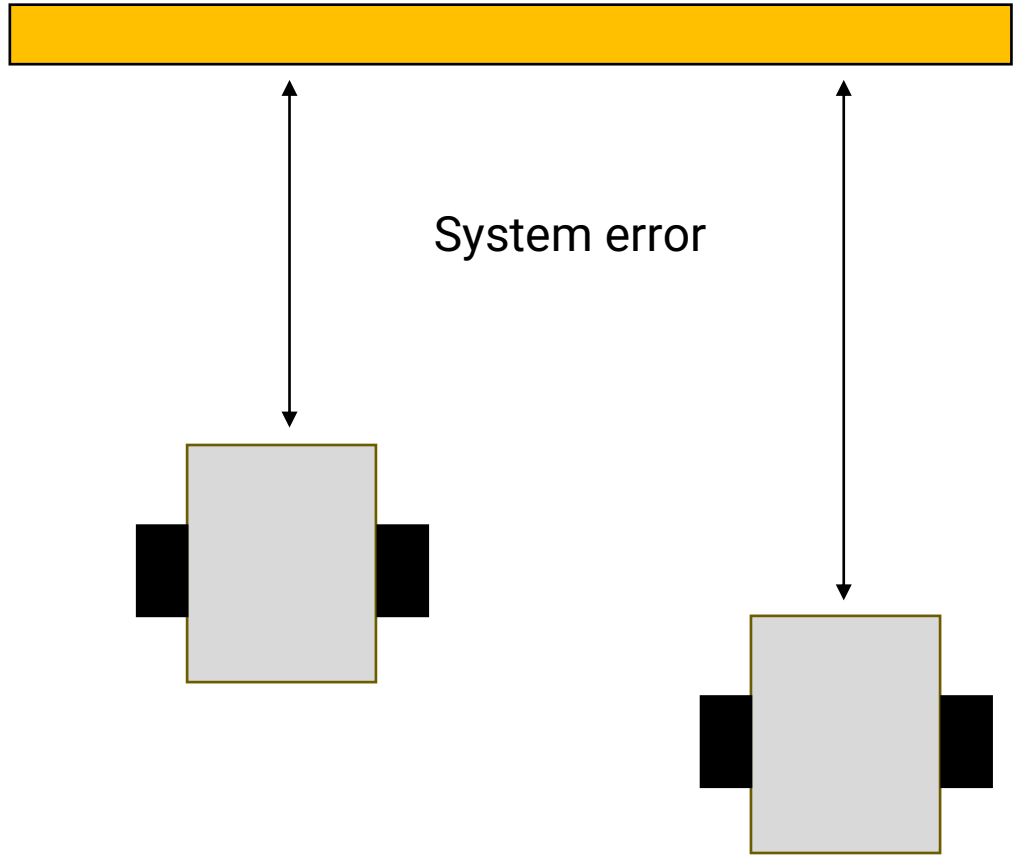
Front alignment

Use the front lidar to line up some distance from a wall Infront of you.



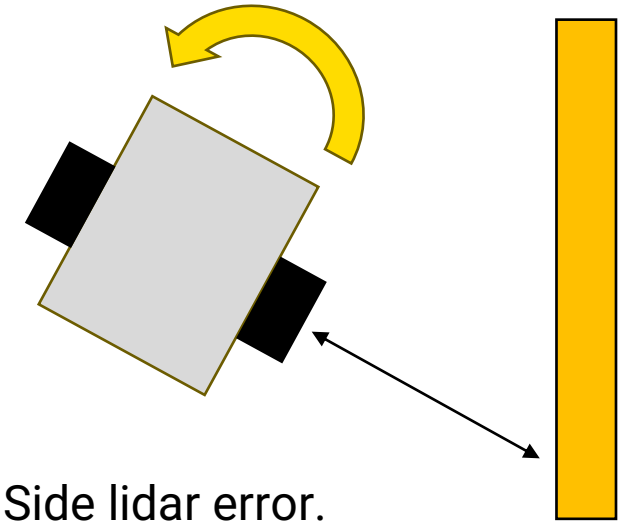
Turn alignment

As you turn side lidars can be used to measure the distance between the robot and the wall.

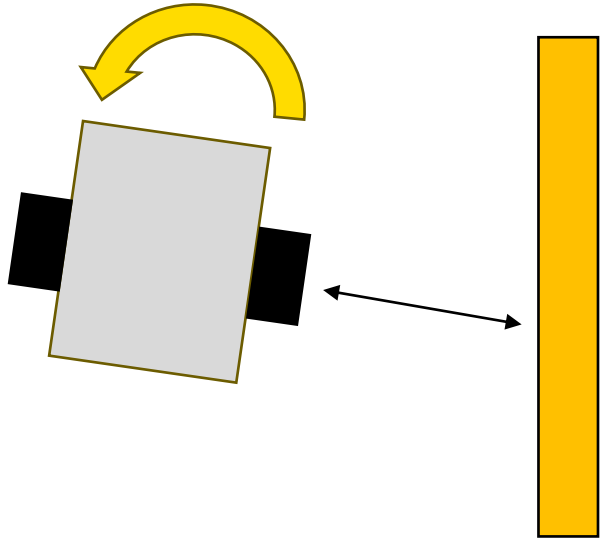
The error will be the shortest when the lidar and wall are parallel.

Least squares regression may be of assistance.

NOTE: The lidar may be noisy.



Side lidar error.



Development Tasks

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Development Tasks

Rather than jumping in right away it may be better to perfect some basic movement tasks separately and then bring them together. Here are some suggestions:

- Controller to drive forward 10 rotations.
- Controller to drive forward 10 rotations with IMU controller to ensure straight driving.
- Controller to ensure front lidar is 10cm away from a target.
- Controller to turn 90 degrees with kinematics.

Development Tasks (cont.)

- Controller to turn 90 degrees with IMU.
- Turning controller to line up against wall.
- Waypoint controller which calculates the system error and turns than drives to reach the target.
- Straight drive trajectory controller.