Multi-Robot Control (MRC)

W9: Localization and Detection
Plan of the Day

Glide Slope
• Planning the remainder of the course

Review Assignment 7
• What you should have seen.

Preview Assignment 8
• RFID Integration
  – Localizing targets in odom frame
• Waypoint navigation in odom frame.
Our Toolbox

- Multiple Machine ROS Operations
- MATLAB Control
  - Waypoint navigation in odom frame
- MATLAB Post-Processing

What's Left (after this week)

- Five classes
- Finals week
Final Challenge

1) Single Robot “Mow-the-Lawn” Search
   • 15 m x 5 m search area (in odom frame)
   • Localize multiple targets

2) Leader-Follower Control
   • Teleoperated leader (joystick)
   • Leader provides waypoints for follower

3) Leader-Follower Search
   • Leader achieves pre-defined waypoints

Documentation
   • Engineering report describing results and quantifying performance

Teams of 2-3
Accuracy, but Imprecise
UM7 inaccurate and imprecise as a North reference
Assignment 7: Example Data

Driving via joystick, logging: odom, gps, imu

X / Longitude

Y / Latitude

Yaw

X / Longitude
Assignment 7: Review

**Odometry: Precise, but Inaccurate**

**GPS: Imprecise, but Accurate**
Assignment 7: Review

Challenges of measuring True North
Summary

• Process for sensor/actuator integration
  - Find ROS driver
  - Bench test
  - Standalone test on robot
  - Integrated test with robot

• Localization requires precision and accuracy
  - Sensor fusion (robot_localization in ROS)

• MATLAB tools for assessing mobile experiments
  - We'll use these later...

• UM7 Challenges
Assignment 8: Preview

RFID Integration - “Mine Detector”
• Bench test and installation (2 of 4 robots have mounts)
• Experiment with sensor placement

Ex. 1: Indoor Joystick “Mine Search”
• Drive over known mine locations, verify detections.
• Post-process to localize mines.

[Graph showing Odometry Localization]
Ex 2: Outdoor Waypoint Navigation in Odometry Frame

- Reuse controller from Assignment 5
- Navigate 15x5 m box, counter clockwise, then clockwise
- Work in pairs! Be safe!
This Week

Meet in CAVR – T, W, R

Assignment 8
- RFID Integration
- Outdoor waypoint navigation