CSCE 574 ROBOTICS

Recap

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Focus

- Computational Aspects of Robotics
  - Not hardware design
  - Not control
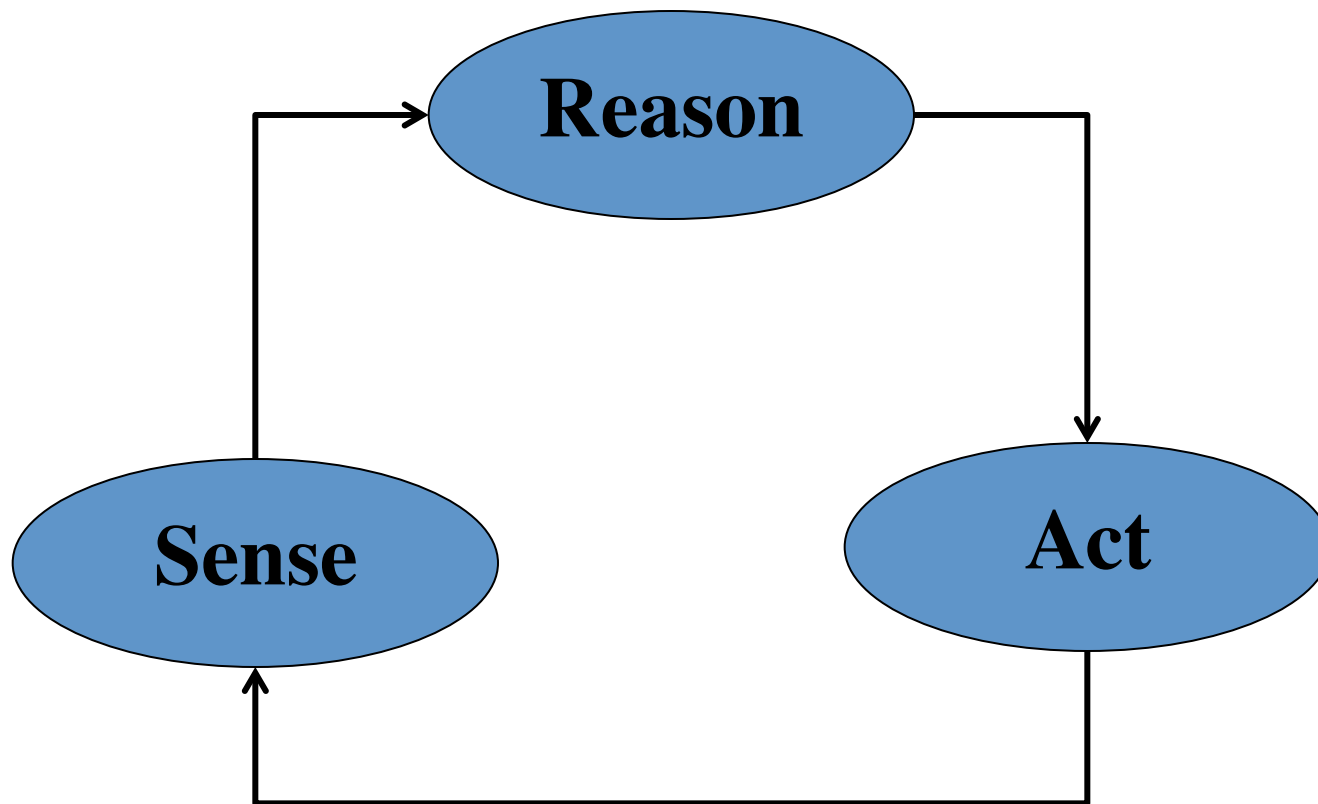 - Not in depth single sensor (e.g. vision)

Three Main Challenges in Robotics

1. Where am I? (Localization)

2. What the world looks like? (Mapping)
   – Together 1 and 2 form the problem of *Simultaneous Localization and Mapping* (SLAM)

3. How do I go from **A** to **B**? (Path Planning)
   – More general: Which action should I pick next? (Planning)
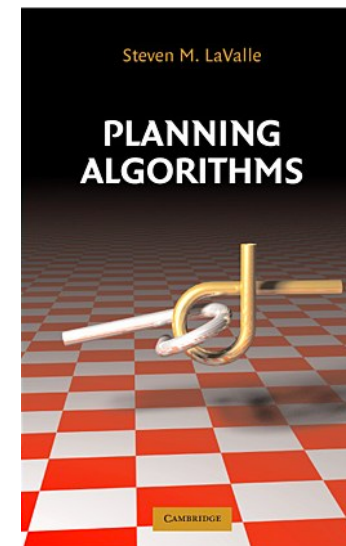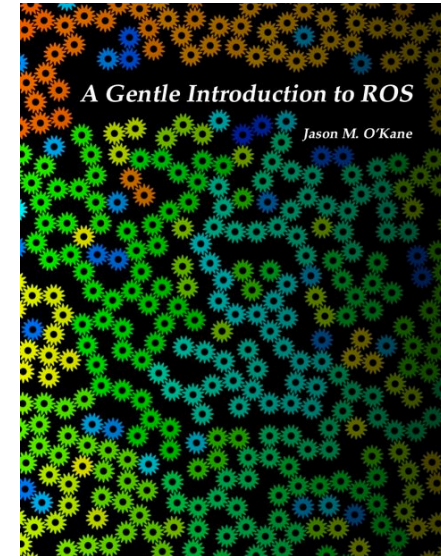
Robot

Reading Material:

- ## Main textbook:

Computational Principles of Mobile Robotics, G. Dudek and M. Jenkin

- ## Additional:

A Gentle Introduction to ROS, by J. O'Kane

Planning Algorithms, by S. LaValle

Presentation PDFs

Barbados Field Trials 2015

- Participants from:
  - UC Santa Cruz; (Marine Biology 101), (CubeSat)
  - McGill University; G. Dudek, R. Dimitrakopoulos (Marine Robots, Stories about Gold and Diamonds Part II)
  - York University; M. Jenkin
  - Simon Fraser University; R. Vaughan (Adaptive Path planning for UAVs)
  - Laval University; P. Giguerre (Terrain Learning,)
  - University of Minnesota; S. Roumeliotis (Large Scale 3D Localization on Mobile Devices)
  - Drexel University; A. Hsieh (Collaborative Tracking of Geophysical Flows)
  - Clarkson University; J. Sattar (Multimodality and computational HRI – algorithms, interfaces, and systems)
  - UMASS-Lowel; H. Yanco (Human-Robot Interaction at the DARPA Robotics Challenge Trials)
  - University of South Carolina; I. Rekleitis (Exploration)

Barbados Field Trials 2015

- Experiments:
  - Legged Locomotion – surf entry/exit
  - Drifter/boat rendezvous
  - Small ROV test
  - **Aqua Data collection**
  - 6-GoPro Data collection
  - Sonar/Camera Data collection
  - U/W LIDAR test
  - **Drifter deployment and data collection**
  - **Stereo Vision data collection**

Photo courtesy of Prof. Sattar
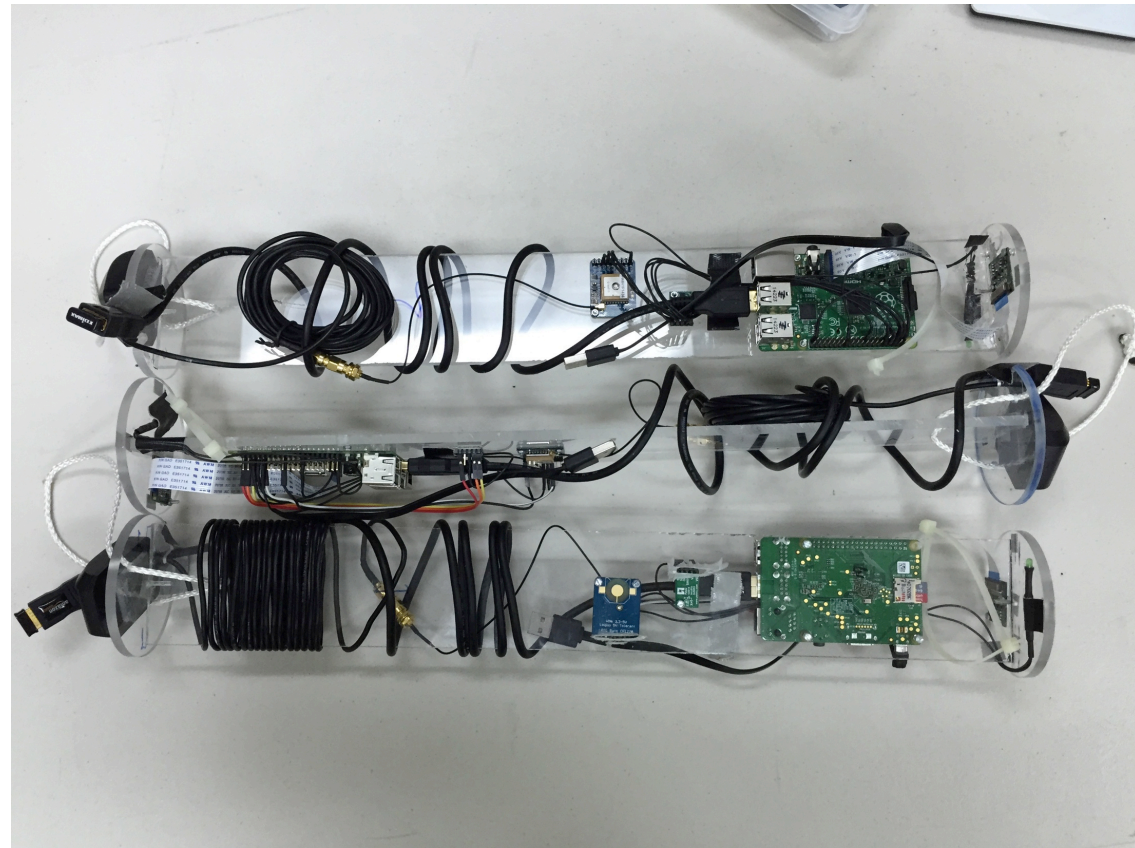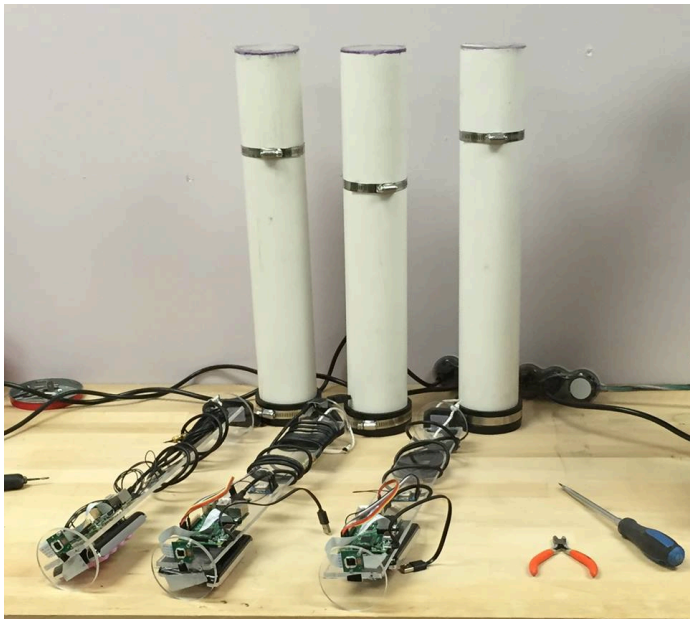
Omnidirectional Camera/Sonar

Photos courtesy of Prof. Sattar

Cooperative Localization of Drift Nodes

- New Drift Nodes
- IMU, GPS, WiFi, Camera, Raspberry Pi,

Drift Nodes – Hot off the beach!

- Measure current characteristics, marine life, salinity, turbidity, etc.

- Improve accuracy estimation

- Track Aqua

Underwater State Estimation

- Employ multiple cameras
- Map U/W structures (caves, wrecks)
- During descent and ascent
- When there are few features (sand)

Stereo Vision