RSS I: Recap

RSS Lecture 19 Wednesday 9 May 2012 Profs. Teller & Rus

Key Questions

- What were we trying to do in RSS?
 What we covered this term, in lecture and lab
- Where might we go from here? - Other robotics-related activities at MIT and beyond

RSS I: Teaching Objectives

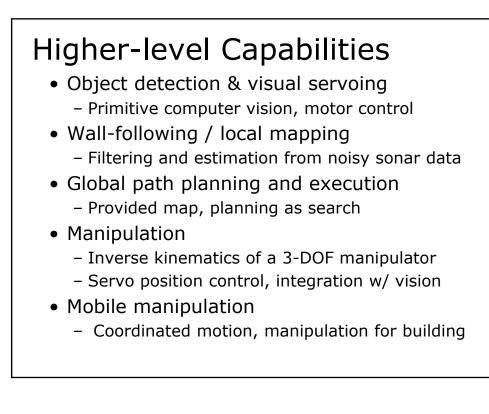
- Intensive introduction to mobile robotics
 - Focus on autonomous mobility & manipulation
 - End-to-end, systems perspective on robotics
 - Exposure to fundamental robotics algorithms
 - Mens et manus: lecture and lab
 - Hands on literally every aspect of a mobile robot
 - Generalists! With depth in some area of interest
 - Course challenge: 4-6 week scope
 - Authentic, intense team-based design experience
 - Flexibility to choose your technical focus & role
- Communications
 - Briefings, engineering documents, schedules
 - Team coordination and dynamics
 - Debates: consideration of policy and ethical perspectives

• Controller board architecture

- Power, sense data, control
- Signal-level motor control – PWM, closed-loop feedback
- Reactive behavior w/ analog sensing
 - Braitenberg with photoresistors
- ... All of this was managed by you
 - Direct odometry handling, motor control etc.

Abstraction via ROS

- One possible choice of robot "O/S"
 - Publish/subscribe message abstraction
 - Message-based event handling
 - Odometry and sensor time-stamping
 - Packages, extensibility
- Alternatives:
 - USC Player/Stage
 - Microsoft RDS
 - CMU Carmen
 - MIT LCM
 - ...



Things We Didn't Get To

- Localization and SLAM
 From bump sensors, sonar, vision, ...
- State estimation
 - Inference under uncertainty (e.g. Kalman filter)
- High-level vision
 - Object recognition and classification
- Human-robot interaction
 - Speech, gesture, shared mental models, ...
- High-level planning
 - Action selection, unstructured environments, ...
- Distributed activity
 - Multiple communicating and coordinating bots

Areas We Didn't Get To

- Factory automation
- Walking, flying, swimming, climbing robots
- Biologically-inspired robots
- Medical robotics & haptics
- Mobile manipulation robots
- Space robotics
- Learning robots
- Assistive robots & exoskeletons
- Field and service robots
- Evolutionary robotics
- Neurorobotics





Summarizing...

- Tried to give you a taste of robotics...
 - In all its interdisciplinary glory: math (geometry, inference, estimation, optimization), physics, mechanical engineering, electrical engineering, computer science, cognitive science ...
- ... as an engineering endeavor
 - Systems thinking
 - Engineering tools and methods
 - Managing complexity
 - Deadlines and milestones
 - Team dynamics

