Robotics cmput 399

Intro to Real World Robotics Upcoming course project Martin Jagersand

Where we are in the course

•Done: The robot hardware and how it works

- Mobile robot hardware, configurations, sensors and kinematics
- Robot arm hardware, configurations, sensors and kinematics

•Upcoming: How robotics is applied

- Structured environments: Industrial robotics
- Unstructured environments: Everything else
- How to sense the world
- How to improve robot accuracy through sensing
- Human-Robot Interfaces
- Modes of robot control: from tele-operated to Autonomous

Project and labs

- Done labs
 - Mobile robotics
 - Arms
- Upcoming labs:
 - L3: Vision guided motion control (Visual Servoing)
- Project Applications of Computer Vision:
 - Group or individual
 - Worth two and a half labs.
 - 1. Review and proposal: idea+draft: week after reading, props
 - 2. Implementation, demo and final report: End of classes.

Goals of project

- •Learn more in depth and hands-on about one of the course topics
 - Read web descriptions of system and research papers
 - Practically experiment with an implemented system to learn how to use it and what type of images/video it works well at.
 - Find our what are weaknesses and how those could be addressed.
- •Study and implement a small addition or modification to a part of this system.

Application project

- •Discuss ideas for interesting projects
- •Identify some books, web pages or papers to serve as core information sources.
- •Identify a handful of early classic papers to seed your literature search. I will do my best to help here also.
- Tips on carrying out your projects

– Balance between reading and doing

Schedule

• Mid way in course: good time to think about what you would be interested in doing

- Find available systems (ours and on Internet) and try to use them practically.

• Upcoming

project proposal.

- Include reference list and a start at literature review, ie. Read some papers and write a few pages summary
- Include experience from trying
- Throughout course in class: Keep up to date on your project progress.
- End of semester: Project reports.

Resources

•SW: There might be useful software available

- ROS: Open source Robot Operating System and has many applications
- Basic vision, OpenCV, ROS, Xvision,
- Geometry, Hand-eye, Robotics code
- HW:
 - Can use lego kits
 - Build your own
 - Borrow
 - Stream cellphone camera, build smartphone interface
 - Research labs have arms, hands, phantoms cameras etc
 - Vision for motion control: Robot arms: Could be set up.
 - Anything else? Some resources for buying available

Literature search

• **Goal:** Find the handful to dozen most relevant and recent papers in a subarea.

• Method:

- 1. Seed with a few relevant papers.
- 2. Do citation search backwards and forwards.
- 3. Find common "buzz words". Do title and abstract text search.
- 4. Do internet search. e.g. "Cora" from justresearch
- 5. Check most recent proceedings manually. (They won't be indexed yet)

Report:

- 1. Review
 - Summarize the main contributions and comparing the results in the papers.
- 2. Your contribution and experiments.
 - Methods
 - Results
 - (if group, one section per member)
- 3. Discussion
 - Where does it fit into the bigger picture
 - Future work

Martin's tips

- •Plan incremental progress and checkpoints.
 - Makes it easier to identify promising directions as well as difficulties and redefine plans as needed.
- •Find balance between reading and doing
 - It is difficult to fully grasp methods by only reading
 - Some experiments are incomplete, results wrong
- •Practical trying out can add a lot of insight.
 - Learn how to quickly prototype in e.g. matlab