Robot Programming and Simulation

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Automation and Robotics
Robot Programming and Simulation

UNIVERSITY OF ZAGREB

Faculty of Electrical Engineering and Computing
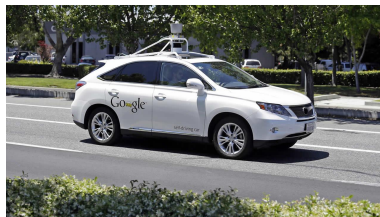
1. What is ROS?
2. What can ROS do for me?

1. What is a robot?
2. How do robots work?

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How do robots work?

Notwithstanding huge diversity, most robots still share a lot of common functionality:

1. Where am I?
2. Where should I go?
3. How do I get there?
4. What do I do when I get there?

Things to note about robot tasks

1. Even simple tasks are difficult for robots :)
2. Implementing a full robotic stack requires a lot of interdisciplinary knowledge
3. Core functionality is similar across different robots
4. Things change quickly, e.g. sensors break or new models appear
5. Visualization tools can make a huge difference

How does ROS help us with robot tasks?

ROS in a nutshell

Tools for programming robots. Its primary goal is to enable code reuse in robotics research and development.

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Adapted from http://wiki.ros.org/ROS/Introduction:

- implementation of commonly-used functionality
- inter-process communication (*middleware*)
- hardware abstraction
- visualization tools
- package management
- ROS community

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ROS in technical terms

An open-source, meta-operating system for your robot.

- For engineers: Building on top of other's work lets us do cooler things in less time

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- For industry: Promotes standardization and broadens the market
- For end-users: Gives us control over the software and prevents vendor lock-in

How does this course help us learn about ROS?

- Bootstrap to ROS in 8 steps (no prerequisites)
    1. Introduction to GNU/Linux
    2. Introduction to Python
    3. Introduction to ROS
    4. ROS programming
    5. Recording and processing data
    6. ROS navigation stack
    7. Linux programming topics
    8. ROS programming in C++
- Individual laboratory excercise assignments for the rest of the semester
- Midterm and Final exam
- Follow announcements on the Course webpage and the MS Teams channel
- Instructors can be reached at {ivan.markovic, matko.orsag,damjan.miklic}@fer.hr.

Homework:

- Check out the Web about the ROS and Ubuntu projects
- It is expected that each student will have a personal laptop to work on
- Get Linux Ubuntu 20.04 LTS on your laptop as dual boot (Linux Installfest) or virtual machine and ROS Noetic
- In order to pass the course and be able to take the exams, you have to turn in all laboratory assignments and attain at least 50% of points

- All laboratory exercise are done individually
- Deadlines are defined on the course webpage
- Submitted via the Moodle system

Useful links

- http://www.ros.org/wiki/ (starting point)
- http://answers.ros.org/questions/ (gamified Q&A community)
- http://www.willowgarage.com/ (ROS founders)
- http://www.osrfoundation.org (ROS maintainers)

Parting thought

1. Robotics is challenging

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1. Robotics is challenging
2. When working with robots, we need all the help we can get
3. ROS can help us a lot :)