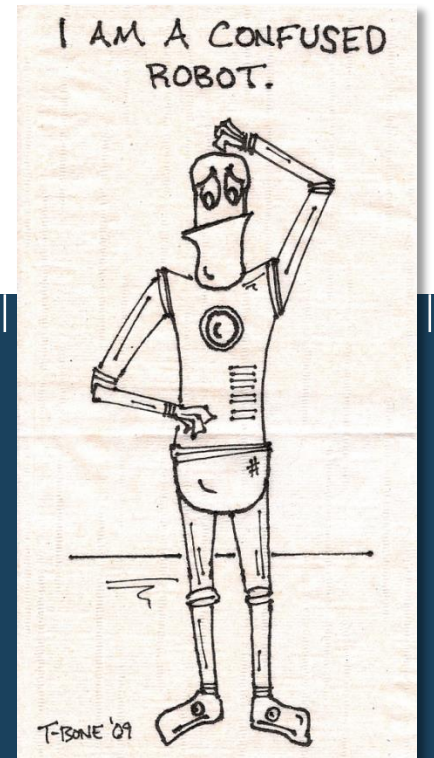# Robotics

Course Introduction

Matteo Matteucci
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Artificial Intelligence and Robotics Lab - Politecnico di Milano

About me and my lectures …

Lectures given by Matteo Matteucci

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Research Topics

- Robotics and Autonomous Systems

- Computer Vision and Perception

- Pattern Recognition & Machine Learning

- Benchmarking in Robotics

Aims of these lectures: learning how to design and implement the software which makes autonomous an autonomous mobile robot (e.g., symbolic planning, trajectory planning, localization, perception, mapping, etc.)

... what about the course?

All the infos on the course website

- https://chrome.deib.polimi.it/index.php?title=Robotics

Lectures given by:

- Matteo Matteucci (Lecturer – 30h)
  http://www.deib.polimi.it/ … then search …
  matteo.matteucci@polimi.it

- Simone Mentasti (Teaching Assistant – 20h)
  http://www.deib.polimi.it/ … then search …
  simone.mentasti@polimi.it

Course in code sharing!!

- Robotics
- Perception, localization, and mapping for mobile robots

???
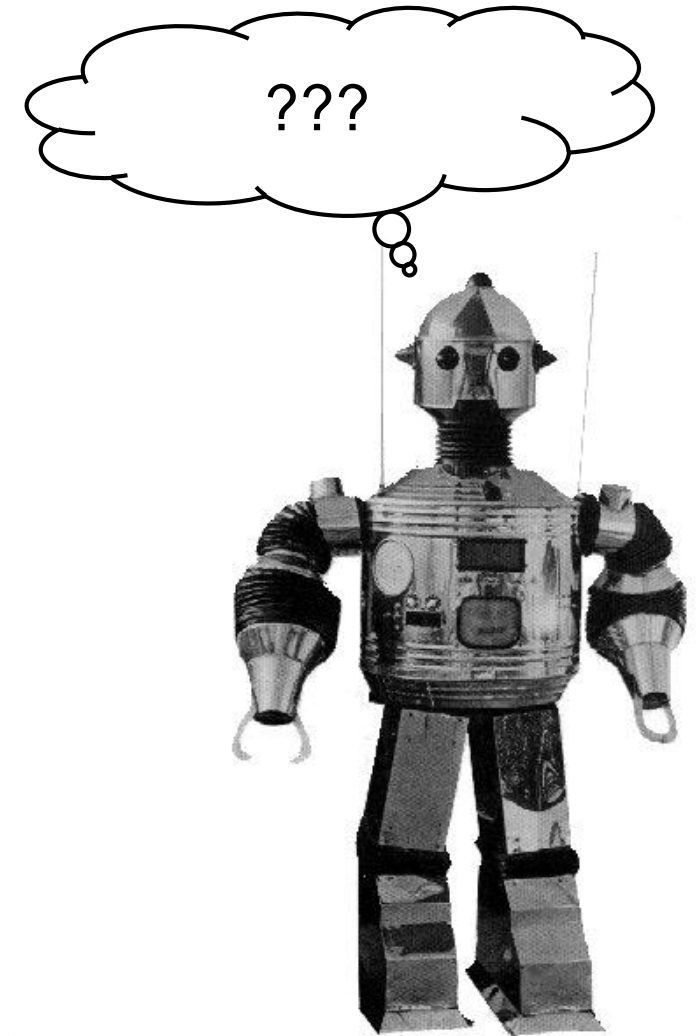
Lectures outline / approach

Introduction to (mobile) robotics

The mind of a mobile robot

Anatomy of a mobile robot

- Sensors and actuators
- Common Kinematics

Localization and Mapping

- Localization vs Mapping
- Simultaneous Localization & Mapping

Robot autonomous navigation

- Motion control and obstacle avoidance
- Trajectory following
- Trajectory planning (graph and sample based)

«Theory»

Middleware in robotics

- Motivations and state of the art
- ROS Installation party

ROS Basics

- Publisher/subscriber
- Messages, services, parameters
- Bags, tb, actionlib, rqt_tools
- Message filters, rospy

ROS Advanced

- ROS on multiple machines
- Time synchronization
- Stage

Navigation in ROS

ROS & OpenCV

Point Cloud Library

«Practice»

Course organization / rules

Classes (no distinction between lecture and exercise):

- Monday, 16:15 – 18:15, in 5.0.1

- Wednesday, 12:15 – 14:15, in 5.03

Detailed calendar online (updated weekly)

- https://chrome.deib.polimi.it/index.php?title=Robotics

Grading policy:

- Written examination covering the whole program up to   27/32 ✚
- Home project in simulation graded up to   05/32 ▬
- Final score will be the sum of the grades of the two …   32/32

> Cum tempore!

> These overlap with …

> *In few (very exceptional) cases be replaced by a lab activity, but this has to be planned, discussed, and agreed with the teacher.*

> *In some (exceptional) cases the home project can be replaced by a lab project, possibly with a slightly higher grade, but this has to be motivated and discussed with the teacher in advance.*

Course material

Material available on the course website
- Check *https://chrome.deib.polimi.it/index.php?title=Robotics*
- Slides from the teachers (not necessarily available in advance)
- Link to online sources, books and papers
- Link to other websites for tools and digital resources

Past exams and sample questions
- Expect 3 theoretical questions + 2 practical exercises (on average)
- No coding exercise since you have it in the home project
- Few past exam examples are available on the course website

Do you need any further info?