



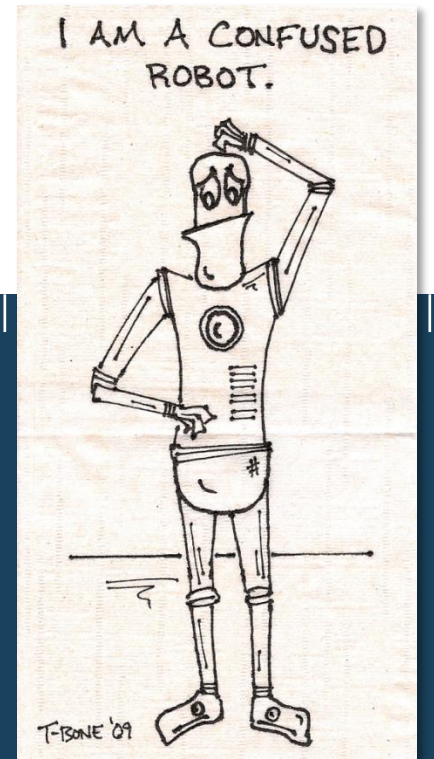
POLITECNICO
MILANO 1863

Robotics

Course Introduction

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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

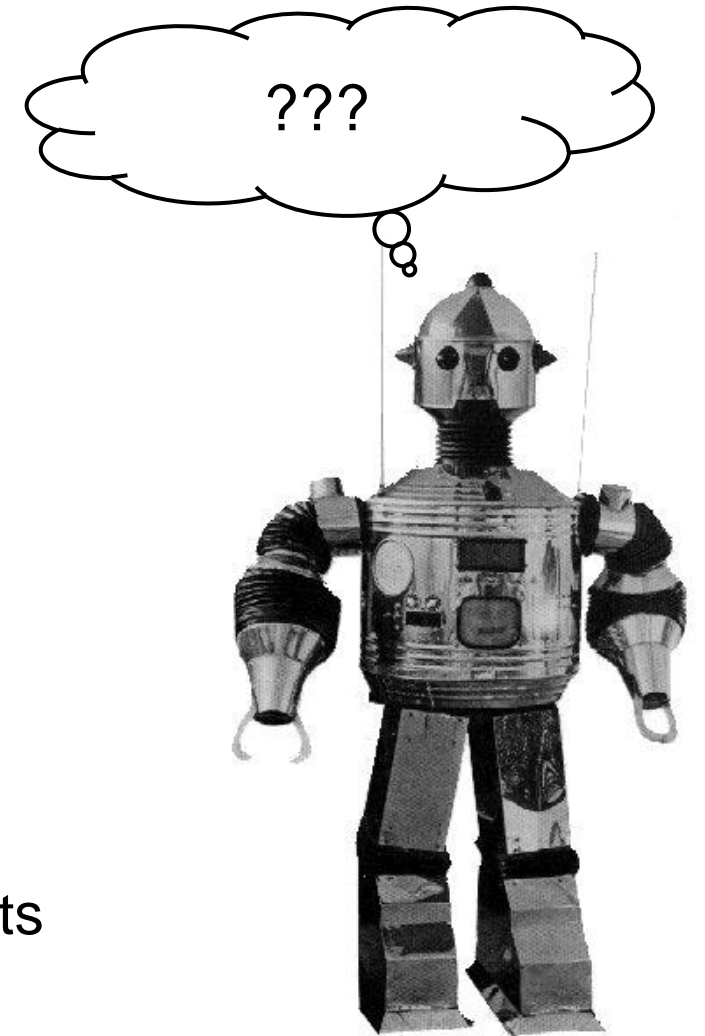
- <https://chrome.deib.polimi.it/index.php?title=Robotics>

Lectures given by:

- Matteo Matteucci (Lecturer ~30h)
matteo.matteucci@polimi.it
- Simone Mentasti (Teaching Assistant ~20h)
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

ROS2 & ...

Linux Ubuntu 18.04
ROS 1.0 Melodic

«Practice»



Course organization / rules

Classes (no distinction between lecture and exercise day):

- Wednesday, 12:15 – 14:15, in 26.11
- Thursday, 14:15 – 16:15, in T2.2

Cum tempore!

May change ...

Detailed calendar online (updated weekly)

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

Grading policy:

- Written examination covering the whole program up to
- ROS Home projects graded up to
- Final score will be the sum of the two grades ...

26/32 +

06/32 =

32/32

Deadlines to deliver it,
valid the whole
academic year.



Alternative projects (instead of exam)

This year we plan to set up 2 teams of students participating to competitions

- Field Robot Event (<https://fieldrobot.nl/event/>) 12th to 15th June 2023
- Leonardo Drone Contest (<https://www.leonardo.com/en/innovation-technology/open-innovation/drone-contest>) October 2023

Real Robots + ROS2 +
physical event + ...

Organization of the teams (4-5 people per team)

- Supervised by a PhD Student / Researcher
- Led by Master Students doing his/her thesis on the topic
- Composed by 3-4 Students from the course

Grading policy:

- The project replace the homeworks
- Written exam replaced by an oral exam with the teacher

I suggest to do the
homeworks anyway!



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?

