Introduction to Mobile Robotics

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Class Schedule

• Monday & Wednesday from 8:00 a 10:00 hrs.
• Beginning
  – February 5th
• End
  – June 2nd
• Schedule modifications
  – Conferences and research stages
Course Details

• An average of 60 hrs.
• Possibility of relevant topics by researchers in the field from LAAS, UG, UASLP, etc.
• Course evaluation:
  – Homeworks and projects (intercourse and final)
• It will be very important participation in discussions about actuality themes.

Course Details

• Communication preferred by email
  anmarin@uv.mx
• Docs will be available in:
  – http://www.uv.mx/anmarin/cur-es.html
• Eminus System (UV)
References


References

  – 2nd ed. 2011
• Dudek G. and M. Jenkin, “Computational Principles of Mobile Robotics”, Cambridge University Press, 2000,
  – 2nd ed. 2010
Topics

• Introduction: Types of robots
• Locomotion
• Kinematics of Mobile Robots
• Perception
• Navigation
• Localization
• Path Planning
• Task Planning

Type of Robots

• What's a robot?
• What can a robot do?
• Which are the main components of a robot?
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<th>Type of Robots</th>
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<tr>
<td>• Manipulators vs. Mobile Robots</td>
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<td>• Mobility</td>
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<td>– Limited range of action</td>
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<td>• Locomotion is the first challenge</td>
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<td>• Robots in hostile or dangerous environments are commonly teleoperated</td>
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<td>– Mars, ocean (Titanic), etc.</td>
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<td>• Robots in Human environments</td>
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<td>– Require autonomy</td>
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<td>– Ability to maintain a sense of position</td>
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<td>– To navigate without human intervention</td>
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Type of Robots

• Robots Classification:
  – Control type
  – Locomotion
  – Goals or tasks

Isaac Asimov laws of robotics

• A robot may not injure a human being or, through inaction, allow a human being to come to harm.
Type of Robots

• A robot must obey the orders given to it by human beings, except where such orders would conflict with the First Law.

• A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

Type of Robots

• Asimov also added a fourth, or zeroth law, to precede the others:

• A robot may not harm humanity, or, by inaction, allow humanity to come to harm.
Mobile Robots

• An area, dealing with the control of autonomous or semi-autonomous vehicles (Dudek 00)

• What is the difference regarding: Robotics arms, Artificial Intelligence and Computer Vision?
  –Mainly the work it is done at different scale

Mobile Robots

• Task at big scales imply:
  –Knowledge Acquisition
  –Position error estimation
  –Detection and recognition of places and objects
  –Real-time response

• It is necessary to do these tasks, simultaneously and coordinately
Mobile Robots

• The study on Mobile Robots can be broken down into three sub-problems (Dudek 00):
  – To move into the environment
  – To sense the environment
  – To reason about the environment

Mobile Robots

• It is not only a set of algorithms to: sense, reason and moving.

• They need to work on physical entities.

• The proposal should be deal with all uncertainties of the real world.
Mobile Robots

• The motion is essential

• There are a few living creatures that can not move or to do spatially distributed tasks in their environments

Mobile Robots

• Interdisciplinary Research
  – Mechanical Engineering
  – Computer Science
  – Electrical Engineering
  – Cognitive Psychology, perception and neurosciences.
Mobile Robots

• Robots can be considered from different perspectives.
• From a physical level (hardware) we have:
  – A device to move the robot in the environment
  – One or more computers to control the robot
  – A set of sensors
  – Communication Hardware

Mobile Robots

• From a computational field of view:
  – A subsystem of motion control
  – A subsystem to acquire data from sensors
  – A subsystem to interpret sensors data
Mobile Robots

Questions?

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