
Robotics

Finalità

The aim of this course is to introduce practical techniques for development of autonomous robot systems. The course promotes acquisition of design skills and consists of theory lectures, seminar presentations on selected topics and laboratory demonstrations.

Programma

1st Module (3 CFU) - "Introduction to autonomous robots and task programming"

- Introduction and classification of robotic systems
- Configuration space and motion planning
- Robot teleoperation
- Human-Robot interaction
- Haptics
- Robot grasping
- Robot Learning
- Imitation and robot programming by demonstration
- Physics-based robot simulation
- Virtual reality and motion capture
- Humanoid robots
- Object recognition and environment modeling
- Visual servoing

2nd Module (2 CFU) - "Mobile robotics"

- Sensors
- Control architectures: deliberative, reactive, and hybrid architectures
- Behavior-based robotics
- Mobile robot navigation
- Probabilistic methods for the estimation of robot and environment state
- Localization, Mapping and SLAM

Laboratory activities

Most course topics involve specific lab classes and demonstrations at the Dipartimento di Ingegneria dell'Informazione on the following topics:

- Frameworks for robotic applications
- Proximity sensors
- Development of robot behaviors
- Local representation of the environment

Modalità d'esame

Project evaluation and written test.

Propedeuticità

Adequate knowledge of architecture and programming of computer systems is recommended. Software design, dynamic systems, and control techniques notions are occasionally referenced.

Testi consigliati

Course handouts provided by the teacher.

H. Choset, K. M. Lynch, S. Hutchinson, G. Kantor, W. Burgard, L. E. Kavraki and S. Thrun, Principles of Robot Motion, The MIT Press, 2005.

R. Siegwart, I.R. Nourbakhsh, "Autonomous Mobile Robots", MIT Press.