



Course guides

270714 - MRS - Multi-Robot Systems

Last modified: 20/07/2020

Unit in charge: Barcelona School of Informatics
Teaching unit: 1042 - URV - Universitat Rovira i Virgili.

Degree: MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE (Syllabus 2017). (Optional subject).

Academic year: 2020 **ECTS Credits:** 4.5 **Languages:**

LECTURER

Coordinating lecturer:

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEA14. Capability to understand the advanced techniques of Vision, Perception and Robotics, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.

CEP3. Capacity for applying Artificial Intelligence techniques in technological and industrial environments to improve quality and productivity.

CEP4. Capability to design, write and report about computer science projects in the specific area of Artificial Intelligence.

Generical:

CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.

Transversal:

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT5. APPROPRIATE ATTITUDE TOWARDS WORK: Capability to be motivated for professional development, to meet new challenges and for continuous improvement. Capability to work in situations with lack of information.

TEACHING METHODOLOGY

In hours in the classroom exposed to the theoretical computer support.

In the laboratory classroom hours are put into practice the theoretical knowledge from simulation exercises.

At the end of the first month exposed the subject to develop the student (in groups of 3-4)

LEARNING OBJECTIVES OF THE SUBJECT

- 1.Understand some cooperative techniques for locating, exploring and perceiving with multiple robots
- 2.Understand the limitations of the cooperative techniques in real environments



CONTENTS

Multi-robot auto-localization

Description:

SLAM, probabilistic methods, particle filters, perception-based methods

Techniques related to exploration and perception

Description:

Exploration in unknown environments, sensory data management and map generation

Multi-robot tasks coordination

Description:

Task assignment: explicit (Finite-state machines), emergent (behaviour-based), swarms, auctions (market-based, voting)

Dynamical physical systems

Description:

Multi-agent systems: software and logical versus physical ones. Dynamics and capacities.

Multi-robot related Architectures

Description:

Subsumption, Swarms, InteRRap, ALLIANCE, DPA2, others...

ACTIVITIES

Development of the theory and simulations

Specific objectives:

1, 2

Related competencies :

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Full-or-part-time: 69h

Theory classes: 27h

Laboratory classes: 6h

Self study: 36h

Homework by teams, with real robots

Full-or-part-time: 43h 30m

Laboratory classes: 7h 30m

Self study: 36h

GRADING SYSTEM

Homework by teams: 80%

Laboratory simulations: 20%

BIBLIOGRAPHY

Basic:

- Oller, Albert. Slides "on-line".