340621 - ROVI-R2P07 - Robotics and Vision

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2019
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: LUIS MIGUEL MUÑOZ MORGADO
Others: LUIS MIGUEL MUÑOZ MORGADO

Prior skills
Previous knowledge on programming, control theory and automation

Degree competences to which the subject contributes

Transversal:
1. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
2. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

Teaching methodology
Master classes, and participative Active Learning, Learning and Projects based problems, and case study.

Learning objectives of the subject
Understand the fundamentals of mathematical models of the robots
Understand the fundamentals of machine vision systems
Learning to program applications of computer vision
Learning to program robots and teleoperation tasks with robot manipulators
Learn the techniques associated with mobile robots and its applications

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h 30.00%</th>
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<tbody>
<tr>
<td>Hours medium group: 0h 0.00%</td>
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<tr>
<td>Hours small group: 15h 10.00%</td>
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<tr>
<td>Guided activities: 0h 0.00%</td>
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<tr>
<td>Self study: 90h 60.00%</td>
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# Content

## (ENG) - Mathematics of vision and robotics

**Description:**
- Spatial Transformations
- Quaternions
- Kinematics models

**Related activities:**
- MP1, MP2

**Specific objectives:**
- Knowing the mathematical tools necessary for the disciplines of robotics and vision.

**Learning time:** 1h  
  Theory classes: 1h

## (ENG) - Visió per ordinador

**Description:**
- Introducció a la visió per computador
- Adquisició i processament d'imatges
- Segmentació i reconeixement
- Visió estereoscòpica

**Related activities:**
- MP1, MP2

**Specific objectives:**
- Aprendre els fonaments dels sistemes de visió per computador i les tècniques aplicades a la robòtica.

**Learning time:** 2h  
  Theory classes: 2h

## (ENG) - Interaction and Teleoperation

**Description:**
- Man-Machine interaction
- Interface devices
- Teleoperation
- Virtual and augmented reality

**Related activities:**
- MP1, MP2

**Specific objectives:**
- Aprendre els fonaments dels sistemes d'interacció persona-màquina i la Teleoperació

**Learning time:** 1h  
  Theory classes: 1h
### (ENG) - Autonomous Robots

**Learning time:** 1h  
**Theory classes:** 1h  

**Description:**  
(ENG) Wheeled mobile robots  
Walking robots  
Planning  
Social robots

**Related activities:**  
(ENG) MP1

**Specific objectives:**  
(ENG) Learn the basics of mobile robots and autonomous planning techniques.

### (ENG) - MP1 Miniproject: Autonomous navigation of a telepresence robot

**Learning time:** 20h  
**Guided activities:** 20h

**Description:**  
(ENG) Developing an application under Matlab and National Instruments programming tools in order to make a mobile robot navigate autonomously in an unknown environment, using its own sensors and actuators in order to perform a predefined task.

### (ENG) - MP2 Miniproject: Vision guided robotic manipulation

**Learning time:** 20h  
**Theory classes:** 20h

**Description:**  
(ENG) Developing an application under Matlab and National Instruments programming tools to make an industrial robot performing a handling task autonomously assisted with computer vision.

### Qualification system

The final qualification is:

\[ NF = 0,3 \times Ex + 0,7 \times Team \text{ Group} \]
Bibliography

Basic:


Complementary: