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: 2017
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:</th>
<th>45h</th>
<th>30.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## (ENG) - Mathematics of vision and robotics

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

### Description:
- (ENG) Spatial Transformations  
- Quaternions  
- Kinematics models

### Related activities:
- (ENG) MP1, MP2

### Specific objectives:
- (ENG) Knowing the mathematical tools necessary for the disciplines of robotics and vision.

## (ENG) - Visió per ordinador

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

### Description:
- (ENG) Introducció a la visió per computador  
- Adquisició i processament d'imatges  
- Segmentació i reconeixement  
- Visió estereoscòpica

### Related activities:
- (ENG) MP1, MP2

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

## (ENG) - Interaction and Teleoperation

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

### Description:
- (ENG) Man-Machine interaction  
- Interface devices  
- Teleoperation  
- Virtual and augmented reality

### Related activities:
- (ENG) MP1, MP2

### Specific objectives:
- (ENG) Aprendre els fonaments dels sistemes d'interacció persona-màquina i la Teleoperació
### (ENG) -Autonomous Robots

**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.

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

---

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

**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.

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

---

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

**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.

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

---

### Qualification system

The final qualification is:

\[ NF = 0.3 \times E_x + 0.7 \times \text{Team Group} \]
Bibliography

Basic:


Complementary: