Universidad Zaragoza

Academic Year/course: 2024/25

69159 - Advanced SLAM

Syllabus Information

Academic year: 2024/25
Subject: 69159 - Advanced SLAM
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 615 - Máster Universitario en Robótica, Gráficos y Visión por Computador / Robotics, Graphics and Computer Vision
ECTS: 3.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

The aim of the course is to introduce the students to emerging research and innovation topics related to Simultaneous Localization and Mapping (SLAM). For this, state-of-the-art techniques will be detailed in various open SLAM problems, attending to technical but also methodological aspects such as their relationship with the foundations of the study area, their assumptions, limitations and potential, and the critical analysis of available experimental evidence.

2. Learning results

The student must be able to:

- Know the research challenges and specific problems related to current localization and mapping technologies.
- Know and apply the fundamentals and most relevant techniques and methods in RGB-D odometry and SLAM.
- Know and apply the fundamentals and most relevant techniques and methods related to implicit representations.
- Know and apply the fundamentals and most relevant techniques and methods related to place recognition using deep neural networks.
- Know and apply advanced and recent techniques in the context of localization and mapping.
- Understand and evaluate the impact of technologies in advanced robotics.
- Identify the research problems for which there are no known solutions in the field of robotics.
- Propose and evaluate the benefits of new algorithms that address unsolved aspects of applications in the field of Robotics.
- Synthetically present the proposed technical and / or scientific results.
- Evaluate relevant bibliographic sources.

3. Syllabus

PART I: RGB-D Odometry and SLAM
PART II: Implicit representations
PART III: Place recognition
PART IV: Advanced SLAM topics of high novelty and scientific interest

4. Academic activities

Theoretical lectures and problems (20 hours)
Expository sessions of theoretical content (15 hours) and problems and brief application examples (5 hours).

Laboratory activities (6 hours)
Two laboratory sessions of 3 hours each.

Study and personal work (30 hours)
1) studying the lecture contents using the suggested bibliography, 2) completing and reviewing the work developed in the laboratory sessions, and 3) completing the course assignments and specifically the reading group.

Evaluation (3 hours)
Time dedicated to the evaluation tasks of the course.

5. Assessment system

The evaluation of the course is continuous and consists of the following components programmed during the course:

E02 - Course assignments related to the two laboratory sessions of the course. The weight in the final grade will be 50%. The understanding of the theoretical foundations, the ability to tackle technical problems, the presentation of the results and critically analyzing them, the scope, the implementation and the methodology will be valued. The test will consist of an oral presentation of the work by the student.

E03 - Oral presentation of scientific articles related to the course. The weight in the final grade will be 50%. The ability to identify the most relevant aspects of the article, its connection with the contents of the subject and the state of the art and the quality of the presentation and the language used will be assessed.

Students will also have the option to pass the course by a global evaluation, on the day designated by the center, having to pass the same evaluation items as in the continuous assessment.

6. Sustainable Development Goals

8 - Decent Work and Economic Growth
9 - Industry, Innovation and Infrastructure