Universidad Zaragoza

Academic Year/course: 2024/25

60822 - Computer Vision and Robotics

Syllabus Information

Academic year: 2024/25
Subject: 60822 - Computer Vision and Robotics
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 532 - Master's in Industrial Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject type: Optional
Module:

1. General information

The objective of the subject is to train the student in the key aspects related to computer vision and its application to robotics in production processes. This requires approaching the discipline from different levels:

- Study of the fundamentals of image formation and processing through vision sensors.
- Introduction of techniques and algorithms that help to extract useful information from images and use them later in automation systems. The development and implementation of algorithms requires studying and practicing programming techniques and languages.
- Finally, the use of computer vision for the development of applications in the context of robotics is addressed.

The aim is to ensure that after upon completion of the subject, the student is able to analyse, design and program perception systems based on computer vision.

2. Learning results

Upon completion of this subject, the student will be able to:

Know and apply the knowledge and techniques of computer vision in engineering.

Know and apply automation and robotics models and tools in a productive environment.

Know and apply basic knowledge and techniques of industrial robotics.

Understand the fundamentals of image formation, acquisition, and representation.

Implement computer vision applications using standard software libraries.

Understand the fundamentals and applications of three-dimensional vision.

Apply computer vision to automated systems.

3. Syllabus

The contents to be developed are the following:

1. Image formation and acquisition
2- Basic image processing.
3- Feature and contour detection.
4- Segmentation of contours and regions.
5- Image learning and recognition.
6- 3D Vision Geometry.
7- Image alignment.
8- Structure from movement.
9- Perception systems for robotics.
10- Applications: visual inspection and 3D perception for robotics.

The practices to be carried out will address the following aspects:
1. Image processing.
2- Feature detection and matching.
3- Image segmentation and recognition.
4- Camera calibration.
5- Two-view geometry.
6- Automated 3D reconstruction.
7- Visual control.

4. Academic activities

The program offered to the student to help them achieve the expected results includes the following activities:

1) Classes

Master classes of theoretical and practical content.

2) Types of problems and case solving.

Students will participate in the development of problems and cases. These will be coordinated with the theoretical content. Part of this activity will be dedicated to the content related to the cases to be addressed in the proposed subject assignments.

3) Laboratory practices

The student will carry out a set of practices using a computer in the laboratories of the Department of Computer Science and Systems Engineering (Ada Byron Building).

4) Subject assignments

Activities that the student will carry out in reference to the assigned subject works.

5) Personal study

Personal study of the student, related to theory, problem solving, and prior preparation for laboratory practices.

5. Assessment system

The student must demonstrate achievement of the intended learning results through the following assessment activities:

According to the regulations of the University of Zaragoza, the evaluation of this subject is established as "Progressive". The final grade will be based on the following assessments:

1. Evaluation of laboratory practices: carried out throughout the term, based on prior study, work development, preparation of reports or issue solving (40% of the final grade).
2. Evaluation of the subject's assignments: there will be a subject assignment. Its evaluation will be based on the oral presentation made according to the established presentation schedule (25% of the final grade).
3. Individual written test: composed of theoretical-practical questions and problems (35% of the final grade).

In the event that a student has not completed any of the previously mentioned evaluable activities throughout the term, each official call will include the global individual tests to be carried out in order to assess these activities.

6. Sustainable Development Goals

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