Universidad Zaragoza

Academic Year/course: 2023/24

69157 - Virtual Reality

Syllabus Information

Academic year: 2023/24
Subject: 69157 - Virtual Reality
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

With a strong applied character, upon successful completion of the course, each student should have achieved the following objectives:

- Multidisciplinary understanding of the scientific basis of the area of virtual reality and its industrial and scientific applications. Knowledge of its evolution, state-of-the-art and open problems.
- Know how to transmit the knowledge acquired to an audience of any kind, adapting themselves to the peculiarities of that audience.
- Be able to work both in an autonomous manner and in team, taking responsibilities.
- Be able to carry out the projection, calculation and design of solutions to specific problems.
- Be able to plan and work out R+D+I projects.
- Know how to design hardware and software solutions.
- Have knowledge of tools and methodologies.
- Be able carry out the creation and exploitation of virtual reality environments

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDG, of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific goals, in such a way that the acquisition of the Learning outcomes of the subject provides training and competence to the student to contribute to a certain extent to their achievement:

- Objective 9: Industry, innovation and infrastructure
    - Target 9.5 Increase scientific research and improve the technological capacity of industrial sectors in all countries, particularly developing countries, including by fostering innovation and significantly increasing, by 2030, the number of people working in research and development per million inhabitants and the spending of the public and private sectors in research and development

2. Learning results

1. Know and know how to apply advanced algorithms for analysis and generation of images.
2. Understand the relationship between efficiency and precision of the different applicable algorithms.
3. Conceptualize and design advanced applications based on techniques of the state of the art of Computer Graphics and Computer Vision.
4. Propose and design new areas of improvement on the state of the art in techniques of Computer Graphics and Computer Vision, including unresolved aspects or improvements on existing techniques and applications.
5. Know and evaluate bibliographic sources related to Computer Graphics and Computer Vision.
6. Write and present technical and scientific results effectively.

3. Syllabus

1. **Introduction to Virtual Reality (VR).** History. Evolution. Applications. VR/XR/MR/AR.
2. **Perception Systems.** The human visual system. Specific characteristics of VR. Presence and immersion.
3. **Systems and tools for VR and MR (Mixed Reality).** Sensors, displays, tracking.
4. **Content generation.** Synthetic content and real content. Content acquisition and representation.
5. **Open problems and latest advances.** Main challenges lying ahead in VR/XR/MR/AR.

4. Academic activities

- **Lectures.** Exposition of contents by means of presentation or explanation by a lecturer (possibly including demonstrations). Participation will be encouraged

- **Practical classes**. Practical activities carried out with computers.
- **Tutoring**. A period of instruction conducted by a tutor with the aim of reviewing and discussing the materials and topics presented in class.
- **Evaluation**. Set of written, oral and practical tests, projects, assignments, etc. used in the evaluation of student progress.
- **Tutorized assignements.** Projects which are larger than the practical classes, which will be handed in and presented
- **Theoretical study.** Self-study of the contents presented, including any study activity which has not be computed in the previous section (studying exams, library work, complementary reading, doing problems and exercises, etc.)

The course consists of 3 ECTS credits that correspond to 75 estimated hours of student work, distributed as follows:

- Lectures and practical sessions: 24 h
- Practical assignments related to applications or research: 30 h
- Personalized teacher-student tutoring: 6 h
- Study: 12 h
- Evaluation tests: 3 h

5. Assessment system

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

1. Written/oral deliverables on laboratory/practical work (40%) - Learning outcomes: 1, 2, 3, 6
2. Project (50%) - Learning outcomes: 1, 2, 3, 4, 5, 6
3. Oral presentations and discussions (10%) - Learning outcomes: 1, 2, 4, 5, 6

The student must obtain a minimum grade of 4.5/10.0 in each of the individual activities listed above to pass the course.

Assessment activity #1 will take place throughout the course, submitting the requested reports and deliverables in time, in the form of continuous evaluation. Assessment activity #3 will also be assessed throughout the course, and by means of a final oral presentation. Students who do not opt for the continuous evaluation procedure described above, do not pass such tests during the teaching period, or want to improve the mark/grade obtained, will be entitled to a global evaluation.