Robotic telepresence and teleoperation

Academic Year: (2019 / 2020) **Review date: 04-05-2020**

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: MONJE MICHARET, CONCEPCION ALICIA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

OBJECTIVES

The course intends to provide with the basics for an understanding of the robotics and teleoperation field theory, its main applications in submarine, nuclear and spatial field. The different types of advanced control used in teleoperation are studied, and finally the application of virtual reality to this research field.

DESCRIPTION OF CONTENTS: PROGRAMME

Contents:

1. Teleoperation history
1.1. Teleoperation overview
1.2. Teleoperation requirements

2. Concepts and definitions
2.1. Main teleoperation concepts
2.2. Main telepresence concepts

3. Technologies: Devices
3.1. Technologies involved in teleoperation and telepresence
3.2. Design specifications for a teleoperated system

4. Teleoperation architectures and supervised control
4.1. Different architectures for teleoperation
4.2. Comparison between architectures

5. Guiding in teleoperation
5.1. Characteristics of guiding and manipulation operations
5.2. Requeriments of guiding systems through teleoperation

6. Human factors in teleoperation
6.1. Physiology of the human body
6.2. The sense of touch
6.3. Requirements for telemanipulation

7. Force-Torque Control / Haptic control
7.1. Definition of force-torque control / haptic control
7.2. Constraints for force-torque control / haptic control

8. Simulators and virtual reality
8.1. Practical session 1
8.2. Practical session 2

9. Applications: submarine, nuclear, and spatial ones, among others

LEARNING ACTIVITIES AND METHODOLOGY

Classroom lectures about the contents described in the programme and 3 practical sessions in teleoperation laboratories.

ASSESSMENT SYSTEM

This subject will be evaluated following the next scheme:

1) Each student will prepare a work on teleoperation with application to submarine, nuclear os space fields. The work will be presented in class, with a later discussion on the topic. This practical part will count a 30% of the final mark. In order to pass this part, the minimum mark must be 5.

2) A theory exam that will count a 70% of the final mark. The exam will be done according to the oficial exam calendar.

In order to pass the subject, the minimum mark needs to be 5 both for the theory exam and for the practical part. In that case, the final mark will be calculated adding the marks from the theory (70%) and practical (30%) parts. If the student fails one of the parts, the final mark will be that corresponding to the failed part.

The extraordinary evaluation will follow the same rules as the ordinary evaluation (the mark of the practical part will be kept if that part has been passed previously).

% end-of-term-examination:	70
% of continuous assessment (assigments, laboratory, practicals…):	30

BASIC BIBLIOGRAPHY

- A. Barrientos, L. F. Peñin, C. Balaguer, R. Aracil Fundamentos de robótica , McGraw Hill, 1977
- Concepción A. Monje Lecture Notes, NA, 2018
- Jean Vertut and Philippe Coiffet Teleoperation and robotics. Evolution and development , Hermes, 1985
- Steven B, Skaar, Carl F. Ruoff Teleoperation and robotics in space, Washington, DC : American Institute of Aeronautics and Astronautics , 1994
- Thomas Sheridan Telerobotics automation and human supervisory control , Cambridge (Massachusetts): MIT Press, 1992

ADDITIONAL BIBLIOGRAPHY

- Concepción A. Monje Lecture Notes, NA, 2018