Universidad Francisco de Vitoria UFV Madrid

Teaching guide

IDENTIFICATION DETAILS

Degree:	Expert in Robotics
Field of Knowledge:	Engineering and Architecture
Faculty/School:	Senior Polytechnic School
Course:	
Type:	Compulsory Internal
ECTS credits:	3
Year:	1
Code:	56212
Teaching period:	Second semester
Teaching type:	Classroom-based
Language:	English
Total number of student study hours:	75

Teaching staff	E-mail
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SUBJECT DESCRIPTION

La asignatura de Plataformas de Simulación tiene como objetivo presentar al alumno y enseñar el manejo de algunos programas software destinado al modelado y simulación de entornos robóticos virtuales. Dichos entornos, además de facilitar la definición de robots con gran variedad de equipación sensorial y actuadores, reproducen las condiciones físicas, cinemáticas y dinámicas, del mundo que se expone al robot.

Las plataformas de simulación se presentan al programador de robots como un entorno bastante preciso en cuanto a propiedades físicas, barato y cómo de usar. En la práctica, suelen emplease como bancos de ensayo de los programas creados, antes de portar dichos códigos a los robots reales. Las funcionalidades de depuración del entorno permiten acelerar el proceso de corrección de los programas al mismo tiempo que reducen los riesgos de averías en los robots reales, o impactos imprevistos que estos pudieran provocar, si éstos llevasen códigos mal programados.

Se plantea un aprendizaje fundamentalmente práctico en el uso de varias plataformas de simulación, variando desde los basados en modelos de dos dimensiones a los tridimensionales. Mediante esta enseñanza el alumno adquirirá competencias para poder definir modelos virtuales de robots y entornos. Esta competencia servirá de base para otras asignaturas posteriores del Título donde se comenzará a programar y validar la inteligencia del

robot en estos programas.

This class is an introduction to the foundations of Robotics Simulation Platforms. It covers a comparative study of different platforms, and the use of some of the most popular platforms.

Whenever is possible, more topics iwill be introduce, such actuation, control, kinematics, dynamics, sensors and signal processing.

During the term, each student will use simulated robots based on Webots and V-REP simulators to reinforce the material in class.

GOAL

Main goals:
•Bring students the robot simulation applications. Justifying its usefulness for the development of Computer Science and classify different types of Robotics platforms.
•Teach the use of some of these tools, both aspects of modeling the world of virtual robots and subsequent manipulation.
•Develop and test active control software on platforms of robots simulation.

The specific aims of the subject are:

To study the simulation software, Webots. Analyze its possibilities and its utilities, learn to model robots in this environment and how to use them.

To study the simulation software, V-REP. Analyze its possibilities and its utilities, learn to model robots in this environment and how to use them.

To introduce Matlab in Robotics

To present different simulation platforms through a review of its functions and scope. Make the comparison between the platforms exposed under the criteria of cost, capacity simulation, accuracy of the simulation, extension to new robots, etc.

PRIOR KNOWLEDGE

Knowledge of English B2 level to follow the subject.
Basic knowledge of the parts of a robot and purposes given in the course "Introduction to Robotics" the first quarter.
Also required skills in programming control logic in robot navigation, taught in the subject "Programming Robots I", the first quarter.

COURSE SYLLABUS

1.- Introduction to simulation platforms.
2.- The History of Robotic Simulation
3.- The History of Control.
4.- Control Concepts.
5.- Webots platform
6.- V-REP platform
7.- Matlab and Robotics
8.- Others platforms (changes on the fly).

EDUCATION ACTIVITIES

During the teaching of this subject the interaction between the students and the teacher will be essential, trying to

capture their attention and get them more involved with the objectives. The professor will raise discussion events inducing students to think about the recent learning.

Classroom activities will be complemented with student's autonomous work. Also group collaboration will be required during exhibition preparations in some classes.

All study and work performed by the student will be reviewed and mentored by the teacher.

Finally, in order to facilitate students with access to necessary materials, as well as a way to practice efficient communication with the teacher, the virtual classroom (Moodle) will be an active learning channel during the full course.

DISTRIBUTION OF WORK TIME

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY
35 hours	40 hours
Lección expositiva 8h Clase práctica 22h Evaluación 2h Tutorías 3h	Estudio y trabajo individual: 30h Trabajo en grupo 10h

SKILLS

To present in class a full project of simulation

Learn to use robotic platforms and simulators.

LEARNING RESULTS

To be able to run a simulation according to the first tutorials of the simulators

To be able to handle a simulation software

To learn basic theory to run simulations such as physics, kinematics, etc.

LEARNING APPRAISAL SYSTEM

The evaluation system includes four different types of tests:
1)Student assignments (individual or group based), without taking into account exhibitions rates, will score 55% of the final qualification.
- Scientific Paper (10%)
- Webots: (10%)
- V-REP: (25%)
- Matlab: (10%)

2)Individual test. An individual exam will be performed at the end of the course period in order to check the concepts learning and understanding of knowledge. The score of the component will be 25% of final rate.
3)Work assignment public presentations will mean 15%.
4)Observance of Dates 5%.

In the three first tests is necessary to get over 5 out of 10 to pass the call.
In both calls (ordinary and extraordinary) the student will be presented only to evidence if mark is below 5.

Those students who are exempt from the obligation to attend class, either by second enrollment in the subject or successive, or by having the express authorization of the Degree Management, will be evaluated by the same type of tests.

For the purpose of counting calls in a subject, only those in which the student has attended to all the evaluation tests, or a part of them, will be counted as consumed, provided that their weight in the final mark exceeds 50%, even if it is not submitted to the final exam. It will be understood that a student has attended to a test although he leaves it once it has begun. The condition of "No Presentado" in the extraordinary call will be linked to the non attendance or delivery of any evidence, practice or work that is pending.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Documentación de Webots: http://www.cyberbotics.com/

Documentación de Gazebo. http://playerstage.sourceforge.net/doc/Gazebo-manual-svnhtml/

Wikipedia Player Project. http://en.wikipedia.org/wiki/Player_Project

KUKA: http://www.kuka-robotics.com/es/downloads/

Documentación de la asignatura disponible en el Aula Virtual.

Documentación de V-REP: http://www.coppeliarobotics.com/

Additional

Open Dynamics Engine, documentación. http://ode.org/ode-docs.html

OGRE Documentación. http://www.ogre3d.org/docs/api/html/