Robotic Sensing, Manipulation and Interaction (COMP0129)

Description

Aims:
The aim of this course is to understand how to build robot systems that can sense their environment to then perform an action. To do this, robots must have the ability to receive information from their environment but also an understanding of themselves with in it. Importantly, how we capture this information greatly influences subsequent actions both in terms of the availability of actionable data but also the processing required to interpret and perceive the surrounding environment. By exploring these trade-offs we discuss differences in sensory modalities and in turn develop an understanding of how to create interaction models that enable robots to co-operate with its environment in different ways.

In this course, we will discuss a range of sensing and cognitive control strategies. This theory will then be used to design robotic systems to perform tasks such as dexterous manipulation to cope with unstructured environments such as localising objects in their environment, visual and haptic serving, teleoperation, safety control features etc. Further, we will also discuss the design and testing of these strategies in the context of different real-world scenarios such as robotic manufacturing, surgery and biomanipulation examples in the life sciences.

Learning outcomes:
- Understand the main concepts related to multi-modal sensing and sensory feedback mechanisms from both a biological and robotic implementation perspective
- Develop methods for tackling uncertainty in robotic manipulation and interaction systems
- Read scientific literature in robotics to choose approaches for a particular problem
- Understand how to implement using off-the-shelf low cost devices e.g. raspberry PI etc. with a focus on measuring the sensory performance of the system and its relationship to the resultant interaction

Key information

Year 2019/20
Credit value 15 (150 study hours)
Delivery PGT L7, Campus-based
Reading List View on UCL website
Tutor
Term Term 1
Timetable View on UCL website

Assessment

- Coursework: 10%
- Coursework: 10%
- Coursework: 10%
- Report: 15%
- Report: 20%
- Report: 35%

Find out more

For more information about the department, programmes, relevant open days and to browse other modules, visit ucl.ac.uk

Disclaimer: All information correct as of June 2019. Please note that aspects of the module may be subject to change. UCL will make best efforts to inform applicants of major changes.
Content:
- Introduction to multi-modal feedback sensing
- Human Haptics
- Machine Haptics
- Optics and understanding how to measure sensor systems
- Networked robotic interaction with a focus on teleoperation Systems
- Neuro-physiological sensing linked to learning systems
- Grasping, Manipulation and Human Robot Interaction
- Robot Interaction and Distributed Collaboration

Requisites:
In order to be eligible to select this module, a student must be registered on a programme for which it is formally available AND must have (i) previous programming experience (e.g. Matlab, ROS, C++, python); and (ii) knowledge on how to set IP addresses and basic computer networking.