Robotic Systems Engineering (COMP0127)

Description

Aims:
The students will gain insight into robotics systems and the general concepts, mathematic and algorithms that underpin moving and actuating robotic arms and devices. Specific topics we cover: fundamental linear algebra, transformations, kinematics and inverse kinematics, actuation dynamics and mechanisms, and motion planning. These will all be applied to problems in simulation and programming of robotic systems.

Learning outcomes:
On successful completion of the module, a student will be able to:
1. Understand robot kinematics;
2. Understand robot motion planning;
3. Understand different robotic mechanisms, specifically robotic arms;
4. Programme with Python and ROS (optional C++);
5. Apply learned theory to programming solutions for robotics problems in simulation.

Content:
- The aim of this module is to provide the basic theory required for solving problems involving the motion of robotics and autonomous systems from a practitioner point of view;
- The module presents theory and methodology for analysis and modelling of robot kinematics, and methods for moving robots within workspaces. Special emphasis is placed on:
  - Linear algebra needed for robot motion and transformation;
  - Robot kinematics and DH tables;
  - Inverse kinematics and solving inverse systems;
  - Planning and executing robot motion;
- Theoretical lectures will be accompanied by corresponding practical exercises using ROS and predominantly carried out in simulation;

Requisites:

Key information

<table>
<thead>
<tr>
<th>Year</th>
<th>2019/20</th>
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<tbody>
<tr>
<td>Credit value</td>
<td>15 (150 study hours)</td>
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<tr>
<td>Delivery</td>
<td>PGT L7, Campus-based</td>
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<tr>
<td>Reading List</td>
<td>View on UCL website</td>
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<tr>
<td>Tutor</td>
<td>Prof Danail Stoyanov</td>
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<td>Term</td>
<td>Term 1</td>
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<tr>
<td>Timetable</td>
<td>View on UCL website</td>
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Assessment

- Coursework: 20%
- Coursework: 30%
- Coursework: 50%

Find out more

For more information about the department, programmes, relevant open days and to browse other modules, visit [ucl.ac.uk](http://ucl.ac.uk)
In order to be eligible to select this module, a student must be registered on a programme for which it is a formally-approved option or elective choice AND must (i) be able to use Linux and have some background/experience in programming, especially using Python (and preferably ROS); (ii) be comfortable with linear algebra mathematics; and (iii) for the next academic year (2019-2020), the module will run on Ubuntu 18.04 (Bionic) and the lab materials/coursework will run on ROS Melodic. Students are required to have a laptop that has a minimum of 2GHz dual core processor, 2GB RAM, 30-40 GB of hard-drive space and an internet connection, can run an installation of ROS on Linux and be used during lab sessions.