Engineering Tripos Part IIB, 4I15: Mobile Robot Systems, 2020-21

Leader
Dr A Prorok [1]

Lecturer
Dr A Prorok [1]

Lecturer
Dr F Iida [2]

Lecturer
Dr F Forni [3]

Timing and Structure
Lent term. Lectures and coursework. Assessment: 100% coursework.

Prerequisites
4M20 useful; 3F2 useful; 3F3 useful

Aims
The aims of the course are to:

- This course teaches the foundations of autonomous mobile robots, covering topics such as perception, motion control, and planning.
- It also teaches algorithmic strategies that enable the coordination of multi-robot systems and robot swarms.
- The course will feature several practical sessions with hands-on robot programming. The students will undertake mini-projects, which will be formally evaluated through a report and presentation.

Objectives
As specific objectives, by the end of the course students should be able to:

- understand how to control a mobile robot;
- understand how a robot perceives its environment;
- understand how a robot plans actions (navigation paths);
- know paradigms of coordination in systems of multiple robots;
- know classical multi-robot problems and their solution methods;

Content
### Further notes

**Requirements:**

Students are expected to have laptops running Linux, with installations of ROS Kinetic and Gazebo. An installation guide will be provided.

**Coursework**

Students will be expected to hand in two reports and attend an individual questioning session.

<table>
<thead>
<tr>
<th>Coursework activity #1 : Assignments</th>
<th>Format</th>
<th>Due date &amp; marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning objectives:</td>
<td>Individual Report</td>
<td>February 2021</td>
</tr>
<tr>
<td></td>
<td>anonymously marked</td>
<td>60% (30% each assignment mark)</td>
</tr>
</tbody>
</table>

The assignments will consist of two elements: (1) experimental work using a robot simulator and real robots, and (2) theory / understanding. The exercises will require data collection and analysis. The balance between practice and theory will depend on the exercise topic. Each student will submit a written report.

Each assignment will be marked on a scale of 0-100, and will compose 30% of the mark.

**Coursework activity #2 :**

<table>
<thead>
<tr>
<th>Learning objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A set of proposals will be announced at the start of term. Students will form groups of 2-3 and select a project proposal. Each proposal will include a core and a set of extensions; Engineering students will be expected to complete the extensions.</td>
</tr>
<tr>
<td>The project will compose 40% of the mark and will be evaluated on a scale of 0-100. It will be handed in as group-work in groups of 2-3, and the report will clearly state what each group member contributed. The overall project mark will be composed by a report score (60%) and a presentation score (40%). Project marks will reflect the contribution of each team member. Every team member is expected to make a similar, significant contribution to the project, and where this happens all team members will receive the same mark. The report requirements will differ for students. Engineering students will hand in a 6-page double-column report (conference-formatted)</td>
</tr>
</tbody>
</table>

Anonymously marked | April 2021 | 40% |
Booklists


Examination Guidelines

Please refer to Form & conduct of the examinations [4].

Last modified: 07/10/2020 08:53

Source URL (modified on 07-10-20): http://teaching.eng.cam.ac.uk/content/engineering-tripos-part-iib-4i15-mobile-robot-systems-2020-21

Links
[1] mailto:asp45@cam.ac.uk
[2] mailto:fi224@cam.ac.uk
[3] mailto:ff286@cam.ac.uk