Queen Mary
University of London

Year 2 Short Semester Summer Design & Build Project 2023

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Year 2 Design & Build Project

Aim

- to solve engineering problems for yourselves
- to apply and use your knowledge in practice
- to gain experience working in a group with students from other programmes
- to understand the work in different aspects of a design project

Motivation

- to encourage your initiative and **innovation**

The D&B project contributes to part of your engineering environment marks.

Year 2 D&B Project: Information

- Groupings:
  - 10/11 students per group (already allocated)
  - Mixed E-Commerce, Telecoms and IoT students (in an approximate ratio of 3: 5: 3)
  - Each group forms a small "engineering design company" of 3 departments.
- Competition: QM sponsors prizes for top three groups that worths up to £150.
- Resources:
  - a hardware kit and electronic components
  - handouts, coding examples, reading lists
  - Sample of project reports

Year 2 D&B Project: Phase 1

- Students from each programme will be trained on their respective skills separately, guided by our fellow BUPT instructors.
  - Telecom: electronic design and microcontroller programming
  - E-Commerce: database and website development
  - IoT: elementary AI programming
- You can develop individual components of the whole project separately during this phase.
- By the end of training, you will be **assessed** by the BUPT instructors on your skills and achievement.

Year 2 D&B Project: Phase 2

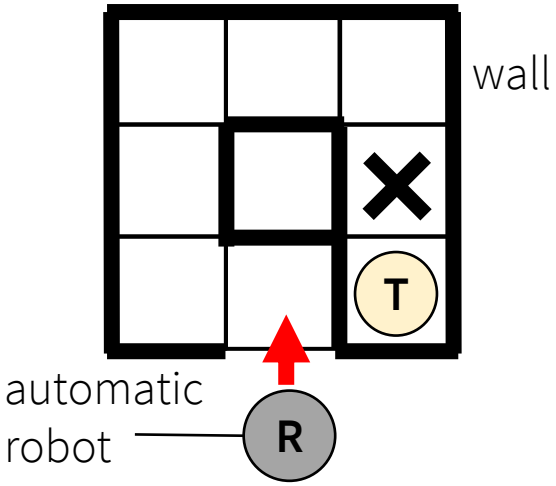
- After all students in a group had completed their training, you can start integrating the components together and produce a complete system.
  - You can further modify/develop the finished components from phase 1
  - You can also add extra features and innovations to your project
  - Focus on communication and teamwork
- Submission deadline (mid-late October)
  Enough time will be given for you to work together with your teammates and produce all deliverables.
- Presentation & Demonstration
  TBC at the beginning of phase 2.

Scenario

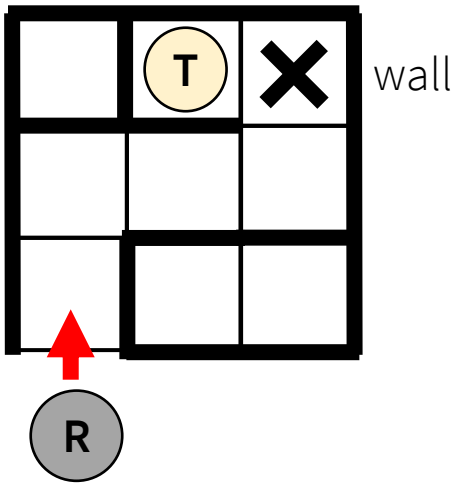
Your company is requested to design and build a prototype of a robot control system that uses an automatic robot to explore a walled maze with a hidden treasure inside. The robot finds the route through the maze and locate the hidden treasure. It also uses camera to take pictures of the treasure and identify the type of treasure using object detection algorithm.

The robot also reports the status of the exploration (e.g. the map of the maze, the pictures taken, time of exploration etc.) on a web interface for monitoring. There should be a web (or mobile) application that provides current and historical exploration records. A database should be designed to manage all information for the whole system.

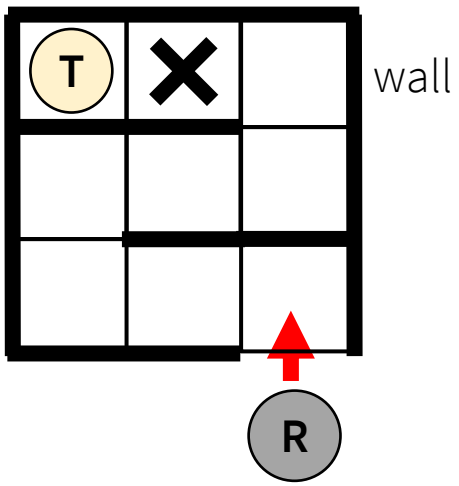
Maze Example 1



Maze Example 2



Maze Example 3



Deliverables [Telecom]

Hardware Model and Control Software

- Design and build an automatic robot hardware that
  1. explores the walled maze;
  2. stops at the treasure inside the maze and takes picture(s) of the treasure;
  3. leaves the maze and returns to the starting position;
  4. records the exploration and stores information for other parts of the system;
- Extra functions:
  1. explores a more complicated maze (e.g. larger maze, with multiple splits/branches).
  2. self-designed other functions.

Deliverables [IoT]

Object Detection Software

- Basic requirements:
  1. Collect picture samples of 3 chosen objects (to be used as treasures);
  2. Produce a simple GUI to demonstrate the accuracy of the trained algorithm;
  3. Run the object detection algorithm on the samples and produce a report on the accuracy on various environment (e.g. bright room, dimmed room, etc.)
- Possible advanced functions:
  1. Train/calibrate the object detection algorithm for new, specific objects;
  2. Self-designed other functions.

Deliverables [E-Commerce]

Database Management and Web Visualisation

- Design the database and create a web application that has the following functions:
  1. allow users to login and check their accounts (1 account for 1 robot);
  2. add/delete/modify information about robot (e.g. name, picture, etc.)
  3. visualise records of explorations (e.g. average maze exploration time, statistics of treasures, etc.);
- Possible advanced functions:
  1. display the real-time map, pictures and other information from the robot,
  2. self-designed other functions

Preview: Phase 2 Deliverables [Group]

- A marketing advertisement:
  a short video (no longer than 30 seconds)
- A project report for all deliverables (not just the hardware)
  - Explain the design process and choices (Phase 1)
  - Planning and management (Phase 2)
    e.g. project time line, Gantt chart
  - Brief minutes for team meetings (Phase 2)
- For the above deliverables, pay attention to
  - layout
  - clarity
  - use of oral and written English

Criteria

Innovative design

Comprehensive documentation

Excellent teamwork

Careful planning

Effective marketing

- Not just circuitry/software...
- Consider all aspects of the product/system:
  - Aesthetics (“how it looks”)
  - Ease-of-use, user-friendliness
  - Maintainability, sustainability.
  - Costs

Let's catch up when we enter Phase 2.
Wish you all a wonderful summer!

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THANK YOU