

Coursework: Robotics (COC001)

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Tasks:

In this coursework, each group are required to design a program to control a mobile robot. You need to implement two tasks:

- a) Demonstrate the ability to walk towards a person. During testing, a person will stand in the view of a robot. The robot needs to navigate to that person and stop at a safe distance.
- b) Demonstrate the ability to follow a path. The robot cannot deviate from the path (the path should stay between two wheels of the robot). Please use a deep learning based solution for this task.

The physical demo is not required this year. Each group needs to write a report addressing the following aspects:

1. Detail design explanation. In this section, please justify your design and answer the following questions:
 - Which robot sensors will you use?
 - What kind of algorithms are needed to accomplish each task?
 - How do you use results from the algorithms?
 - How to control the robot to finish the task?
2. Flowchart of the system and the description of the program functions. In task 2, you will need to train a deep learning model. Please describe the data collection procedure, the data labelling procedure, the model configuration, and the training of the model.
3. Conclusions. You can write any experimental results with the robot, any lessons learned through playing with the robot or any alternative solutions for the task. This is to demonstrate that you have a good understanding of the robot.

Further Information:

This project targets mobile robots we build with the latest AI technology and sensing capability. The robots have a latest Realsense camera from Intel, a Jetson Nano board from Nvidia to support image processing and deep learning etc, proximity sensors, IMU, motors and driving circuits. A simplified version of such robots can be found from the JetBot robot from Nvidia, <https://github.com/NVIDIA-AI-IOT/jetbot>

You will be provided with examples to control the robots, read sensory information and camera images. You can reuse all the codes and information you learned from the lab practicals.

Project type: Group project

Assessment:

The whole module will be assessed by coursework (40%) and exam (60%).

Coursework Report: (design: 10%; flowchart, function description: 25%; result analysis and conclusions: 5%).

Assessment Area	Percentage
Design for task 1	5% (each question 1%, justification of the design 1%)
Design for task 2	5% (each question 1%, justification of the design 1%)
Flowchart and function Description for task 1	10% (flowchart 5%, function description 5%)
Flowchart and function Description for task 2	15% (flowchart 5%, description 5%, data collection and model training 5%)
Conclusion	5%

In the report, it is important to answer the above questions in detail. A brief answer without detailed explanation will lose some marks. For example, in the design explanation of task 1, you need to use an object detection algorithm to detect the human. You need to point out what algorithm you will use (if you checked tutorial 4, you will find that the `ssd_mobilenet_v2` model is used for human detection).

Everyone could get a different mark based on their contribution to the group coursework. We will use Web-PA (<https://webpa.lboro.ac.uk/login.php>) to do online peer assessment.

Coursework to be handed in: by end of 14th May, 2020.