University of Lincoln
School of Computer Science
Assessment Briefing 2023-2024

The use of AI tools to generate all or part of your assessment submission is **not** permitted unless specifically mentioned below.

Module Code and Title: CMP9767 Robot Programming
Contribution to Final Module Mark: 60%
Description of Assessment Task and Purpose: This is **Assessment 1** (Coursework) for the module and is an **individual** assignment. In this assessment, you are expected to build a software artefact using (mostly) existing ROS components. You will be using a real robot platform and a robot simulation to build a system that can accomplish a defined task, linking perception and action. You are expected to use state-of-the-art software engineering methodology to devise your artefact (e.g., Git-based source code management). You are assessed based on the functionality, structure and comments of your source code and your performance in a 15-minute viva where you show your artefact working. Your implementation will be based on Python and the ROS infrastructure. This task is designed to assess you programming and problem-solving skills, as well as your ability to critically appraise and select a suitable solution and implement that into a working robotic system. **Scenario description:** In this assignment, you will implement a software system for a mobile robot deployed to solve a road inspection task. The goal of the task is to automatically appraise the quality of the road surface and report that information to the human user. The basic report will simply contain the number of detected potholes in the whole environment, whilst more advanced reports can include the pothole size, their location and a pothole map indicating the severity of the road damage across the environment. The robotic platform for this task is a LIMO robot together with its sensors deployed in a rectangular arena resembling an urban road scenario with a series of different “potholes” placed at various locations. There will be two variants of the environment available: one featuring easy to spot potholes with distinct appearance and one with more realistic appearance for additional challenge. The robot should navigate autonomously in the environment whilst undertaking the inspection task and aim to cover all the road segments. The basic implementation will demonstrate the pothole counting functionality in an “easy variant” of the simulation with the robot autonomously covering most of the environment and starting from a fixed position. The following features will count towards additional credit: the advanced pothole report, flexible deployment from a random location or in a different layout of the environment, and the physical demonstration of the functionality with the real robot. As a stretch assignment, the robot will navigate over or around the potholes if that is physically possible. You are encouraged to use any existing off-the-shelf ROS2 components and code fragments and integrate them into your system, but you must correctly cite all the used resources in the source code.

An excellent implementation solves the task accurately with innovative use of techniques not covered in the module and is very well documented in the source code. It may also feature meaningful unit and system tests to ensure high code quality. You will be using the Gazebo simulator, providing you with simulated robots, and a world to operate in. In addition, you will be able to demonstrate your software on a real robot and a real test scenario. The simulation setup is presented in more detail in https://github.com/LCAS/CMP9767_LIMO/wiki/Assignment-Setup.

Should you require further explanation of the coursework assignment, you are expected to ask members of the delivery team at scheduled lectures and workshop sessions.

Please see the Criterion Reference Grid for further details on how your code submission and presentation will be graded.

Learning Outcomes Assessed:

- LO1: critically appraise the theoretical capabilities of existing state-of-the-art robot system algorithms and components;
- LO2: understand and critically appraise the requirements and limitations of robot algorithms and components;
- LO3: implement and empirically evaluate algorithms and components, by programming autonomous robots to perform complex tasks in dynamic environments.

Knowledge & Skills Assessed:

Subject Specific Knowledge, Skills and Understanding, Professional Graduate Skills and Career-focused Skills:

- Python, Robotics, and Computer Vision Programming
- Use of a middleware for inter-component communication (ROS)
- Appraising existing software solution and selecting the right ones among alternatives
- Interaction with a Linux operating system

Assessment Submission Instructions:

Your code together with comments must be submitted a single ZIP file via Blackboard. The submission link can be found in “Assessments/Assessment Documents/Assessment Item 1/Assessment Item 1 Upload”.

Date for Return of Feedback:

Please see the School assessment dates spreadsheet.

Format for Assessment:

You must submit your work as a single ZIP file via Blackboard in the respective submission area for this assignment. You must include ALL source code for the simulated case (but no compiled artefacts), and your submission MUST COMPRISE a README.md file (in markdown syntax), comprising the following information:

1. A (max 100 word) summary of your solution (describing what the system is offering).
2. An explanation on how to start your system, detailing all commands and steps necessary to reproduce and run your solution.

You will have to attend a brief 15-minute viva following your submission where you will demonstrate your implementation and answer questions. The viva will take place after the hand-in date for this assessment therefore there is no separate hand-in deadline for this component. The schedule for the viva and more guidance on how to best prepare for this event will be provided by a member of delivery team two weeks in advance.

Feedback Format:

You will receive direct verbal feedback following your viva, as well as detailed written feedback via blackboard, individual for each marking criteria as detailed in the Criterion Reference Grid (CRG). During workshop sessions, the delivery team will offer formative assessments and feedback on the route to your submission.

Additional Information for Completion of Assessment: Ensure you use the interactive sessions with the module team to receive intermediate feedback and actively ask questions. This is an open-ended assessment task, requiring you to think about your approach early and making best use of the resources and guidance made available to you.
Assessment Support Information: https://github.com/LCAS/CMP9767_LIMO/wiki/Assignment-Setup
Important Information on Dishonesty, Plagiarism and AI Tools: University of Lincoln Regulations define plagiarism as 'the passing off of another person's thoughts, ideas, writings or images as one's own...Examples of plagiarism include the unacknowledged use of another person's material whether in original or summary form. Plagiarism also includes the copying of another student's work'. Plagiarism is a serious offence and is treated by the University as a form of academic dishonesty. Please note, if you use AI tools in the production of assessment work **where it is not permitted**, then it will be classed as an academic offence and treated by the University as a form of academic dishonesty. Students are directed to the University Regulations for details of the procedures and penalties involved. For further information, see www.plagiarism.org