CS4048 Group Programming Project

Academic Year 2024-2025

Dr Rafael C. Cardoso and Dr Mingjun Zhong

Learning Outcomes

On successful completion of this assessment, you will have demonstrated competence in the following aspects:

- Ability to utilise a variety of sensors to obtain information about a robot's environment
- Ability to program a robot using standard software tools
- Ability to deal with errors in sensing and movement
- Ability to have a robot pursue and achieve its goals

Project Description

This is an open-ended project where your group should design and implement a robotic system exploiting the capabilities of the Robot Operating System (ROS) and concepts that you have learned so far in your degree. Your solution must have at least one robot performing at least one task in a simulated environment. The robots, tasks, and simulation environment (e.g., Gazebo, Webots, Turtlesim, etc.) you use in your project is up to you to decide. Pay attention to the marking criteria to understand what is worth marks.

You can use existing code available online as inspiration or a starting point, but any use of existing code has to be properly documented in your final report with a detailed account on what has been added.

Please discuss your project idea with your group and with the teaching staff as soon as possible to ensure that you are on the right track. There will be some (limited) time during practical sessions to discuss your project with your group and with the teaching staff. You are expected to meet with your group and discuss your project outside of lecture or practical sessions.

Write a paragraph describing your group project and make an initial submission by Friday 11th October at 5:00 pm.

This project is worth 50 marks of your overall grade.

Submission Instructions

Your project must be developed using ROS 2 Jazzy Jalisco.

Your submission will receive 0 marks if any of these conditions are met:

1. **Submission does not use ROS 2 Jazzy Jalisco;**

2. **Contains code that is too similar with another group submission;**
3. **Contains code copied from somewhere else with no explanation on what was changed or with very small modifications;**
4. **A submission that does not have at least one robot performing at least one task successfully in a simulated environment;**
5. **Any of the word limits are exceeded;**
6. **Any of the required files listed below are not submitted.**

Your final submission should contain the following files (**with these exact names and extensions, deviations will receive mark penalties, additional files are ok if required**):

- project_code.zip – a zip file containing all of the code necessary to run your project. You need to include a **README.md file containing detailed instructions on how to run your project**. It should include the description of the installation of any additional libraries or tools that you may have used.
- video.mp4 – a video demonstration of your project. It should successfully show all the robots, tasks, and the simulation environment. The video should begin with you running the code. You can take the opportunity to provide some voice-over to explain the demonstration.
- report.pdf – your report should be succinct and direct to the point. It should include a brief description of your project, the robot model, the tasks, and the simulation environment. If any additional libraries or tools have been used these have to be briefly explained as well. All of your choices have to be motivated. Make sure to provide evidence for each marking criteria as part of your report. You should conclude your report with the strengths and limitations of the project, and how you would attempt to solve the limitations or extend the work further if you had more time. A section on references is mandatory and should be used to not only provide links to documents/code you used for inspiration, but also explain how they were used and extended. **This has a word limit of 1500 words, please include a word counter at the end.**
- reflective_report[SURNAME].pdf – one for each member of the group, where SURNAME is the surname of the member. The reflective report should contain an account of your contributions in the group, what you learned during the project, and what were the main challenges you faced (you individually). **This has a word limit of 500 words, please include a word counter at the end.**

Marking Criteria

Note that your maximum grade is **50**, even if the individual criteria marks exceed this limit.

CRITERIA	MARKS	DESCRIPTION
ROBOT, TASK, SIMULATION ENVIRONMENT	15	How appropriate and well-implemented was the choice of the robot model(s), task(s) and simulation environment
MULTIPLE ROBOTS	5	Use of multiple robots that are working together to solve tasks.

MULTIPLE TASKS	5	Robots are achieving multiple (complex) and different types of tasks.
VIDEO	5	How well the video demonstrates the project.
SCENARIO INNOVATION	5 (bonus)	How innovative/creative was the idea for the robotic scenario developed in the project.
INTEGRATION WITH OTHER CS CONCEPTS	10 (bonus)	Provide evidence that you have integrated your solution with other Computing Science concepts. Bonus marks will be awarded if you used a concept you learned in a previous course of our degree.
REPORT	20	See submission instructions for details on the report.
INDIVIDUAL REFLECTIVE REPORT	0.0 to 1.0	Any complaints from your group about you may incur in mark penalties. You start with 1.0.

Your final mark will be your total group mark times your individual reflective report mark. The individual reflective report is a contribution coefficient, you start at 1 which means you will get the maximum group mark, and it can go down depending on the level of your contribution to the group.