

CS36010 - Robotic Applications

Programming Assignment and Report

Patricia Shaw

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Abstract

The assessment for this module consists of a programming assignment (60%) and report (40%). The deadline for submission is **13:00 on Tuesday 10th December 2019**. Details of the assignment, submission and marking scheme are given below.

1 Programming assignment

Using the Fetch robot, you should detect and retrieve a set of objects placed in the environment, transporting them to a drop-off location elsewhere. A solution could be achieved using a single node, but you are encouraged to consider how your solution could be broken down into separate nodes with topics for communication.

Note that your solution should not be tailored to the example environments, but should be flexible enough to work in variations of the scenario.

1.0.1 Single room scenario

In this scenario, the robot is placed in a single room. At one end of the room is a table with 3 objects (red cubes). At the other end of the room is a bucket (green). The robot should pick up the 3 objects from the table and place them in the bucket at the other end of the room.

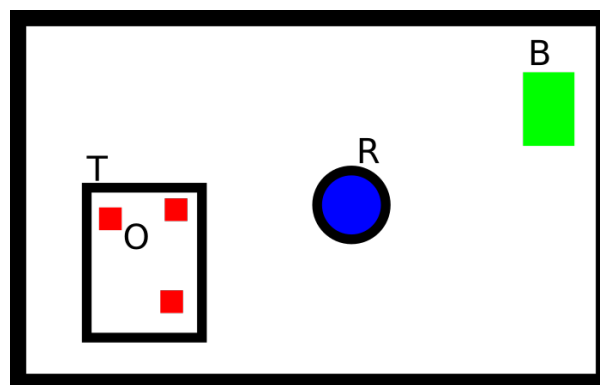


Figure 1: Top down view of single room scenario where T is table, O is objects to pick up, R is robot and B is bucket to place object in.

1.0.2 Multi room scenario

In this scenario, the 3 objects are spread out between tables in different rooms. The bucket will always be in the room the robot starts in (for a robot starting at (0,0,0)). The robot will need to explore the various room to find all the objects and return them to the bucket in the starting room.

An initial solution for exploring may use the laser scanner to follow a wall around to explore each room in turn. A more sophisticated solution might involve constructing a map of the environment, recording navigation points for objects detected during exploration and of course the bucket location.

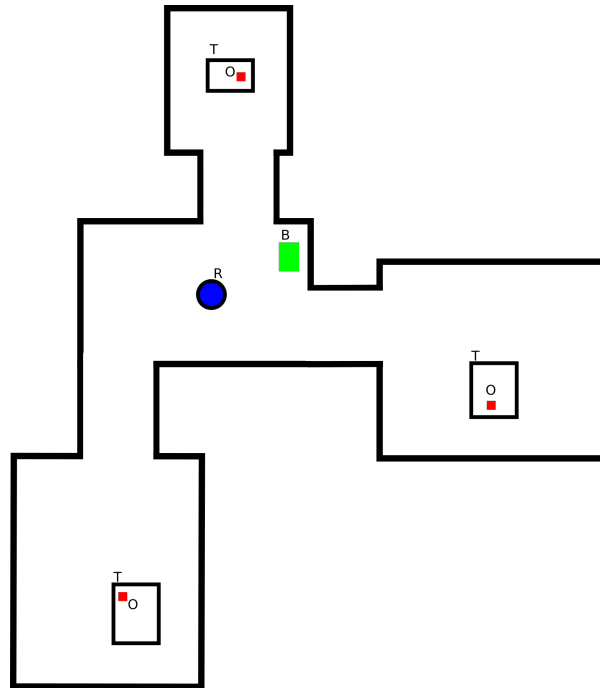


Figure 2: Top down view of a multi room scenario.

1.1 Screenshot

As part of your submission, you should include a screenshot of your robot in action. This should include an explanation of what is being observed in the demonstration. The screenshot should be 2-5mins in length.

The screenshot should be included inside your ROS package.

1.2 Packaging

You should include a readme file in your package with instructions for running your solution.

Your complete ROS package, including the screenshot should be compressed as a zip file.

2 Report (40%)

The report is split into two parts; Robot Strategy and Ethical Considerations for robots. The total word length for the report should be $1500 \pm 10\%$. Each part should contain at least 500 words.

10% of the marks will be awarded for formatting, referencing and writing style, the remaining 30% is split equally between the two parts described below.

2.1 Robot Strategy

In this part you should describe how you have structured your solution to the scenario. In the simplest form, this will describe how your code works, but a more detailed description may cover how aspects of your solution are broken down between nodes, communication between topics, use of services/actions, and use of ROS packages.

If you have not attempted the Multi room scenario, you should also include a description of how you would approach this along with the tools and techniques you would look to apply.

2.2 Ethical Consideration

As robots become more common place, there are many ethical considerations. In this part you should consider the topic of assistive robots in the home for care applications enabling people to live more independently, both due to age or disabilities. With reference to relevant sources, you should discuss ethical issues related to the assistive robots in the home environment.

2.3 Reference

References should be included for any source code used from outside the module and any sources to support the report. Recommended reference style is IEEE Transactions¹. A guide for using the reference style (IEEEtranS.bst) in L^AT_EX is available from: http://mirror.ox.ac.uk/sites/ctan.org/macros/latex/contrib/IEEEtran/bibtex/IEEEtran_bst_HOWTO.pdf

3 Submission

Please ensure you review the University policy on Plagiarism before submission of your work. Any code reused that has not been supplied as part of the module should be referenced both within the source files where it is used and in the report.

Make sure you allow time before the deadline for the upload of larger files, e.g. zip file containing screencast. The deadline is **13:00 on Tuesday 10th December, 2019.**

After submission, check you have had receipts confirming both components have been submitted.

Programming assignment : The package should contain a readme file which gives instructions for running your application. You should create a zip file containing the full package(s) and your screen cast, which should then be submitted to the Programming Assignment submission point on the Blackboard module page.

¹Formal definition: <https://ieeauthorcenter.ieee.org/wp-content/uploads/IEEE-Reference-Guide.pdf> or for a more accessible description: <https://www.bath.ac.uk/publications/library-guides-to-citing-referencing/attachments/ieee-style-guide.pdf>

Report : The report should be submitted as a PDF to the TurnItIn submission point on the Blackboard module page.

3.1 Marking scheme

Component	Description	Mark %
Programming assignment		60
Single room scenario	A solution that successfully enables the robot to transport the objects from the table and place them in the bucket	[30]
Screen cast	A recording demonstrating and describing the behaviour of the robot	[10]
ROS usage ²	The quality of the implementation and the range of ROS techniques used including, but not limited to, parameter server, services, actions, mapping tools	[20]
Report	A well written report with supporting reference that addresses the points specified	40
Strategy	Description of robot strategy used for solving the problem	[15]
Ethics	Discussion of ethical considerations for robots	[15]
Style	Format, writing style and references	[10]

²While these can be demonstrated in the single room scenario, or that the multi-room scenario could be completed without these, it is anticipated that these will best be demonstrated within the multi-room scenario.