ELEC330
Assignment One
Robot Design

Dr H LAKANY

Abstract

This assignment has a weight of 10% of the total grade. The assignment is issued on the first week and is due on Friday of fourth week of the first semester. This assignment is very important as it represents the main stepping stone to enable you to complete the other two assignments.

1 Assignment requirements and marking criteria.

Table 1 summarises the assignment requirements.

Module	ELEC330
Coursework title	Assignment 1
Component weight	10%
Semester	1
HE level	6
Lab location	lab sessions and private study
Work	Individually
Timetabled time	9 hours (3 hours per week –Tuesday PM depending)
Suggested private study	4 hours including report writing
Assessment method	Individual, formal word-processed reports in addition to CAD drawings and code.
Submission format	On–line via VLE (CANVAS)
Submission deadline	23:59 on Friday 21^{st} October 2022
Late submission	Standard university penalty applies.
Resit opportunity	August resit period (if total module failed)
Marking policy	Marked and moderated independently
Anonymous marking	No
Feedback	via annotated copy corrections.
Learning Outcomes	LO1: Describe the main components of a robotic system. LO2: Critically assess a number of scenarios where deploying/using robotics may be advantageous and/or favourable from safety, social, economical and ethical perspectives. LO3: Design, model and simulate a simple robotic system with a manipulator to perform a particular task.

Table 1: Assignment Requirements

Table 2 summarises the assignment requirements.

Section	Marks available	Indicative Charateristics	
		Adequate/pass (40%)	Very good/Excellent
Clarity of presentation (including succinctness) of main report	20%	2–page executive summary. Comprehensible language with adequate grammar and punctuation. Documented code and CAD drawings in appendices	Appropriate use of technical language. All sections clearly signposted. Correct cross referencing to appendices. Annotated CAD drawings and code files including readme files.
Quality of design and modelling	40%	Adequate CAD model exported to Gazebo; minimum design of mobile body with a manipulator with one degree of freedom.	Well thought through design foreseeing requirements of the exploration mission. Video showing the detail of the design features.
Quality of discussion, reflection and conclusion	40%	Critical assessment of the design and the model. Discussion on what worked and what did not.	Discussion how the model fulfils requirements of the exploration mission and how the model was fully assessed/tested.

Table 2: Marking Criteria

2 Assignment Outline

In this module you will design and implement a model of a robot to be deployed in an exploration mission in an indoor environment over three different assignments.

In the first assignment, you shall start by designing the robot structure: chassis, body, drive, etc. You know the task and you have to come up with requirements specifications for the robot to enable it to successfully complete the exploration mission.

You are required to design a mobile robot capable of navigating safely indoors to explore the environment and identify an object. You will do this by using a CAD software such as Creo or SolidWorks. You will produce STL files. From these files you will produce the visual and collision meshes of the robot in ROS. You should finally produce a URDF file where the robot model is completely defined.

Refer to the following tutorials for help:

- http://wiki.ros.org/urdf/Tutorials/BuildingaVisualRobotModelwithURDFfromScratch.
- http://wiki.ros.org/urdf/Tutorials/Createyourownurdffile.
- http://wiki.ros.org/urdf/Tutorials/AddingPhysicalandCollisionPropertiestoaURDFModel.
- http://wiki.icub.org/wiki/Creo_Mechanism_to_URDF.
- http://wiki.ros.org/sw_urdf_exporter.

You should be able to display the model in Gazebo. Customise your robot by changing colour of the body, etc. **Give your robot a name to reflect its character and purpose!**. Failing to give the robot a name will result in deduction of marks.

2.1 Submission Deadline

The submission deadline for the assignment is **Friday** 21^{st} **October 2021** at *23:59*. You will submit your report and code on–line using the dedicated link in the module page on VLE.

3 What to submit

You will submit an executive summary, a detailed report, code and a video as follows. The title of your submission should include the name of your robot. Use appropriate names for all files and zip them in one file to submit.

3.1 Executive Summary

You will submit a 2–page executive summary with one figure only (excluding any appendices) in 11 point font with no less 2cm margins. Note that this summary is very important and will be the only part that is completely read by the marker. It should include all what is needed to get the reader acquainted of what you have achieved and how. The reader should not have to refer to any other material. The executive summary should include

- Requirement specifications.
- Robot design and model.
- Discussion and reflection design and model.
- Conclusion in view of designing and deploying robots in rescue mission from ethical, social and economical perspectives.

3.2 Appendices

You should use appendices where you include the detail of all the steps you have gone through to complete the design of the model of the robot. The appendices should include a detailed section for each of requirement specification, the design, the model, how you achieved the model using the CAD files. A reflection section on what worked, what did not work, what are the lessons learnt and skills acquired.

3.3 code

This will include any code you have written or used to complete the assignment. This will also include all the .stl, xacro, urdf and any other files. All code and CAD drawings should be appropriately documented and annotated.

3.4 video

Submit a video showing the model in Gazebo using different perspectives. Figures will also be accepted.