McGILL UNIVERSITY

ECSE 211: Final Design Project

Requirement Document

Aliah Mohd Nazarudin

supervised by
Frank P. Ferrie

October 18, 2017

1 SUMMARY

The goal of this document is to try to make sure that the requirements of the client are fully understood. It is composed of several sections, each of which tries to address one aspect of the specification and to try to identify all the related issues. The sections are detailed below and are reasonably generic. Once this document is completed, we should know everything about the problem to be solved and the end device to be created. However, as the design process progresses, questions will arise which lead to answers or decisions which might contradict this document. In this case, we need to go back to the document and the client and clarify the issue and update the document appropriately. This is a living document.

Contents

1 Summary i

2 Task 2

3 EDIT HISTORY 2
- 3.1 Document Version Number 2
- 3.2 Edit History 2

4 CAPABILITIES 2
- 4.1 Purpose 2
- 4.2 Scope 3
- 4.3 Constraints 3
- 4.4 User function 3
- 4.5 Operating Environment 3
- 4.6 Performance 4

5 COMPATIBILITY 4
- 5.1 Component re-use 4
- 5.2 Compatibility with third party product 4

6 GLOSSARY OF TERMS 4

2. TASK

Project: Design Principles and Methods Final Project: Capture the Flag - Team 15
Task: Design an autonomous robot that can play a one-on-one version of the Capture the Flag while navigating through an obstacle course.

3. EDIT HISTORY

a. Document Version Number

i. 0.0.1: Version presented to Prof. Ferrie on the 2017/10/20

b. Edit History

i. Aliah Mohd Nazarudin - Start a summary of the document, fill all if not most sections

4. CAPABILITIES

4.1 PURPOSE

(what is this product intended to do – this should be as detailed a description as you can get. You could probably start by putting in the specification that you have to date. Note that while details may change, the overall purpose is unlikely to alter. So the starting purpose for this project is to create an autonomous vehicle capable of navigating around an obstacle course, collecting balls and tossing them at a target.)

To design an autonomous robot that can play a one-on-one version of the Capture the Flag while navigating through an obstacle course. It can do so by first receiving parameters from the game controller and localizes itself. Next, it has to navigate to the ramp corresponding to the starting zone, transverse the river using the zine line or shallow crossing, search for the flag, indicate capture and navigate back to the starting point using an appropriate transit method.

4.2 SCOPE

(*range of capabilities, limitations, etc. – this is likely to be detailed and could change as the project progresses as budget issues, technical issues, etc., start to be recognized. As a starting point, you need to develop a set of questions and get the answers to them. For instance, you need to know the size of the area the device will function in; you need to know if there are time limits on the competition; you need to know what the final competition might be;…, Are there tolerances on*

any of the parameters? Also, is this a one-shot operation or is it the prototype for a future design?)

- 12X12 floor
- 30 seconds to localize itself -given the starting corner number, the robot needs to move to the closest grid intersection and note its initial position and alignment.
- Navigate to the ramp
- Ensure the right color of flag
- 3 Mindstorm Kits (Set of Components)
- Size of robot: no restrictions
- Using transverse line that is used in Lab 5

4.3 CONSTRAINTS

➔ Please refer to the Constraints Document

4.4 USER FUNCTIONS

(*Can the user interact with this device (a) before it operates, (b) during operations? Is there an interface that the user will have access to for operating the device? Is this usable during the device operation? Do you set it up in a "batch" mode? – in terms of subtasks, this might be more important..)*

4.5 OPERATING ENVIRONMENT

(*Where will the device operate? What is the composition of the competition surface? Will this have an effect on the performance of the device in its navigation? Could this affect locate itself? What about ambient lighting? External sounds? Are there any restrictions due to this? What about the temperature environment, external effects, etc.? etc*.)

- Floor size: See Figure 1 of the Design Project Specifications; 12X12 floor size.
- Surface: Hardwood, same used in the labs
- Ambient lighting: Lots of light from the windows, could change the reading of the color sensor.
- Blocks are made of different colored styrofoam

4.6 PERFORMANCE

(*Minimal performance requirements, e.g. response time to a command, how long must it operate for, how far will it have to travel, etc. Some of*

this will have been covered in the SCOPE and CONSTRAINTS sections and repetition may not be good – much better to reference the other section – that way changes only need to be made in one place.)

Operation time: See *Scope*
Travel distance:

5. COMPATIBILITY

5.1 COMPONENT RE-USE

(*Are you allowed to use existing components? (in a real design this might involve an extra cost), e.g. those developed in the labs? Is there existing software that can be leveraged? What else?)*

Hardware: component used in Traversing a Zip Line Lab (Lab 5)
Software: Any relevant codes from the previous labs can be used
A MakerBot Replicator 2 rapid prototyping machine is available for fabricating parts if needed

5.2 COMPATIBILITY WITH THIRD PART PRODUCTS

(*Does the system have to interface with/connect to devices or components from suppliers other than Lego? What about software and software support?.Does the client specification mandate particular products to be used?)*

Need special permission to use other material than Lego kit

6. GLOSSARY OF TERMS

N/A

Note that this document should be reviewed with the "Clients" and should be developed in conjunction with them.