Requirements Document

Project:

Task: To construct an autonomous robot that navigates to its opponents specified area in search for a specific colored block through a 12’x12’ enclosed area filled with randomly placed obstacles and then to deposit the block on a specific square area 1’x1’ in under the constraint time.

(identify the task in some way – on a big project there may be subtasks, each with its own requirements document)

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Author: Daniele Bercovici

1.0 TABLE OF CONTENTS (This will be set up at the end and allows a reader to find his/her way through the document relatively easily)

2.0 CAPABILITIES

2.1 PURPOSE

The robot will be placed and started in one of the four corners (labeled X1-X4) with a random orientation angle. The robot will receive a wifi message containing 13 integers indicating the starting corner number, the parameters of the location of Home zone, the location of its opponents Home zone, the location of the destination for the captured flag, an integer [1,5] indicating the color of the robot’s Home flag and the color of the opponent’s Home flag. The robot will then localize to the grid in under 30 seconds and navigate to the opponent’s Home area avoiding the randomly placed obstacles. It searches for the flag (colored Styrofoam block) with sensors identifying it by shape, color and potential weight. The robot retrieves the flag (means to be determined) and returns the flag to the designated square within a prescribed time to be determined after lab 5.

(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 pallets and moving them to a designated drop off area.)

2.2 SCOPE

The size of the enclosed area is 12’x12’

The size of Home and opponents Home zone is 2’x3’

The size of the designated square is 1’x1’

The size of the flag is 10x10x10cm

There is a time limit for localization of 30 seconds or less

There is a time limit for the whole task of 5 minutes but to be confirmed after lab 5

There is 2 rounds to the competition, of a total of 4 runs per robot, at least 1 out of the 4 must pass all capabilities in order to be successful.

(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;…, Also, is this a one-shot operation or is it the prototype for a future design?)

2.3 CONSTRAINTS

(Has the client imposed any constraints on the design? Often these might be cost or the need to use a particular set or subset of components. There could be limits on size and weight. Are these given or implied by other parts of the client specifications, What about power requirements and operating time? You need to determine the basic parameters of the system and then look for any limits – e.g., mechanical systems, electrical systems, software systems, processor limitations, etc. – a first constraint from the user is that you are only allowed 3 Lego systems, what other limits or constraints might there be?)

2.4 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..)

2.5 OPERATING ENVIRONMENT

The robot will be on a nine 4’x4’ hardwood-covered metal panels locked together with grid marks similar to the ones in the labs. The robot will be operating on the second floor of Trottier where there are large windows. The amount of sunlight will affect the readings of the sensors. There will be more noise and therefore the calibration of the robot sensors must be prepared for that amount of light as well as the possibility of shadows disrupting the readings.

(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.)

2.6 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.)

3.0 COMPATIBILITY

3.1 COMPONENT RE-USE

The software and hardware components from the all the labs can be re-used. As well as the different tests that were used in the labs can be repeated.

( 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?)

3.2 COMPATIBILITY WITH THIRD PART PRODUCTS

A maximum of three Mindstorms kits can be used. Material other than from the Mindstorms kits must be approved by instructors. The device must connect to the wifi.

(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?)

4.0 GLOSSARY OF TERMS

(Define all the terms used in the document – especially if they are not in common usage or not expected to be understood by all the members of the team. This is intended to try to avoid misunderstandings between team members and between the team and the client)

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