THE REQUIREMENTS DOCUMENT

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. These can be modified in your version but only by adding extra sections. The sections given MUST be completed. Once this document is completed, you 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, you need to go back to the document and the client and clarify the issue and update the document appropriately. This is a living document.

Requirements Document

Project: (*enter project name here)*

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

Document Version Number: *(set up a numbering scheme so that you can track versions of the document)*

Date:

Author:

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 basic purpose of this project is to construct an autonomous robot capable of locating, grasping, carrying and placing an optical beacon, while navigating within an enclosed area populated with known obstacles placed at restricted locations within the enclosure. The task of the robot is to play a version of “Capture the Flag” with a single opponent where the beacon serves as the flag. Upon receiving instructions on Bluetooth radio, the robot will assume the role of either defender or attacker and proceed according to its role. If the role assigned is attacker, the robot proceeds to search for the flag, capture it, and place it at a location specified in the instructions received. Otherwise, if the role assigned is defender, then the robot proceeds to the flag location specified in the instructions received, captures the flag, and places it in an arbitrary location within the enclosure (usually chosen to make it difficult for the attacker to find).

(*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 hem to a designated drop off area.)*

2.2 SCOPE

Range of Capabilities

* Robot will operate on a 12x12 field comprising of nine 4’x4’ hardwood-covered metal panels that lock together. The surface of each panel is marked with a 4’x4’ grid that aligns precisely with adjacent panels. These are intended for navigational purposes, covered in the previous labs.
* The robot will be placed in one of the 4 corners shown, at a random position and orientation within the corresponding tiles.
* This will be a onetime operation.
* The robot will be programmed to operate in a 3D environment, whereby it can successfully place and retrieve the object, regardless of its position inside the field.

Limitations

* Budget issues: Large proportions of the budget were taken up by the initial mechanical design as well as the considerable changes which were made as the project moved ahead. High cost of disposable batteries led to the purchase of rechargeable batteries.
* Time Limitations: Each team will be restricted to 5 minutes to complete the specified tasks.

(*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

Hardware/Design Constraints

Software Constrains

User/Client Constraints

Time 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

(*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

( *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

(*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)*