REQUIREMENTS DOCUMENT

Project: ECSE 211 Final Design Project – Team 6
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[14/10/2017] Frederic Cyr: set up the format of the document.
[16/10/2017] Alex Hale: added content from project specifications; changed version system to WEEK.EDIT (e.g. it is currently week1, edit 2 => 1.2).
[22/10/2017] Alex Hale: transferred to Word document for easier formatting; minor revisions
[30/10/2017] Alex Hale: resolved Scope TODOs

1.0 TABLE OF CONTENTS

2.0 CAPABILITIES

2.1 PURPOSE

Create an autonomous vehicle capable of navigating around an obstacle course, crossing a zip line, finding and recognizing flags, and returning them to a specified zone.

2.2 SCOPE

- size of area: 12x12 grid of squares with a 30.48cm side length
- capabilities of robot:
  - receive parameters from game control server
  - localize in its starting square
  - navigate around the field
  - traverse a zipline
  - find a block of a particular colour in a particular zone
  - beep
  - return to the starting zone
- time limit
  - 30 seconds to localize
  - 7 minutes to complete the run
- tolerances on robot capabilities

- navigate with enough accuracy to mount the zip line
- differentiate between colours of blocks
  - sensors will be calibrated to ensure adequate accuracy

2.3 CONSTRAINTS

See Constraints Document.

2.4 USER FUNCTIONS

The user may interact with the device before it operates, but once the robot is given to the TA to be placed on the field, the robot must act entirely autonomously. The user can operate the device using the keypad on the front of the brick.

2.5 OPERATING ENVIRONMENT

The robot will be operating on the playing field, which is a 12x12 grid of squares, each with side length 30.48cm. The surface of the field is beige wood, with black grid lines separating each square to help the robot navigate. The lighting of the environment will be variable, so the performance of the light sensor will have to be carefully tested. The competition will be held indoors, so any other external environmental factors will be negligible.

2.6 PERFORMANCE

Since user input only occurs before the start of the trial, response time to commands need only be fast enough to make testing easy for the user. Other time limits and travel requirements are outlined in Section 2.2 - Scope. The travel speed of the robot has no explicit requirements, but faster is better - the faster you can go without making errors, the more likely you are to win against the opposing robot.

3.0 COMPATIBILITY

3.1 COMPONENT REUSE

Any hardware or software created during the Research and Development phase (lab 1 through 5) can be reused. However, it will be important to ensure that those products do not pose restrictions on the robot. For example, all of the hardware designs in the labs required fewer sensors than will be required on the final robot. The most important existing components that will be used are the LEGO Mindstorms EV3 set and the leJOS API.

3.2 COMPATIBILITY WITH THIRD PARTY PRODUCTS

The robot hardware will be entirely made up of LEGO parts, so the system will not have to interface with components from other suppliers. The robot's sensors must be calibrated for the wooden floor and coloured blocks that will be part of the competition, both of which will be made available before the competition. Some custom structural pieces can be 3D printed specifically for the robot if needed.

4.0 GLOSSARY OF TERMS

None required.