

McGILL UNIVERSITY

ECSE 211: FINAL DESIGN PROJECT

Constraints Document

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1 SUMMARY

This document is intended to list all the constraints on the design solution. These can involve the environmental constraints that might be specified in the original design description or by the client in meetings, e.g. the operating environment of the device. Note, again, that the information here is only given if it does not already exist in one of the other documents. The document might also point to time constraints for the project and due to the resources. There are also constraints due to the systems available and these come out of the Systems Document. Finally, the budget provides a major constraint on the solution.

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2 EDIT HISTORY

Project: ECSE 211 Design Project

2.1 Document Version Number

- 0.0.1: Version presented to Prof. Lowther on the 22/02/2017
- 0.0.2: Version presented to Prof. Lowther on the 06/03/2017

2.2 Edit History

1. 21/02/2017 (Ali) Create basic document
2. 05/03/2017 (Philippe) Reformatted the document in LaTeX.

3 ENVIRONMENTAL ISSUES

The environment that the competition takes place in presents challenges of its that need to be accounted for in the robots design. The expected problems are as follows: Ambient light affecting the color values measured by the light sensor Variation in the color of the ground will generate false positives Obstacles placed at certain angles and oddly shaped objects will interfere with the ultrasonic readings and generate false readings The friction between the wheels and ground will not be the same as during testing. If the coefficient of friction is significantly lower, the robots wheels will slip very often and throw off odometry.

4 HARDWARE CONSTRAINTS

The major problem created by the hardware is the flex present in the join between lego pieces. The flex can cause errors in the measurements of physical constants in the robots chassis, such as the wheel base.

The second most significant limitation is imposed by the project. The robot must be able to fit in a single 30cm by 30cm tile. This places limitation on how many individual components, such as motors, we can use.

5 SOFTWARE CONSTRAINTS

The robot is programmed using Java, Eclipse and LeJOS. We possess all the same constraints that java possesses. We cant program the robot without the LeJOS library and Java. However, we do have the option regarding our IDE. We will use Eclipse for the convenience afforded by the tight integration with LeJOS plugin.

Java and the LeJOS library allow us to interact with the brick, the motors, and the sensors using high-level abstractions. The most important abstractions are the SampleProvider and RegulatedMotor classes.

Using the RegulatedMotor class allows us to issue commands such as rotate() and forward() to control the motor without blocking the codes logic. This affords the capability of interacting with the sensor, and performing logic without the motors requiring attention.

However, the major drawback of the RegulatedMotor class is the inability to achieve extremely high speeds. The power to the motor is tightly regulated to ensure a constant RPM. In many scenarios, such as launching a ball, this undesirable and thus we have to use a different abstraction. Fortunately, the LeJOS library provides with the UnregulatedMotor class which does exactly what we need.

6 AVAILABILITY OF RESOURCES

The most important resource in this project is time. From the writing of this document, the project must be completed in 6 weeks. However, many milestones have to be met earlier in the projects life.

In order for the project to be successful, meetings have to be held to ensure communication and cohesion between the different teams. However, not everyone is available due to classes and other commitments. However, everyone is free during the time that DPM would normally take place, hence weve decided to have meetings during that time. The whole team will meet once a week to ensure things are going smoothly, and the software team will meet once a week to validate merge requests and evaluate test data.

7 BUDGET

The project delivery date is set to April 5th of 2017. We have approximately 6 weeks from the writing of this document to finish this project.

In terms of man hours, we have 9 hours per person per week. In a team of 6 people this amounts to a total of 324 man hours. We have only 324 man hours to use to finish the entire project. The most ideal use of our time will be 54 hours per week, hence, while the amount of hours demanded of each member will vary every week, we will only consume a total of 54 hours per week.

The role of the tester is minimal during the initial stages of the project and hence, to minimize idle time, the test will work as a software developer.

8 GLOSSARY OF TERMS