**CONSTRAINT DOCUMENT**

Project: Design an Autonomous Robot

Task: To design an autonomous robot that is capable of navigating to a predetermined position while avoiding obstacles and firing objects at two targets. This is to be done in the shortest time possible.

Document Version Number: 2.0

Date: March 13th, 2015

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# ENVIRONMENTAL ISSUES

Environmental issues that will affect the operation of the robot are ambient noise, ambient light conditions and the type of floor used in the competition.

1. Ambient Noise

Because the ultrasonic sensor’s reading is based on sounding technology, background noise such as chatter, cheering or pings from other robot can affect the accuracy of the sensor.

1. Ambient Light

This has an impact on the operation of light sensor. Light sensor will get different readings from being in a brightly lit room than being in a dimly lit room.

1. Floor

The floor that will be used in the day of the competition may be slightly damaged during previous labs. For example, some grid lines, which will be used by the light sensor, are faded, making the sensor unable to detect those lines.

# HARDWARE CONSTRAINTS

This project will require, in addition to Lego Mindstorm kit, the use of two sensors – ultrasonic sensor and light sensor and they have innate disadvantages. Other factors also have an impact.

1. Lego Mindstorm kit

For this project, only 3 Mindstorm kits will be available to each team. Therefore, there is a limitation to the size of the robot.

1. Ultrasonic sensor

This sensor is subject to sound noise and has previously been proven to be an inaccurate source of detection. This can cause a problem while measuring distances from the robot.

1. Light sensor

The light value that it detects is dependent on the ambient light condition.

1. Wheels

The wheels used will be constantly in contact with the floor through the project. This will lead to friction and slipping, which will affect the NXT’s navigation’s accuracy.

1. Batteries

Batteries play a big impact on the performance of the robot. It is necessary to assure that the team uses new batteries during the day of competition.

# SOFTWARE CONSTRAINTS

The project is going to use Lego Mindstorm API “Lejos” to control the robot. Due to the fact that Lejos is an open-source software, there are concerns about its product development.

# AVAILABILITY OF RESOURCES

(Refer to the Capabilities document)

# BUDGET

In the scope of this project, we have 7 weeks to complete this project, and each member has 9 hours every week. This totals to 63 hours per member, and 378 total for the project maximum to complete the project.

Financial constraint also limits the quality of this project. Each member is willing to donate 10$. The batteries and the final poster are the main areas where it will be spent. Some small accessories for the robot which the Lego kit doesn’t include will also need a budget.

# GLOSSARY OF TERMS

N/A