# CMPT 433 Project

## Proposal


Team SFU Mindstorm

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# System Description

Our system will be composed of an NXT mindstorm lego set and the BeagleBone Black. We will be using the BeagleBone Black as the controller to communicate with the lego robot via bluetooth. We will utilize the motors for movement and the ultrasonic sensor for detecting distances. With these components, our lego robot will autonomously move around the area/room and send back information, such as the distances to walls and objects.

The NXT mindstorm robot will use the sonar attachment to read how far the robot is from its surroundings, using data the robot gathers as it traverses the area we will create a map of the surrounding area. With the distance measurements and other data we gather, our system will be able to display a map on a webpage. With the completed map users will be able to pick a location on the map for the robot to travel to, the robot will travel to the location using the shortest path.

Furthermore, users will be able to manipulate the robot using the joystick, alter its speed with the usage of potentiometer, and see how far the next object in front of the robot is on the 14 seg display on the BeagleBone Black. As for additional libraries and guides, we plan on using the bluetooth library as well as the NXT guide created by Fall 2014 CMPT 433 students found in the “Links and Resources” section on the course website.

# Project Timeline

## Iteration 1

- Assemble robot
- Set up and configure bluetooth
- Send simple movement commands to the NXT robot
- Receive data from NXT robot

For the first iteration, we will be focusing on building the lego robot, communicating with and receiving information from the Lego EV3 brick, and writing basic commands such as move motors. First, we will build the lego robot and make sure all components needed for this project work. Then, for the communication between devices, we will try and get the bluetooth configuration to function correctly.If the previous steps are successful, we will then start writing basic commands to test the success of the previous steps and ensure both the lego robot

and the BeagleBone Black devices are working as we expected for further coding and implementation of our project.

### Iteration 2

- Make a mapping system that the NXT robot uses to map its surrounding environment
- Design a system where the robot traverses the entire area efficiently
- Use map data to generate a web page displaying the map
- Use generated map to give coordinate for the robot to travel to
- Use the BeagleBone joystick to manually control robot and the potentiometer to manually increase motor speeds.

The goal of the second iteration is to get the mapping system working and the generation of a simple webpage that displays the mapped data. In continuation to the first iteration, we will continue to work on sending commands and receiving data from the NXT robot for mapping. We will also work on the code which involves algorithms and calculations of the NXT robots mapping procedure.

In terms of the minimal configuration that will let our system work, we would need to have the NXT robot built, have working bluetooth to send commands and receive information, and have a mapping system using the data from the NXT robots sonar readings.

In terms of the tasks that might be the most time consuming, we think that communication using bluetooth and the mapping configuration will be the most time consuming stages.

## Acceptance Criteria

The NXT robot can be placed in a simple closed environment with simple objects and it should begin to move around, mapping its environment. Using the Sonar attachment, the robot should be able to move around the room on it’s own, covering the entire environment and mapping out all the details. It should also output its results to a web page which contains the map generated by the robot's sonar data. The robot should also have the option to be controlled manually by the joystick and potentiometer of the BeagleBone Black. Finally once it has completed mapping the area it should be able to take a coordinate on the map and move to that position using the shortest path.

Users can use the system by performing the following steps

1. Place robot in simple closed environment with simple objects
2. Turn robot on to begin mapping
    a. Once robot is done mapping it will stop moving and will emit a short beep
3. Go to the generated web page to view map data
4. Manually control the robot with controls on the BBB or give a position on the map for the robot to travel to autonomously