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To: Dr Morton
From: Min Suk Kim
Subject: SE101 proposal

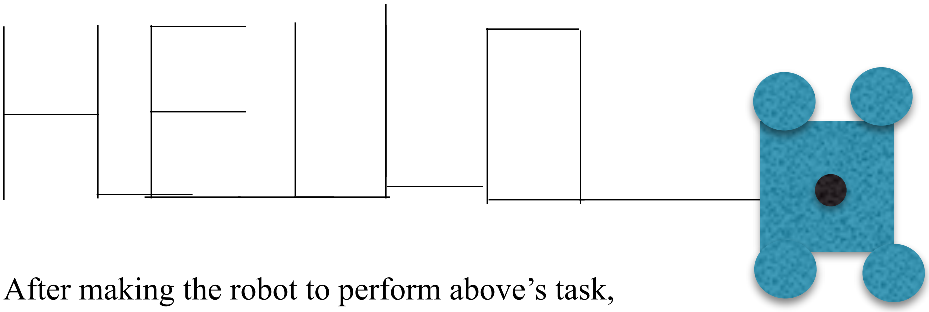
Proposal

The objective of this project is to create different functions for a given robot. For the functions to work, the existing hardware components will be used. The robot will be able to perform tasks, such as recognizing voices/images, and move in various directions. Other than moving in random directions, it will also be able to navigate through complex mazes. Also, the robot will be able to create drawings or write with a marker placed inside its pen port. Theses tasks of the robot will be done with a gamepad controller or by inputting commands into a computer that is wirelessly connected to the robot. We will use as many components in this robot as possible to create a perfect software for the robot.

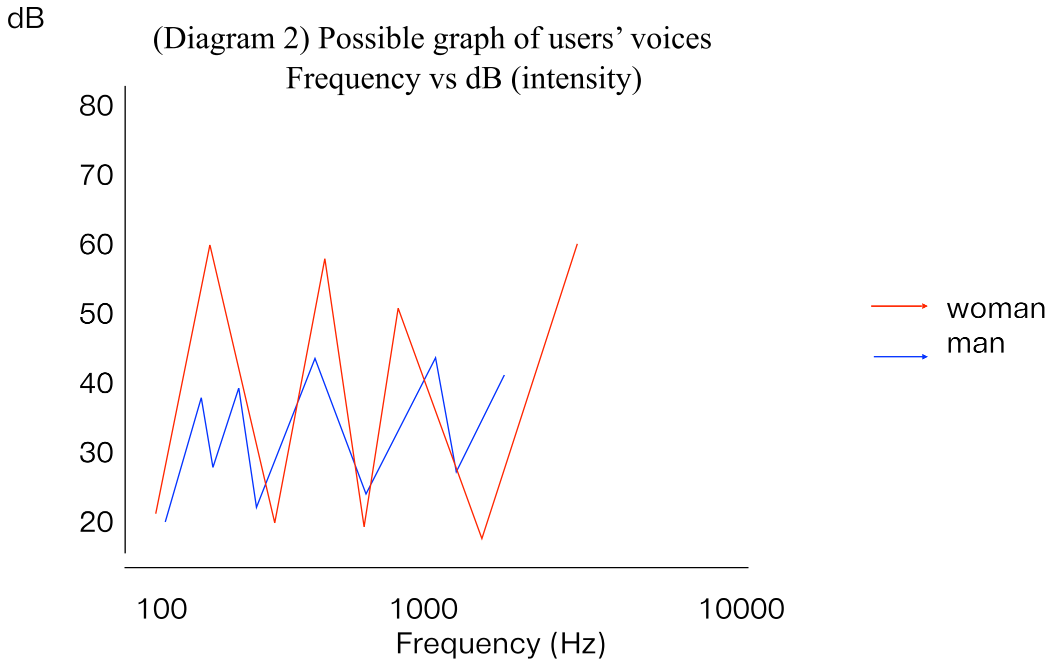
Features & Python Modules

The Scribbler robot contains many hardware components, such as flash light, camera, sensors, speakers , bicolour indicator LED lights and wheels which enable it to perform different actions [4]. Additionally, we will use devices such as a laptop and a phone for our team's convenience. By using the voice recognition function of this robot, we will make the robot to perform tasks with users' verbal commands. Also by using numpy.fft module, the robot can detect different tones and may classify them into genders [2]. "The Fast Fourier Transform (FFT) is one of the most important algorithms in signal processing and data analysis" [3]. This would enable the robot to identify users' tones by analyzing the graph of users' tones. The program will convert user's voices into frequencies and classify them depending on the user's gender. We can also make the robot do complex calculations, such as finding a probability by using pre-existing data, and also different calculations which involve complex calculations. In order for this to be done, we need to use a module, other than Myro. Calculation python module,such as math or math module would be necessary to perform this type of task [1].

(Diagram 1) Diagram of scribbler robot writing a word "Hello"
Alphabets are all connected, because the robot cannot detach a marker by itself.
starting position



After making the robot to perform above's task, we can work furthermore to make the robot move back to the original position by following the path of the line drawn with its line sensor located at the bottom, or by taking exactly the same path it took as it wrote the word.


(Diagram 2) Possible graph of users' voices
Frequency vs dB (intensity)

Design Challenges/Risks

It is very likely to face unexpected errors during the process of completing a project. Many possible errors may occur in both hardware and software systems. One of the possible errors may occur during the voice recognition process of the robot. When users put in their voices into the computer for robot to analyze, unnecessary background noises may interfere and we may end up having a wrong outcome. Another possible error may happen from the robot's motor. Poor condition of the motor may lead our robot to take the wrong path. With a bad motor, robot will never be able to perform any tasks which involve movements.

Time Estimate

We need to take a number of steps in order to complete the whole project. Our first major task is to plan which software system we are going to build. We also need to make a perfect algorithm for the plan we made. These tasks may take about 15 hours for a completion. Our next major step is to use the algorithm that we made and code a program so that the robot can interpret what we asked it to do. Since this type of task is the biggest task which should be done, it is required to put a big amount of time than any other tasks. In order to end up with a good, quality product, we must spend about 30 hours to complete this step. After making a good piece of a software for the robot, we must test the robot and make corrections, whenever the robot encounters any technical problems. This will probably take about 15 hours for a completion. It will take approximately 60 hours to complete the whole project.

References

[1] “9. Numeric and Mathematical Modules,” https://docs.python.org/2/library/math.html. Accessed October 1, 2014.

[2] “Discrete Fourier Transform (numpy.fft),” http://docs.scipy.org/doc/numpy/reference/routines.fft.html. Accessed October 1,2014.

[3] J. Vanderplas, “Understanding the FFT Algorithm,” http://jakevdp.github.io/blog/2013/08/28/understanding-the-fft/. Accessed October 1, 2014.

[4] “Myro Hardware,” http://wiki.roboteducation.org/Myro_Hardware. Accessed October 1, 2014.