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Arduino Echolocation Library

This senior design project focuses on GPS echolocation properties and is all about studying self-preservation techniques from an in-animate object’s perspective. This is especially useful when it comes to military tactics, considering that it can be used to determine where danger is located based on the surrounding sound. Additionally, using the echolocation library, Arduinos will not only be able to determine the location of danger, but they will also be able to locate beneficial environments based on sound. For example, if the Arduino identifies a sound that represents a resource that is essential for survival, it should pursue that sound, instead of fleeing. Overall, our goal is to create an entirely new library for Arduino that allows it to follow a sound or retreat from a sound based on how beneficial or threatening that sound is assumed to be, thus allowing new GPS properties to be based solely on acoustic intensity. This can be done through utilizing a sonar attachment for Arduino, which the library will use to determine the pattern of decibels and determine what object or environment is the source.

I have worked with Arduinos previously in the introductory C++ courses (CS 1001 and CS 1002) for computer science, so I have some background when it comes to programming in relation to Arduinos. I have also programmed other kinds of robots including Lego Mindstorms robots in my introductory engineering courses (ENED). Furthermore, I have extensive experience scripting in a variety of languages thanks to my co-op experiences. For my first two co-op rotations, I worked for a company called Etegent Technologies in which I scripted several internal tools. I learned shell script, VBScript, and JavaScript while working there as well as a few markup languages including xml and html. My third co-op rotation, I worked for 84.51 and wrote an application in Java using Spring framework that related to data engineering. It timed campaigns and took data from a database to determine if the campaigns were due in the upcoming days. I learned both Java and Spring framework from that co-op as well as bettering my communication skills since it was done remotely. For my final co-op, I worked for Bosch and continued scripting. I wrote an application in shell script that automated the process of running and monitoring jobs on Azure by taking in a json file.

I expect to apply all these skills while working on my senior design project. I will use my experience working with robots to debug logic errors and figure out electrical problems if the robot is not behaving the way our library intends. I will use my experience learning and programming with different languages to be able to figure out which functions need to be included in our library. I will also use the soft skills I’ve gained to work with my partner and communicated well as well as plan out the steps we need to take moving forward with this project. I will also apply the skills that I acquired working remotely since this class in asynchronous. Adaptation and virtual communication skills will be very valuable to our collaboration while pursuing this assignment.

The motivation behind this project is somewhat based in my previous experiences. I have history working with robots and programming them and I have really enjoyed it. One specific aspect of these robots that I have worked with in the past that piqued my interest is sonar. I worked in a division of Bosch that uses sonar and radar for self-driving cars, so this also furthered my interest. I then came up with the idea to build an Arduino library that could use sound to sense danger or safe-haven based on its ability to determine the source of the sound, and I determined that it seemed feasible to complete in two semesters.

My preliminary approach to this project is to start by acquiring the materials like the Arduino and the sonar attachment. We can then begin the process of creating the library and determining what functions will be included. The functions will be tested using the robot and sonar attachment. The satisfactory completion of the library will be determined with a demonstration. When the robot responds correctly to all sounds that it is tested with (ex. Water, verbal communication, loud crashes, etc.) then we will know that we have done a satisfactory job. However, if there are sounds the robot does not respond to or does not respond to in the correct manner, we will know that there is still work to be done on the library.