Arduino Echolocation Library

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Background and Goals:

Arduino is an open-source electronics platform based on easy-to-use software and hardware. Arduino boards are able to read or take in an input and turn it into an output. Our project focuses on one of it's many aspects, specifically it's GPS Echolocation property. We created a library to detect sound and classify the sound as either good/positive or bad/negative.

Our overall approach is to get the robot to move towards good sounds and away from bad sounds. We started by ensuring the robot could respond to sound. When it detected sound, the LED light would light up. The type of sound determined how bright the LED light would light up, signifying if the sound was positive or not. After getting the robot to determine sound and categorize them, we worked on movement.

Background and Goals:

Goals Statements:

- Create a library that determines the intensity and significance of any detected sounds
- Library initiates movement toward or away from identified sounds
- Library is accurate and passes all usability tests

Intellectual Merits

The echolocation library changes the way that robotics interact with the world by relying solely on sound to move.

This project enables the deaf and hearing-impaired community to have a greater awareness of their surroundings without having to modify their level of hearing with aids and/or cochlear implants.

This software has the potential to increase safety for military personal by alerting when danger may be nearby, and it can be uploaded to any arduino compatible machine that the military wishes to use.

Impacts

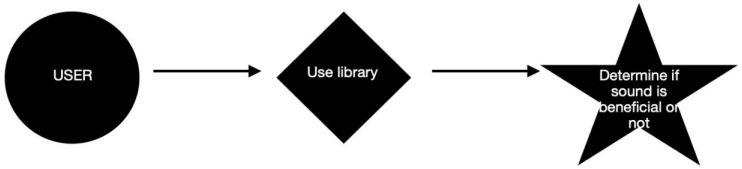
This project has the potential to impact society by:

- Providing more accessibility to the deaf community
- Giving society a means to use a ‘heightened sense of hearing’
- Increasing the effectiveness of military technology by assisting in locating and identifying the significance of various sounds

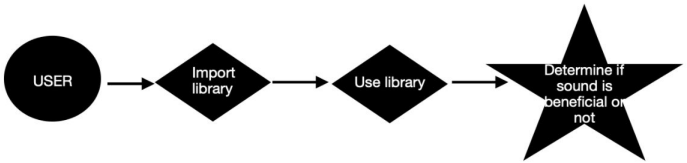
Design Specifications

Collaborate on this document

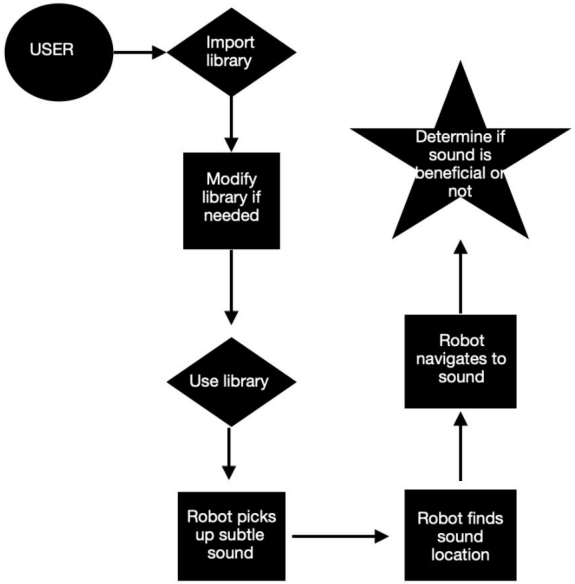
Design D0 -
In this diagram, the user, represented by a circle, uses the new library to reach the goal of determining whether or not the sound detected is positive or a notice for danger



Design D1:
This diagram shows the process the user will have to go through to reach the end goal of determine the type of sound/decibel heard.



Design D2:



Technologies

Hardware

The robot itself uses a combination of various technologies including a frame kit that comes with four dc motors, four wheels, and a frame to build on. The robot also utilizes two L289 motor drivers that each control input for two of the dc motors. It has a battery pack so that the robot can move freely without being connected to power and microphone attachments to detect sound. Lastly, it has an arduino circuit board which uses the programming from the library to move the robot in response to sound.

Software

The library is programmed in the arduino ide using c++ and contains a series of identified sounds that have been recorded. These sounds each have a frequency threshold, so that if new sounds that are detected are within the frequency threshold, they can be identified as a specific sound and categorized as either beneficial or dangerous.

Milestones

- Completed the necessary research to understand the Arduino IDE and debug it efficiently (December 2021)
- Have all the necessary materials (December 2021)
- Have a rough draft and testable library (February 2022)
- Complete debugging of code (March 2022)
- Robot executes every function in library (April)
- The robot reacts appropriately to different sound intensities (April)

Challenges

COSTS:

- Arduino compatible starter kit: $40
- Wheels and motors for circuit board: $20
- High sensitivity microphones for sensing sound: $10
- Motor drivers: $30
- Total costs: $100

TIME:

- Building the robot beforehand will take extra time, but the library itself should not take more time than what we have, as long as everything goes as planned
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PROFESSIONAL/TACTICAL:

- Technical expertise outside of our own knowledge should not be required for this project

ETHICAL/LEGAL

- This project to our knowledge does not have an ethical impact on anyone. There should also be no legal issues regarding our project

Challenges (Continued)

SECURITY:

- The development and testing of our code will be done offline, so security shouldn't be an issue

ENVIRONMENTAL:

- There are limitations where the robot can be used
- Some environments may harm it
- If the robot itself is equipped for such environments, the library may be used wherever needed

DIVERSITY/CULTURE

- Since the library will be based on how loud the noises are and what they represent instead of language, there shouldn't be any cultural constraints on our project

Results

list the results you have achieved so far, and discuss your progress and the finishing tasks to complete your demo and all final deliverables.

Your presentation should include some creative artifacts/elements to help present and promote your project. Appropriate artifacts include things such as logos, infographics, audio/videos, and links to websites.