# Arduino Echolocation Library

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# Project Purposes and Goals Statements

Project Purposes:

- Help users to locate sound and identify the significance of the sound
- Assist users on circumventing more effectively than the current status quo

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

# Project Abstract

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Our senior design project would focus on one of its many aspects, specifically it's GPS echolocation properties. There are a magnitude of reasons as to why this would be beneficial; from determining danger to acting as added on assistance for the visually impaired.  Arduino will not only be able to determine the location of danger, but they will also be able to locate beneficial environments based on sound. With the assistance of the echolocation library, we will create a new library that allows Arduino to identify a sound and determine its source by analyzing the sound of the decibels.

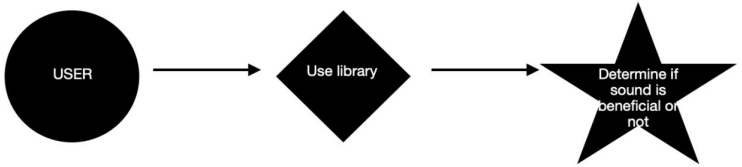
# User Stories

1. As a member of the military I want to be able to determine the location of danger so we may be able to retreat from any threat
2. As an environmental specialist, I want to be able to find beneficial environments so we may locate new resources that could be essential for survival
3. As a scientist I want to be able to distinguish positive decibels from negative, so we may know when something has gone awry

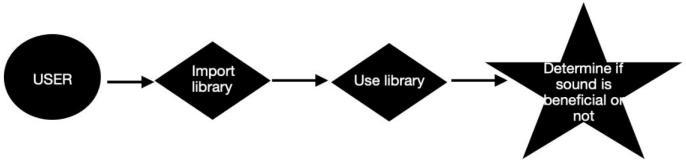
# Design Diagrams

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

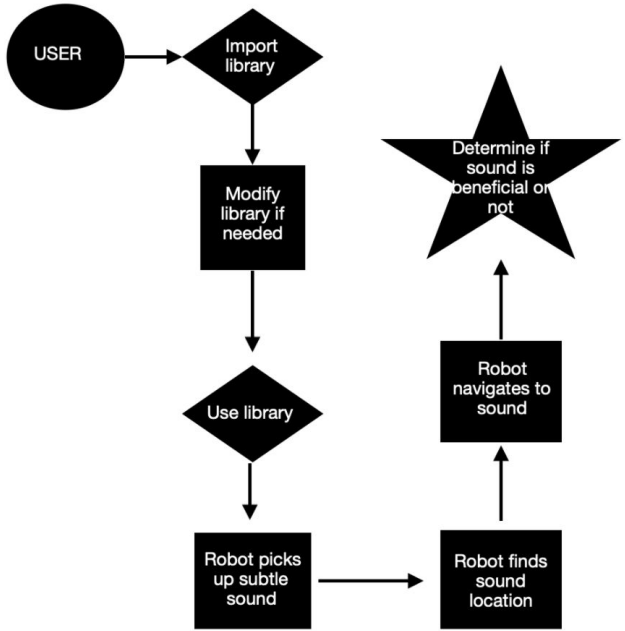



Design D1:
This diagram shows the process the user will have to go through to reach the end goal of determine the type of sound/decibel heard.




Design D2:

This diagram shows the process the user goes through to reach the end goal in more details. The user first imports the library and determines if they want to modify it or not. If modification is not needed, then the user simply uses the library as is. If there is sound the robot will go through the process of picking it up, determining its location, before finally, moving to said location. Once this is done, the robot will then determine wether the sound is beneficial or dangerous



# Major Project Constraints

**Economic Costs:**
- Arduino compatible starter kit: $40
- Wheels and motors for circuit board: $20
- High sensitivity microphones for sensing sound: $10
- Total costs: $70

**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 planne

**Scope:**
- Both team members agree on the scope of the project and understand what contributions need to be made

**Professional/Technical:**
- Technical expertise outside of our own knowledge should not be required for this project

**Ethical and Legal:**
- This project to my knowledge does not have an ethical impact on anyone. There should also be no legal issues regarding our project

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

# Major Project Constraints (Continued)

**Social:**

- The library may eventually be used as a public service for military use or to help people who are hard of hearing
- As of right now we have not drawn up plans to put it into production
- We will however been publishing the finished code

**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 and Cultural:**

- 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

# Project Progress

- The project is currently approximately 25% done
- We have an outline as to exactly what we would like to do
- We know what materials we need
- We have identified every goal and obstacle we may run into
- We also have a good idea of what our library needs to include

# Expected Accomplishments by DEC 2021

- Have all materials necessary (all robotic parts)
- Have a rough draft of the library which is testable
- Know what obstacles we might face with the code and be prepared to debug
- Complete the research necessary to understand the arduino IDE and be able to debug it efficiently

# Division of Work

1. Anne will obtain the Arduino and attachments needed to test the developed library
2. Marcellina will research the current sound functions and libraries for Arduino
3. Anne will specify the functionality of the robot prior to the development of the library
4. Marcellina will design the library by itemizing the functions it contains
5. Anne will investigate the quality of Arduino sound sensors to ensure there are no flaws
6. Anne will develop an original outline for the library and share it on github
7. Marcellina will document the test results
8. Both Anne and Marcellina will edit, debug, and develop the code
9. Anne will test the functions on the robot
10. Marcellina will validate the results of the tests

# Expected Demonstration at Exposition

- The robot will execute every function in the newly created library
- Different sounds will be implemented to determine the robots reaction
- The intensity of the sounds will be changed to determine how the robot and library react