Assistive Device To Detect and Aid Drowning Victims

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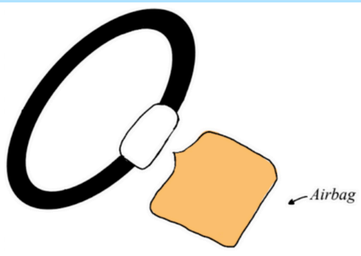
Problem

Victims of drowning enter what is known as the "Instinctive Drowning Response" ("Drowning Prevention," n.d.) which can make both calling for help and searching for visual indications of drowning difficult.

Engineering Goal

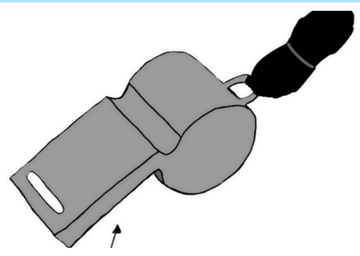
Develop an assistive device that will aid in drowning response.

3 Initial Designs



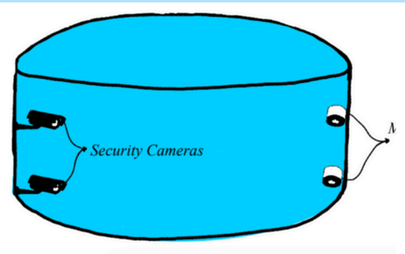
- Detects drowning
- Directly aids swimmer
- Requires the user to wear a bracelet

Figure 1. Drawing of initial design 1, a wearable bracelet.



- Aids lifeguard
- Indirectly aids swimmer
- Does not help with detection

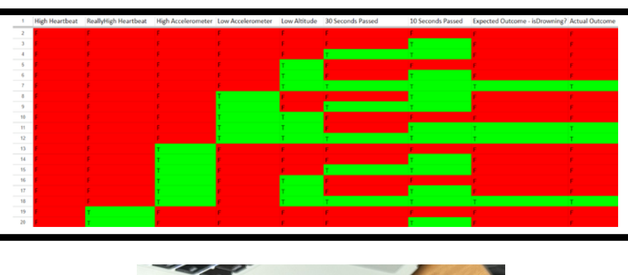
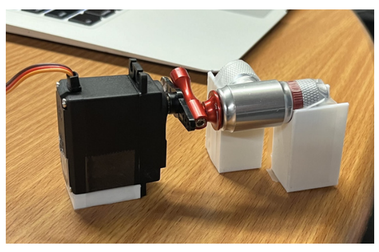
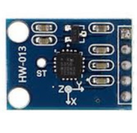
Figure 2. Drawing of initial design 2, an assistive lifeguard whistle.



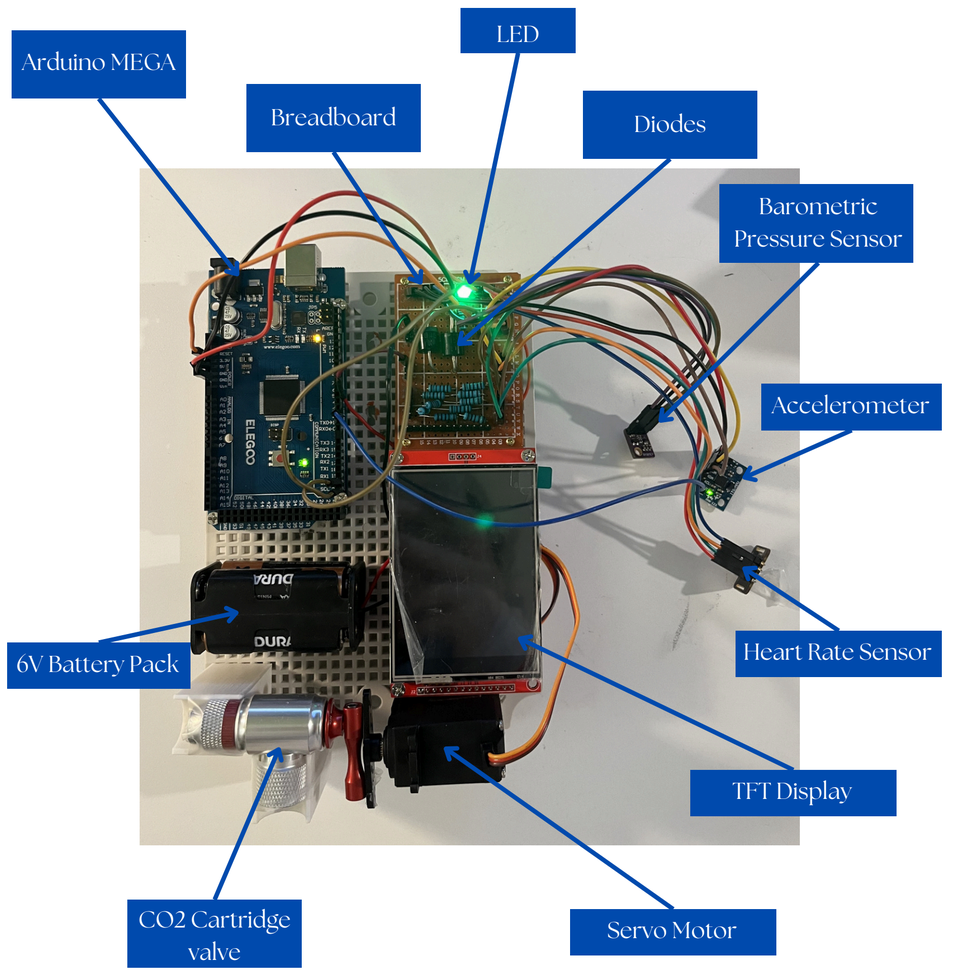
- Detects drowning
- Requires outside aid
- Complex
- Large learning curve

Figure 3. Drawing of initial design 3, a automatic drowning detection system with cameras.

Design Studies

Logic Testing	54 test cases to accurately test Arduino code logic. 
Servo Motor Tests	CAD design servo attachment constructed and tested to ensure correct motor. 
Sensor Testing	Each sensor was individually tested for its reliability in measuring its surroundings.   

Final Design



Process/ Methods

Logic

- Logic was written using Arduino IDE
- Receives input from sensors, and, using these inputes, decides whether or not the user is drowning

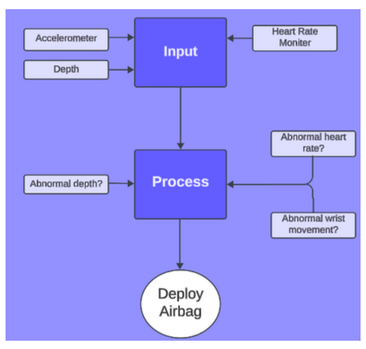


Figure 4. Visualization of Arduino Logic.

Hardware

- If sensors detect drowning, the Arduino turns the servo motor
- The servo motor turns the bike pump valve, relasing CO2 from the cartidge into the balloon

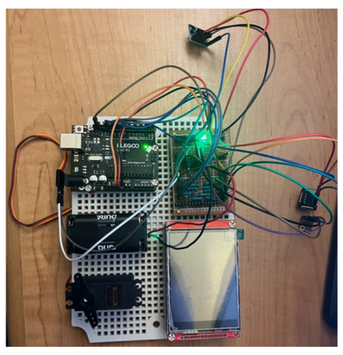


Figure 5. Picture of the hardware, with all devices attached.

Requirements

- The device shall be waterproof
- The device shall directly aid the swimmer in distress
- The device shall detect drowning within 30 seconds
- The materials used shall be non-toxic and non-allergenic
- The device shall not hinder the user's ability to swim
- The device shall be functional up to 2.5 meters
- The device shall work in all water areas. (pools, beaches, lakes, etc.)
- The device shall not cost more than $250 to build

Conclusions

- Is a viable solution in aiding drowning prevention
- Needs more sophisticated sensors to do more thorough testing of both device and logic

Future Work

- Implement the sensor system into a physical bracelet
- Develop a way to create drowning victim data
- Further develop logic based on more accurate data