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**Introduction**

Being deaf can make everyday interactions within the home harder to interpret and impossible to notice; since so many alarms or sensors alert us by making a noise, there has to be a way to detect when something interacts with the objects outside or inside the home, whether it may be a neighbor ringing a doorbell or fire that is growing by the second. The only way that a deaf person can be aware of each input is through a wristband that vibrates at different levels when such an input (that ranges in importance) interacts with the person.

**Problem Description**

Deaf people need a way to be informed when various alarms go off in their homes- without a sensor that depends on sound, they would have no idea if something is wrong within their household. While technologies exist that flash when their phone rings or when someone is at the door, the flashing would be of no help to a deaf person who is sleeping. In addition, there is no product that alerts a person in a different way for the many types of interactions that occur within the modern day household. There is similarly not a device that tells a person the severity of a situation that needs a response; for example, someone ringing the doorbell would elicit a small response whereas a fire or carbon monoxide would trigger a much greater response to the person.

**Proposed Solution**

We intend to make a wristband that communicates with all of the alarm systems in a home, such as smoke alarm, carbon monoxide detector, and intruder alarm for front and back doors. By attaching a small microcontroller to the speaker output of these various alarms, the wristband will receive a signal through wifi capabilities that will cause it to vibrate. In addition to vibrating, the wristband will display text indicating which alarm has been tripped. Because the device always needs to be active, it will have a rechargeable battery to ensure that it remains on. Batteries could be swapped out so that one battery will be completely charged at all time.

**Demonstrated Features**

1. We will build a wristband that will vibrate when a signal is triggered in the house. The level of the vibration will vary based on the severity of the alert that is being given. For example, the vibration will be much stronger to alert the wearer the fire alarm has been triggered in the middle of the night than it will be if the doorbell rings in the middle of the night.
2. There will be a small LCD screen on the wristband that will display which alarm has been tripped via scrolling text.
3. There will be two small LEDs that will be used to indicate the level of severity with the alarm. If the LEDs are red, the wearer is thought to be in danger, i.e. the fire alarm is going off. If the LEDs are blue, the alert is not a warning for danger, i.e. someone rang their doorbell.
4. The wristband would use batteries that are easy to swap out and can be recharged. This way, while one battery is being used the other can be fully recharged.
5. The wristband will be connected to wifi which will be used to signal what should be displayed on the LCD and what color the LEDs should be when an alarm is triggered.
6. The wristband will have a clear/reset button that the wearer can press in order to convey that they have received the warnings for the dangerous alarms that are triggered, such as fire or carbon monoxide warnings.
7. We will be building a sensor that will attach to the various alarms' circuits. It will be wifi enabled so that it can send a message to the wristband when the alarm it is connected to is tripped.

**Available Technologies**

* Red LED ($0.35)
	+ https://www.sparkfun.com/products/9590
* Blue LED ($0.50)
	+ https://www.sparkfun.com/products/10635
* WiFi Transmitter/Receiver ($5.92)
	+ https://www.amazon.com/433Mhz-Transmitter-Receiver-Link-Arduino/dp/B016V18KZ8/ref=pd\_lpo\_21\_tr\_t\_3?ie=UTF8&psc=1&refRID=WJ5GEP2RN9H41C0XWGR6
* Rechargeable Battery Cell ($1.95)
	+ <https://www.amazon.com/Battery-Li-Ion-Rechargeable-Button-LIR2032/dp/B006O3UG6A>
* Small LCD (~$5)
	+ <http://www.mouser.com/Optoelectronics/Displays/LCD-Displays/LCD-Numeric-Display-Modules/_/N-6j739>
* Buzzer (~$1)
	+ <http://www.digikey.com/product-search/en/audio-products/alarms-buzzers-and-sirens/720967?k=buzzer>
* Microprocessor
	+ <http://www.mouser.com/ProductDetail/Microchip-Technology/PIC32MX695F512H-80I-PT/?qs=icxrp76fIjAmnsG2FewlMA%3D%3D>
* Smoke Alarm (~$8, for testing)
	+ http://www.smokealert.net/ProductDetails.asp?ProductCode=RV-XWMG-MPAR&gclid=CI\_Cha3D9M8CFZCEaQodhHgMWw
* Micro USB Serial Connector (~$1 each)
	+ http://www.digikey.com/product-detail/en/molex-llc/0475900001/WM17144CT-ND/1832256
* Push Button (~$0.50)
	+ http://www.digikey.com/product-detail/en/e-switch/KS-01Q-01/EG4791-ND/2116270

**Engineering Content**

* Build a circuit that senses when alarms are triggered
* Program a board that will assess the severity of the alarm triggered and vibrate at a level strong enough to convey the severity
* Program LEDs to light up different colors depending on the severity of the alarm triggered
* Design a program that will display different warnings on the LCD depending on the alarm triggered
* Establish programmable alerts on the wristband that can be changed by the user based on attached device
* Enable wireless communication via wifi between the sensors and wristband
* Solder circuit elements to boards to ensure the sensors and wristbands are working correctly
* Serial connection for testing/debugging wristband and sensor



**Conclusions**

Our houses are full of commodities that we take for granted that we can use. These include various alarms such as smoke detectors, intruder alerts, and carbon monoxide detectors. Someone who is deaf would not be alerted to all of these sensors that use loud alarms to indicate danger. Our project intends to make a wristband that will notify the user to all of these issues through vibrations.