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ECE 120 Honors

Women's/General Safety Bracelet Final Project Report

- Introduction
  - Statement of Purpose:

    One of the most harmful crimes which has unfortunately become common in recent years is sexual assault/rape. Though it is a rampant crime in third-world countries, it is happening everywhere. Women, more than men, are taken on by force or taken advantage of in vulnerable situations. In some parts of the world, women are not even able to walk to places such as school or work without feeling a sense of danger. While some have handy smartphones to reach for to call for help, many do not. However, even a smartphone does not provide much help when one is caught in an unexpected situation. So, we propose that distributing our women's/general safety bracelet will be the solution to this problem. This bracelet will be discretely worn and when one perceives danger s/he can quickly send his or her location to emergency contacts to immediately receive help.

  - Features and Benefits:

    This safety bracelet will have two input signals to ensure that the user can signal the emergency response in more than one way. For example, if the user has the other hand available, she can press the button; if she does not, she can use a different method of input. Our first idea was to have the second input be a voice command. However, because our voice recognition device was faulty, we decided to make the second input a vibration, in the thought that by shaking just the hand with bracelet by hitting it against something, the emergency response can be triggered. The benefit of having these features is so that the emergency response does not get accidentally triggered and so that multiple inputs are available to trigger it.

- Design

- ○ System Overview:

   This semester we just created a proof-of-concept of our bracelet design. We wanted to focus on the digital logic and the voice recognition input this semester. Instead of the voice recognition module, we used a Piezo vibration sensor. Our project system consisted of an Arduino Mega, a Piezo vibration sensor, a button, a NOR chip, LEDs, and a siren.

- ○ Design Details:

   The NOR chip takes input from the Piezo vibration sensor and the button. We designed the logic so that it implements the OR function. If either input is detected, the emergency signal, or the LEDs and siren, go off. The NOR chip send a 0 or a 1 to the Arduino analog input, and the Arduino then outputs the LED flashes and siren sounds through pin 13.

- ○ Block Diagram:
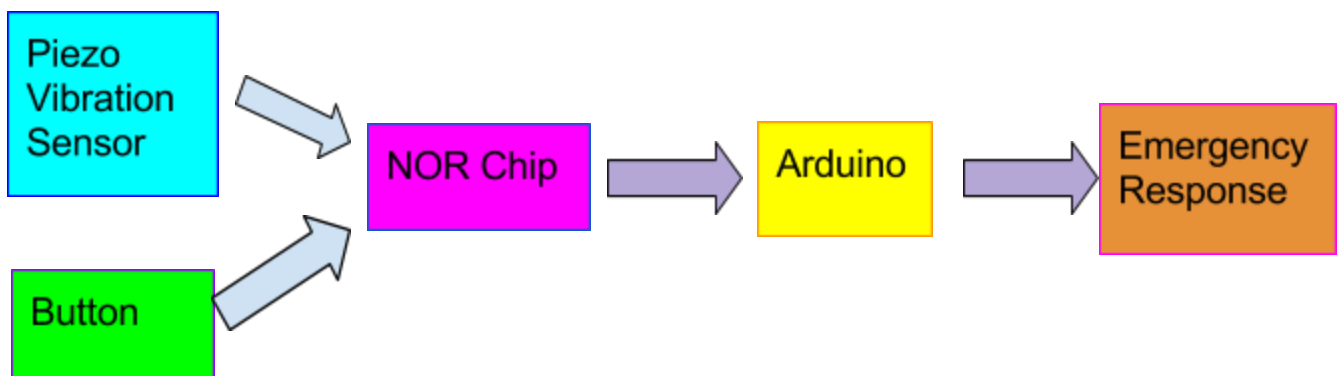
- ● Results

   - ○ Piezo Vibration Sensor:

      A small AC and large voltage (up to +/-90V) is created when the film moves. A simple resistor gets the voltage down to ADC levels. The active sensor area is shielded for improved RFI/EMI rejection. Rugged, flexible PVDF sensing element withstands high shock overload. Sensor has excellent linearity and dynamic range, and may be used for detecting either continuous vibration or impacts. Easy to set the threshold by using Arduino. We set the threshold at 480, just for demonstration purposes.

Frequency Response
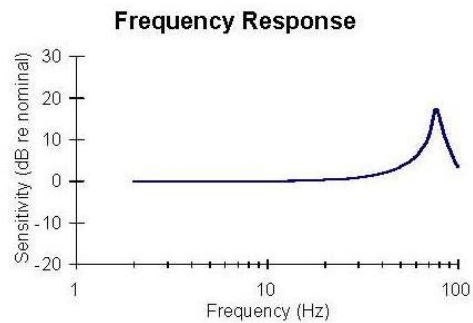
- Problems and Challenges
  - The biggest challenge we faced in this project was getting the Sparkfun Voice Recognition Shield 3.0 to work. The problem we were having was that the GUI software that came with the Shield, called VR Shield Commander, did not recognize the VR Shield device. We extensively searched for the solution online. Many other people had the same exact problem, but no solution was written in the forums. We also contacted the other Honors group who worked with this module, but the solutions that worked for them did not work for us. Because so many people are having the same issue with the device, we think it is a problem on the manufacturer's side. There might have been a work around, but we spent too many of our weekly hours trying to figure it out. It was also too late to order another one, wait for it to arrive, and incorporate it into our project. So, we opted to use the vibration sensor for this semester.

- Future Plans
  - Next semester, we will incorporate the voice recognition and work on the application which will go with the bracelet, specifically designing trigger sequences based on user input. We will also add the GPS+GSM module which will send the location of the user to an emergency contact as the emergency response. Once we have completed this, we will work on making the device compact enough to put on a bracelet.

References

http://www.final-yearproject.com/2011/09/gsm-gps-based-school-kids-tracking.html#.V-WfWSgrI2w

https://www.adafruit.com

https://www.sparkfun.com/products/retired/9753

http://www.wonderslist.com/10-countries-highest-rape-crime/

https://en.wikipedia.org/wiki/Sexual_violence_in_the_Democratic_Republic_of_the_Congo

www.rainn.org

http://www.unwomen.org/en/what-we-do/ending-violence-against-women/facts-and-figures

Appendix

```
int sensorPin = 0;    //Vibration Sensor Pin on analog 0
int ledPin = 12;
int sensorValue = A0;

void setup() {
  pinMode(ledPin, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  // read the value from the sensor:
  sensorValue = analogRead(sensorPin);

  Serial.println(sensorValue);
  delay(0);

  if (sensorValue > 480) {
    // turn LED on:
digitalWrite(ledPin, HIGH);
delay(50);
digitalWrite(ledPin, LOW);

  }
  else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```