SPECIAL ARDUINO UNIT

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CMPT 422 111 Professor Pablo Rivas | 27 November 2017

Date:11/27/2017
Time: 16:15:02
SER#:3852359234

Abstract

Welcome to the SAU or, Special Arduino Unit of the NYPD. To combat the sudden rise in crime, we have decided to invest in more modular methods of fighting for justice. After looking at the Arduino Uno and its wide range of capabilities, we believe we have created the perfect mobile polygraph unit. Through using our current knowledge of how the human body reacts to the act of lying along with the sensors an Arduino has at it's disposal, we are now ready to conduct the Mobile Polygraph Unit's (MPU) first city-wide beta test. Remember to give a full report of your findings and submit them to your superintendent.

Introduction

Currently, whenever officers or other law officials need to conduct a polygraph test, there is the need for advanced preparation. Polygraph tests require a wide array of sensors, monitors and other peripherals that require an extended amount of time to set up. Although this unit does not offer the full range of possible variables to consider when conducting a real polygraph test, the concept is incredibly adaptable. With the Arduino's full sensor kit options, including other sensors would be a simple matter of figuring out efficient circuitry, making the appropriate changes to the code that processes the input, and nearly any features the user might desire.

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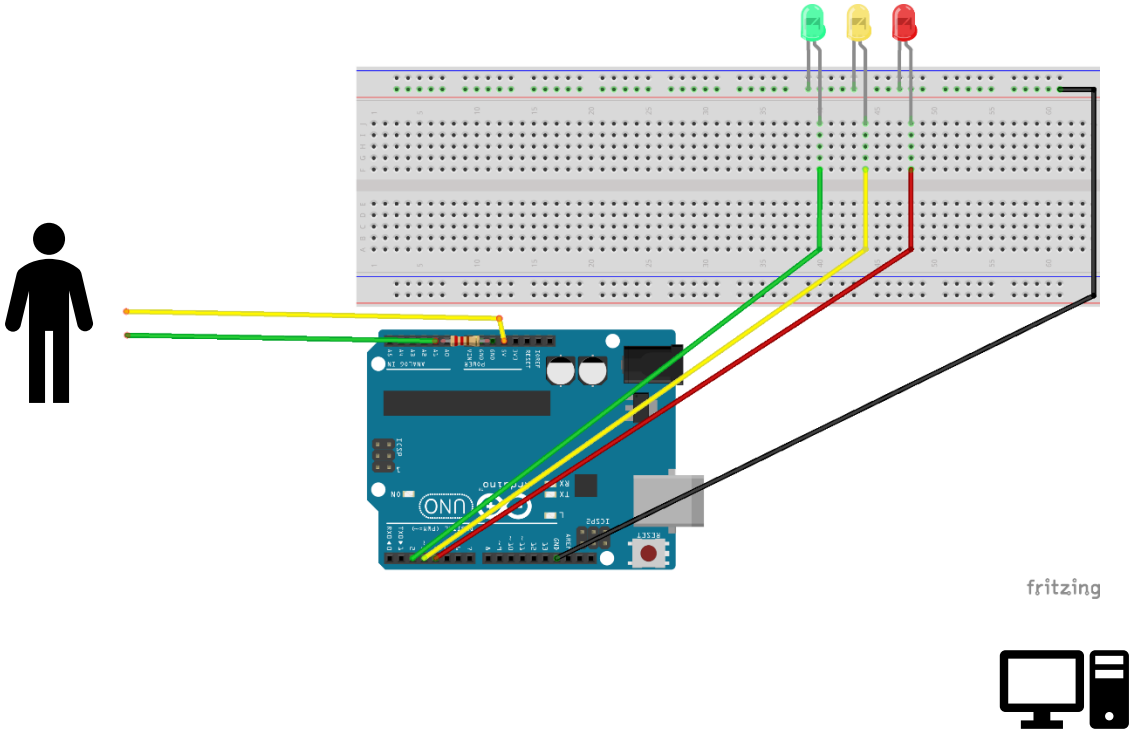
Methodology

This project will interface with two different environmental items: a participant and a monitor.

When the participant touches their two fingers to the exposed wires connected to the analog pins, they will send their what is essentially mini pulses of electricity. As it is generally known, humans are said to exude a very minuscule amount of electric energy. This energy chances depending on the emotions an individual is feeling. In this case, are attempting to track these changes by means of the exposed wires. When a chance occurs, the electric output will either increase or decrease by a noticeable amount. The Arduino is programmed to detect that amount and display it to the monitor or other device the Arduino is connected to. In the event that a monitor cannot be found, the lights will indicate the individuals output. When the green LED lights up, it might be that the individual is telling the truth. If the yellow or red LED's light up, there is a greater chance the individual is lying.



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Arduino Code

To account for different baselines, varying personalities and the varying degrees of stress different individuals may face, there is a need to account for variance. To do this, we must continuously set the thresholds for what determines a truth or a lie. I believe this is the most integral part of the entire project, as it dynamically accounts for differences between individuals.

```
int maxthreshold = 54;
int mediumthreshold = 25;
int lowthreshold = 15;
int offset = 10;
int arrayCounter = 0;
const int readAmount = 10; //If each LED reaction is delayed by half a second, lets wait 5 seconds to set our averages
int readings[readAmount];      // the readings from the analog inputs
void setup(){
  Serial.begin(9600);
  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
  digitalWrite(2, HIGH);
  delay(500);
  digitalWrite(3, HIGH);
  delay(500);
  digitalWrite(4, HIGH);
  delay(500);
}
void loop(){
    if (analogRead(A0) > maxthreshold - offset) {
      digitalWrite(4, HIGH);
  }
  else{
    digitalWrite(4, LOW);
  }
  if (analogRead(A0) > lowthreshold ){
   digitalWrite(2, HIGH);
  }
  else  {
    digitalWrite(2, LOW);
```

```
  }
  if (analogRead(A0) > mediumthreshold - offset) {
   digitalWrite(3, HIGH);
  }
  else{
   digitalWrite(3, LOW);
  }

  Serial.println(analogRead(A0));
  //delay(20);
  arrayCounter =arrayCounter + 1; //add to array counter
  readings[arrayCounter] = A0; //assign analog reading to array
  if(arrayCounter == 10){
   setMax(readings);
  }
}
/**
* On every `10th reading, reset the thresholds
*/
void setMax(int valueArray[])
{

  if(arrayCounter == readAmount){  //check if we reach 10 readings
    int max_v = 0;
    int min_v = 70;
    int total = 0;
    for(int i = 0; i < sizeof(readings); i++){
      if ( readings[i] > max_v ) //set max threshold if larger than previous entry
      {
        max_v = readings[i];
      }
      if( readings[i] < min_v ){ //set min threshold if smaller than previous entry
        min_v =  readings[i];
      }
      total = total + readings[i];
    }
    maxthreshold = max_v;
    lowthreshold = min_v;
    mediumthreshold = total/readAmount; //make the medium threshold a value inbetween
```

```
  arrayCounter =0;
 }
}
```

Challenges and Future Possibilities

While this project was an incredible learning experience, there are a few items that produced a bit of an issue. The main issue occurs during the live readings. If the individual shifts or is overly nervous, the threshold adjustment does not work as intended. Additionally, the individual must be incredibly still. If they move just slightly, it will throw off the entirety of the program.

Given more time, I would like to add additional sensors, such as a heartbeat monitor, moisture / humidity monitor, and possibly even something that could measure chest-constrictions for the monitoring of breathing.

REFERENCES

"Arduino Lie Detector." *Arduino Project Hub*, create.arduino.cc/projecthub/BuildItDR/arduino-lie-detector-a0b914.

Benedek, Mathias, and Christian Kaernbach. "A continuous measure of phasic electrodermal activity." *Journal of Neuroscience Methods*, Elsevier/North-Holland Biomedical Press, 30 June 2010, www.ncbi.nlm.nih.gov/pmc/articles/PMC2892750/.