

EECS 3215 Project  
Force Sensitive Shoe LED Array  
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**Youtube Video:** <https://www.youtube.com/watch?v=QFyuifWcGec>

### Introduction

The purpose of this project was to design a shoe insole that could monitor a user's walking and running style. The data gathered could be used to better customize shoes resulting in a decreased amount of stress exerted upon the body and provide more stable support with each step. This was accomplished using an Arduino Uno and multiple force sensitive resistors. The LEDs that can be seen here are representational of the type of data that could be collected while the user is walking with room for future development.

### Hardware with all schematics and explanation of design (all components and technique)

To build this prototype device we used an Arduino Uno microcontroller.

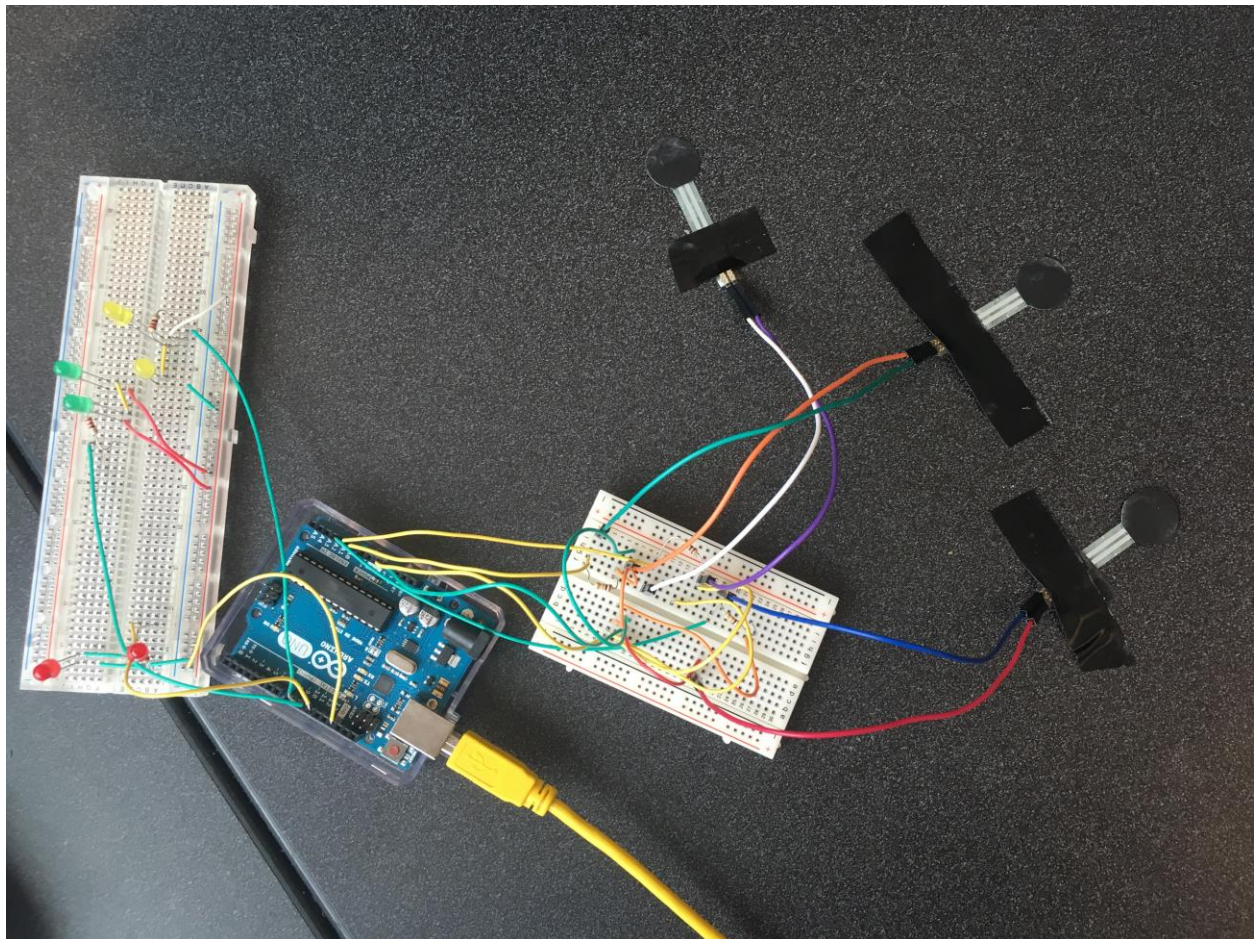


Fig 3. The Prototype

The LEDs were connected to ports ~9, ~10, ~11 of the Arduino. However the voltage and current coming out of these three powered ports is too high so we need to use resistors. On the other side, we had 3 FSRs

connected to port A0, A1, A2 and 5 volt. Port A0, A1, A2 are analogue read in ports. The FSRs additionally were also connected with resistors.

### Item List

1x Arduino Uno

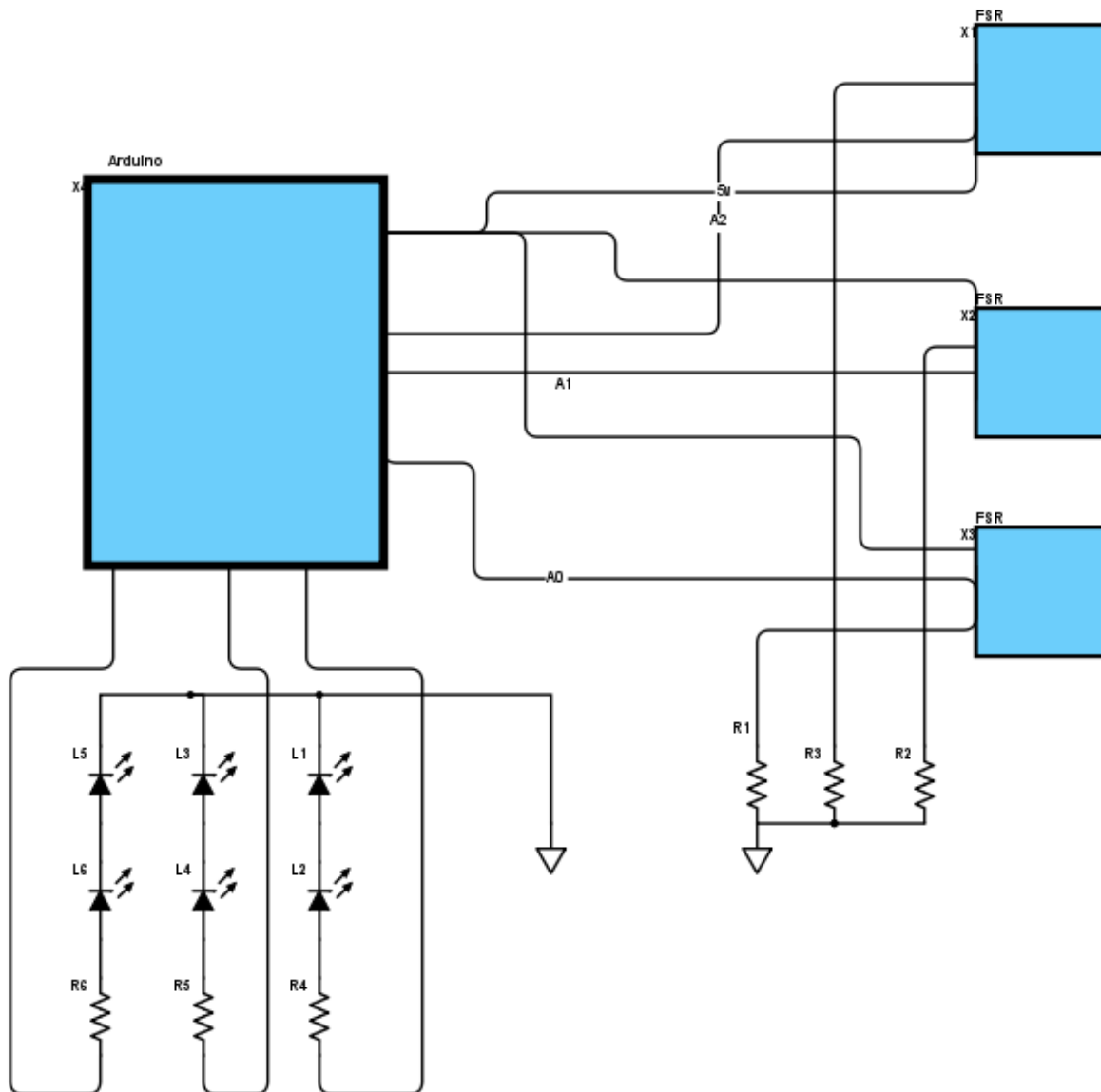
3x 10 K-Ohm Resistors (R1, R2, R3)

3 x 220 Ohm Resistors (R4, R5, R6)

3 x FSR 402 (R1, R2, R3 are mandatory for the use of the FSR)

2 x Breadboard (1 for the LED and 1 For the FSRs)

6x LEDS (but more can be used)



**Software with all program source and explanations**

The code below connects the FSR to the LEDs. It is very simple due to the arduino's easy ability to read in analog data. The Analog data is then transferred to the LEDs in real time.

----- Main Program -----

```
//Set Up LEDs on port ~9, ~10, ~11
```

```
int LED= 11;
```

```
int LED1 = 10;
```

```
int LED2 = 9;
```

```
//Setup serial to read in the data
```

```
void setup(void) {
```

```
  Serial.begin(9600);
```

```
}
```

```
//initializes LEDs pins for use
```

```
Void initializepins(void)
```

```
{
```

```
  pinMode(LED, OUTPUT);
```

```
  pinMode(LED1, OUTPUT);
```

```
  pinMode(LED2, OUTPUT);
```

```
}
```

```
//set up the FSRs
```

```
//Read from Analog input A0, A1, A2
```

```
int fsr = A0;
```

```
int fsr1 = A1;
```

```
int fsr2 = A2;
```

```
//Set up Read-In Values
```

```
int value;
```

```
int value1;
```

```
int value2;
```

```
//Set Up LED Out
```

```
int LEDb1;
```

```
int LEDb2;
```

```
int LEDb3;
```

```
//Set up FSRs and Output to LED
```

```
void loop(void) {
```

```
  value = analogRead(fsr);
```

```
  value1 = analogRead(fsr1);
```

```
  value2 = analogRead(fsr2);
```

```
  LEDb0 = map(value, 0, 1023, 0, 255);
```

```
  LEDb1 = map(value1, 0, 1023, 0, 255);
```

```
  LEDb2 = map(value2, 0, 1023, 0, 255);
```

```
analogWrite(LED, LEDb1);
analogWrite(LED1, LEDb2);
analogWrite(LED2, LEDb3);

//currently not used, but set to output to screen
//Serial.println(LEDb0, LEDb1, LEDb2);

delay(100);
}
----- End Program -----
```

## Conclusion

The next step is to add more FSRs and print this data to a file so that we can analyze it. If we find this data to be valuable we will design a sole that will go into a shoe and then run several tests with it on several people.

## Works Cited

We used this source as the main source on how to set up our code.

Vasilakis, M. (n.d.). *How to use a Force Sensitive Resistor - Arduino Tutorial*. Retrieved from [www.instructables.com: http://www.instructables.com/id/How-to-use-a-Force-Sensitive-Resistor-Arduino-Tuto/](http://www.instructables.com/id/How-to-use-a-Force-Sensitive-Resistor-Arduino-Tuto/)