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ECE 120/110 Honors Lab Section Final Report

1. Introduction

PinPoint is a tool to ease the process of finding seats in auditoriums and classrooms by providing a simple visual indicator for individuals at the back of the room using LEDs. It is designed to be easily upgraded and inexpensive to produce and install. The development team chose to focus on this issue in particular because of the difficulty involved in navigating crowded lecture halls. This project, even in its present state, can easily be deployed with a degree of social utility that will be developed further with analytics or more connectivity using either the XBee Wifi Module or Bluetooth platforms.

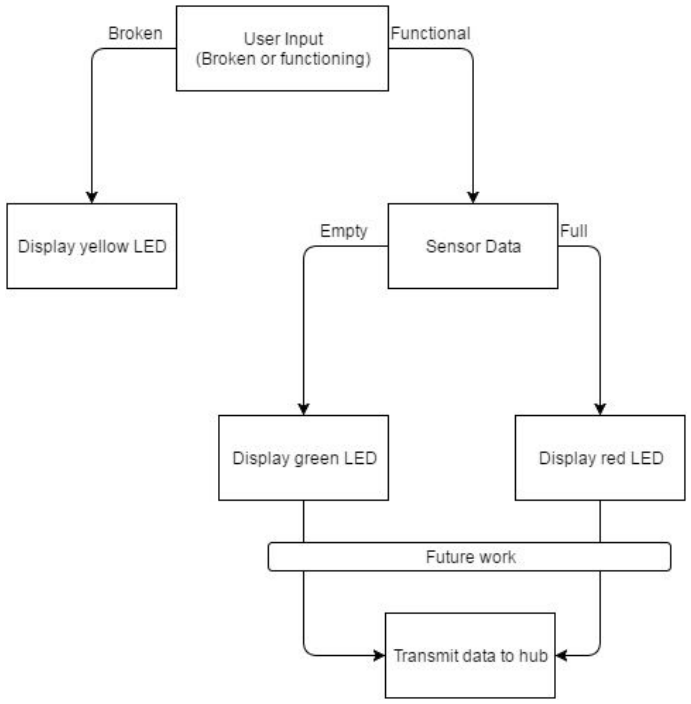
In its current state, the PinPoint device uses a pressure sensor (SEN-09376) [2] and a minimal transistor architecture to show one of three LEDs to indicate whether the seat is available or not. If PinPoint were to be produced for use in its current iteration, it could be produced cheaply, while if it were to be developed further, the amount of free space left on the Arduino in terms of both processing power and memory would allow each user to customize it for their own use cases.

2. Design

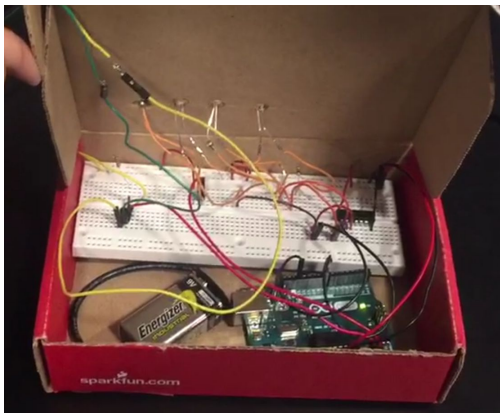
Truth Table

Pressure Sensor (P)	User Input (U)		Available (G)	In Use (R)	Broken (Y)
F	F		T	F	F
F	T		F	F	T
T	F		F	T	F
T	T		F	F	T

General Block Diagram:



Pictures:



Code: See Appendix A

3. Results

The PinPoint device uses a pressure sensor which has a variable resistance depending on the pressure placed upon it and is configured to activate even at low applied pressures, which ensures accuracy in the greatest number of applicable user postures. After testing with all members of the development team and a few external volunteers, the pressure sensor detected the user in all cases when it is placed on the seat and the majority of cases when it is placed on the back of the seat. The device itself is sturdy and in none of the cases did the soldered connections between components fail.

The pressure sensor's resistance increases with increased pressure, which ultimately leads to a greater potential difference across its terminals, which can be measured by the arduino, and the feedback loop acted accordingly.

4. Problems and Challenges

The most significant problem encountered while working on this project was that the Sparkfun x8266[1] Wi-Fi module/Shield burned out during the development process due to an issue with the voltage regulator. This resulted in a few weeks of troubleshooting

through both the software and hardware before realizing that the component was malfunctioning. As a result, the connectivity features outlined in the project proposal were not achievable in the time remaining during this semester. However, any additional work that members of the development team might choose to do would likely first involve integrating connectivity features, as detailed in the “Future Plans” section.

We also envision there being a problem with implementation of our prototype on a large scale due to cost concerns, which could delay our vision of seeing PinPoint being used in all lecture halls/large classrooms.

5. Future Plans

Our future plans mainly incorporate having to improve the functionality and deployment for large scale use of Pinpoint. Initially having planned on incorporating a wifi module which would be able to read input from the arduino and transmit it to a Mobile App or web browser, we would still try to focus on the same and attempt at having a working output, besides the LED for real time feedback and more useful data.

6. References

[1]S. ESP8266, S. Thing, S. Arduino, S. 3.3V, W. ESP8266, S. Board, S. Thing, F. I/O, A. R3, T. 2 and R. Kit, "SparkFun WiFi Shield - ESP8266 - WRL-13287 - SparkFun Electronics", *Sparkfun.com*, 2016. [Online]. Available: https://www.sparkfun.com/products/13287. [Accessed: 11- Dec- 2016].

[2]F. Square, F. 0.5", F. area), F. 100lbs., F. 25lbs., F. 1lb., F. 4.5", F. 2.2", A. R3, R. total), F. Small and B. (White), "Force Sensitive Resistor - Square - SEN-09376 - SparkFun Electronics", *Sparkfun.com*, 2016. [Online]. Available: https://www.sparkfun.com/products/9376. [Accessed: 11- Dec- 2016].

Appendix A: Arduino Code

```
bool prev;
bool broken;
void setup() {
  // put your setup code here, to run once:
  prev = false;
  broken = false;
  pinMode(A0,INPUT);//sensor
  pinMode(13,OUTPUT);//occupied
  pinMode(A1,INPUT);//button
  pinMode(8,OUTPUT);//broken
  Serial.begin(9600);
}
void loop() {
  // put your main code here, to run repeatedly:
  bool activated = analogRead(A0)>512;
  Serial.write(activated);
  if(!prev and digitalRead(A1)==1){
    prev = true;
    broken = !broken;
  }
  if(digitalRead(A1)==0){
    prev = false;
  }
  if(broken){
    digitalWrite(8,HIGH);
    digitalWrite(13,LOW);
  }
  else if(activated){
    digitalWrite(8,LOW);
    digitalWrite(13,HIGH);
  }else{
    digitalWrite(8,LOW);
    digitalWrite(13,LOW);
  }
  delay(40);
}
```