THE MAKERSPACE

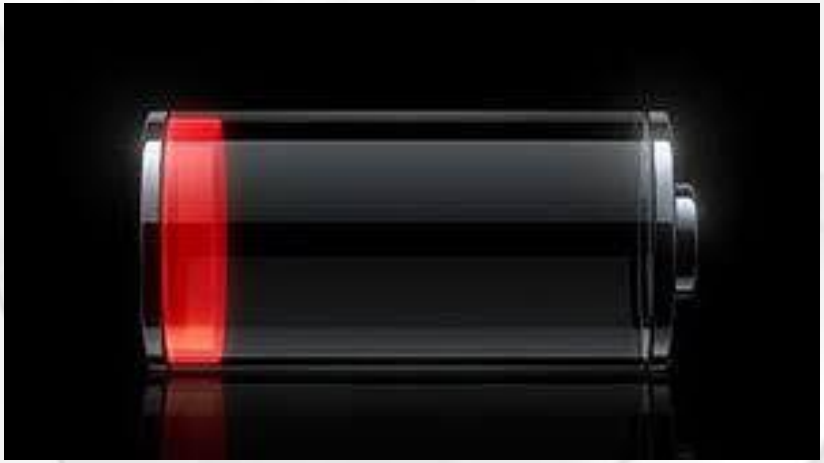
Cooper Union Summer STEM 2015
Prof. Victoria Bill
Prof. Yosef Skolnick

ENERGY KICKS

Kevin Shah, Nur Nibir, Kahlil Francis,
Joshua Boniuk

The Problem

- **The poor battery life of todays mobile devices**



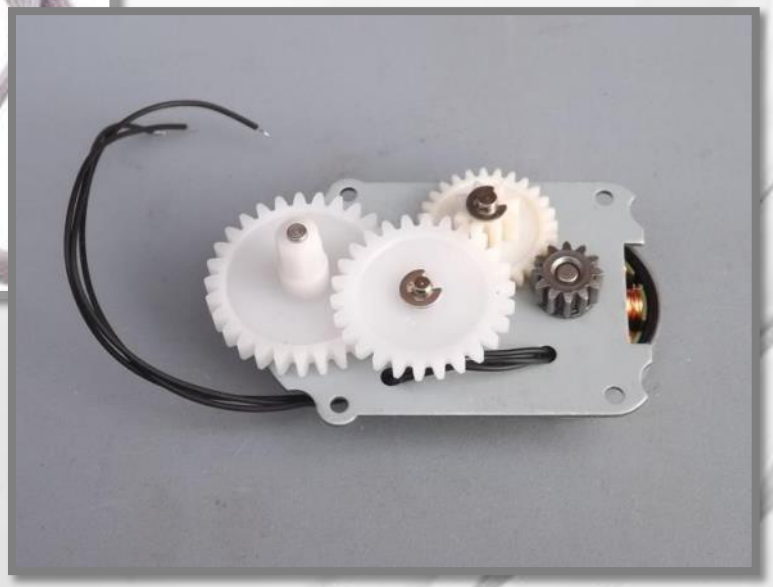
Background Information

- **The average person walks 1000 – 5000 steps a day**
- **New York City walkers log an average of 7000 – 8000 steps a day**

Mission

Charging electronic devices by harvesting kinetic energy

Inspiration



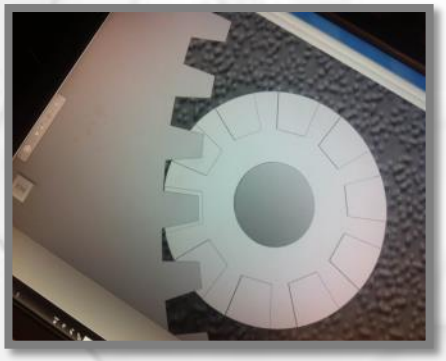
A Dynamo Torch was used as the model for the Sole Power shoes.

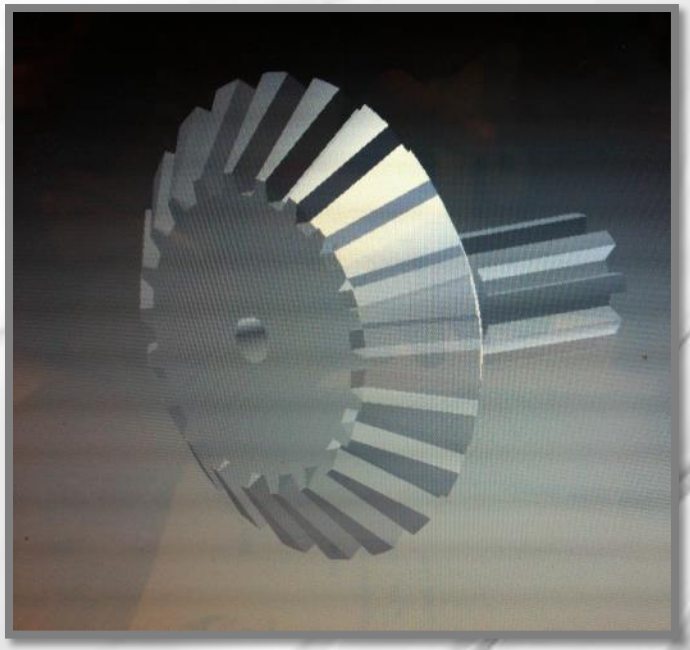
Physics

- Voltage = Current x Resistance
- Capacitance Formula - C=Q/V
- Voltage from phone charger - 5V
- Generator gives AC (Alternating Current)
- Phones require DC (Direct Current)

Process

AutoCAD Inventor





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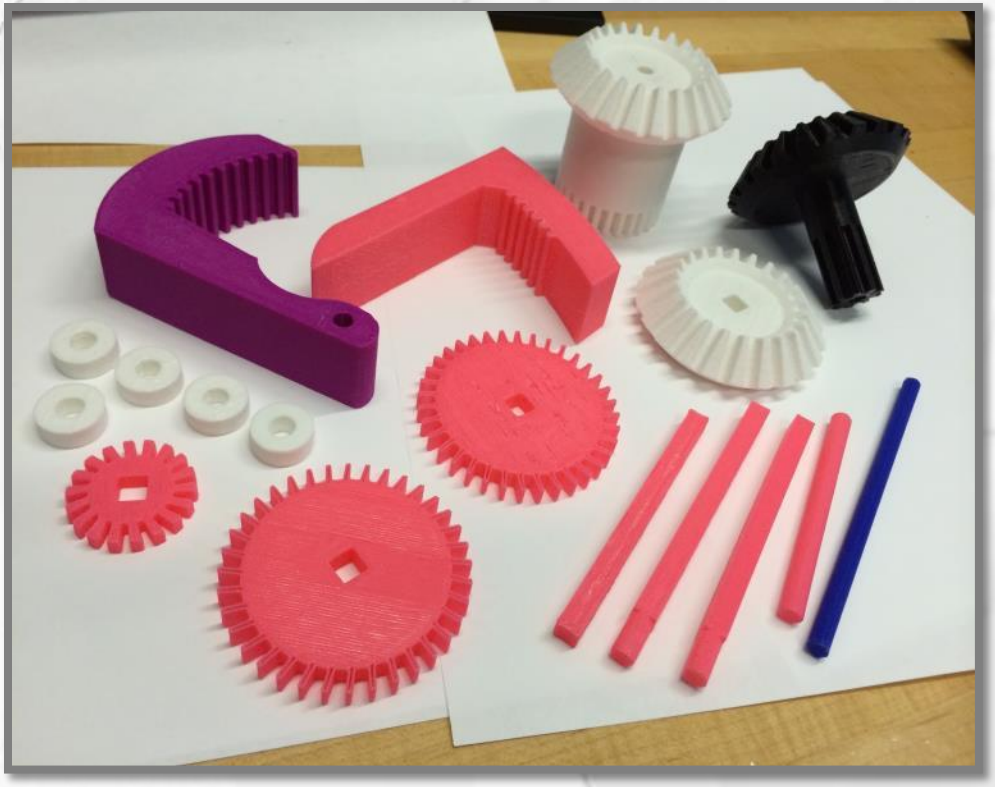
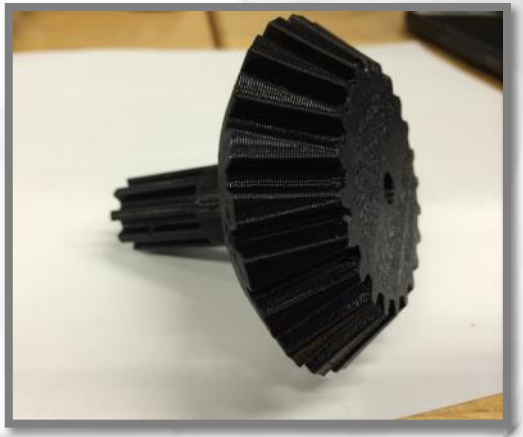
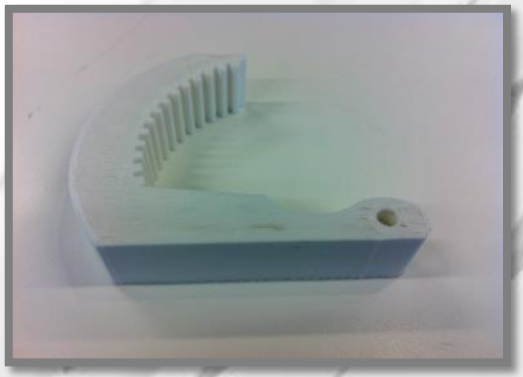
3D Printing







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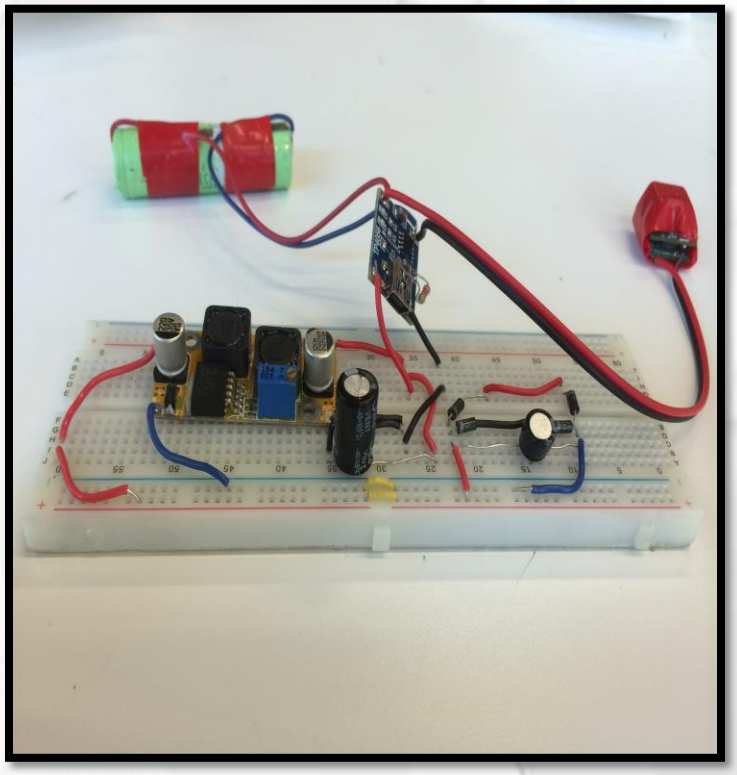
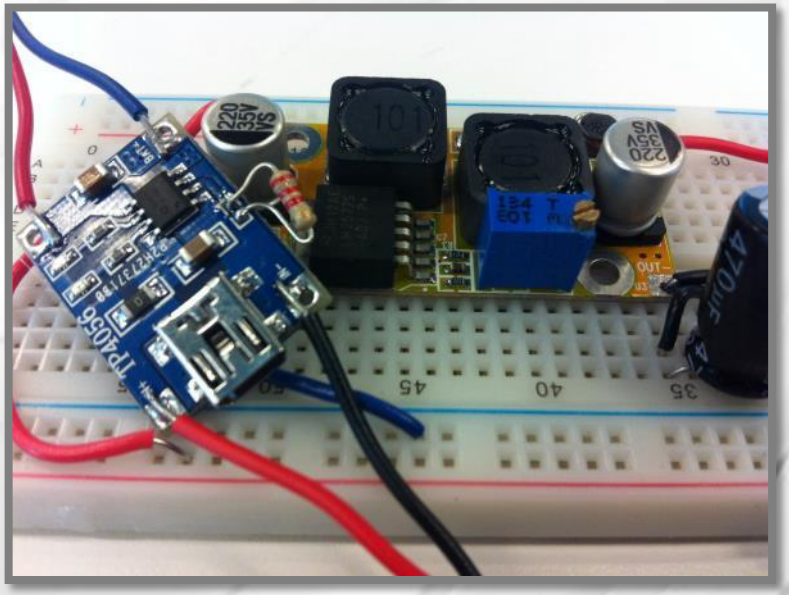
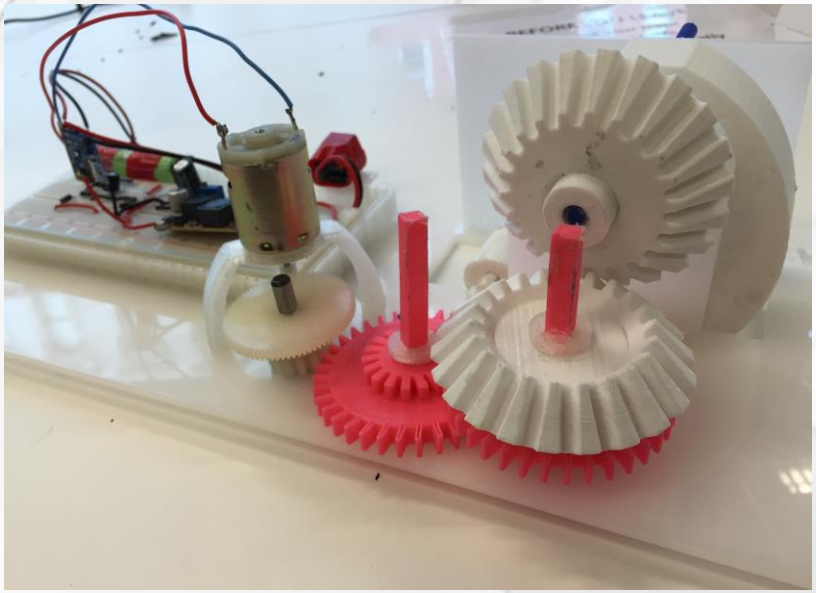
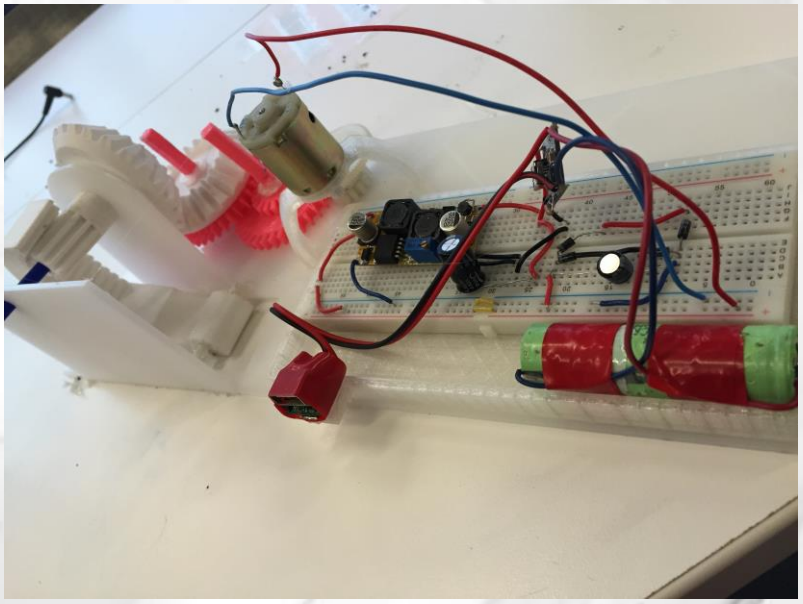
Hardware





Future Work





The next goal is to condense the project so that it fits into the sole of a shoe.

Conclusion

Energy Kicks will revolutionize the way people charge their mobile devices in the modern era.

EnergyKicks.Wordpress.com

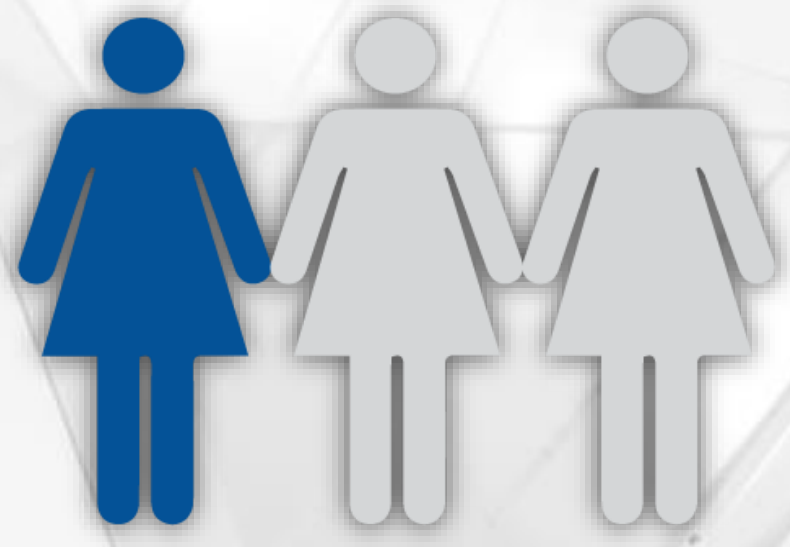
THE ANXIETY AVENGERS

Jules Almazar, Ilearys Fernandez,
Valerie Ivanov, Ayesha Haniff

Anxiety consists of excessive worry that the person cannot control.

Introduction

- **40 million** adults are affected (**18%** of the US population)
- Only **1/3** of the population receives proper treatment



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Introduction

Anxiety develops from complex factors including:

- Biological
- Environmental
- Life Events

What is our Goal?

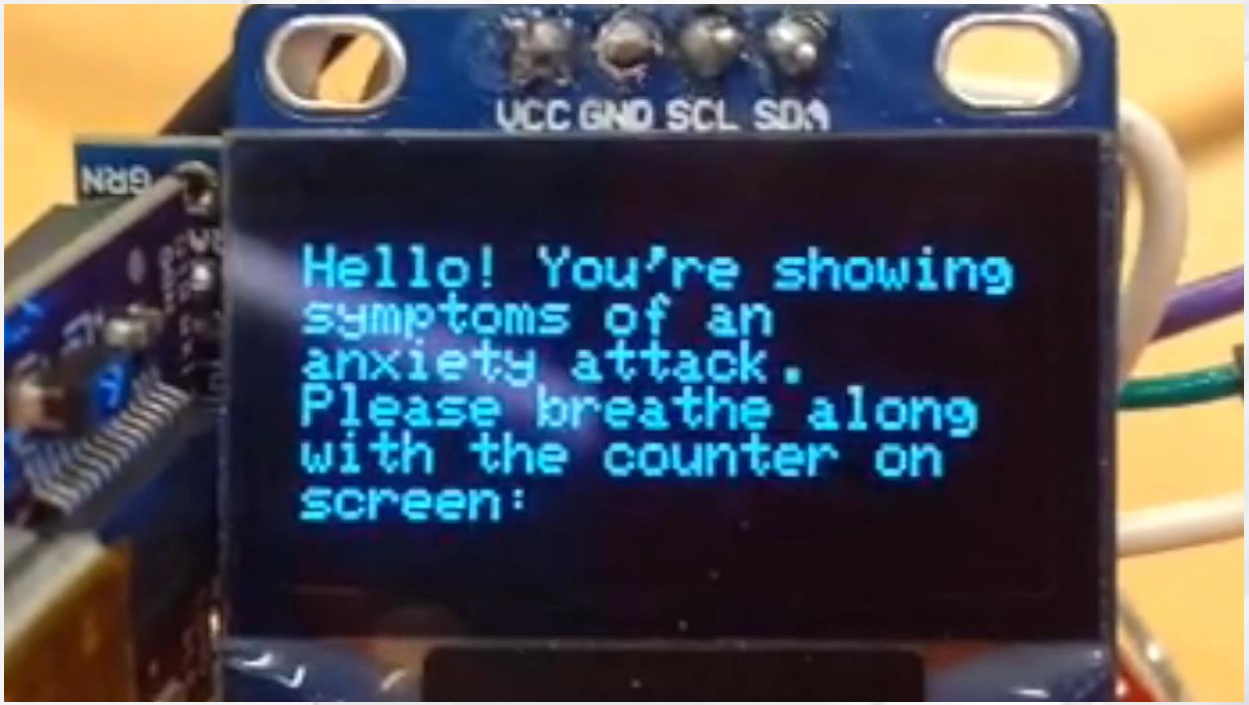
Software

- There are 5 different codes
  - Pulse Rate
  - Body Temperature
  - GSR (Galvanic Skin Response)
  - Vibration Motor
  - OLED & RetroWatch

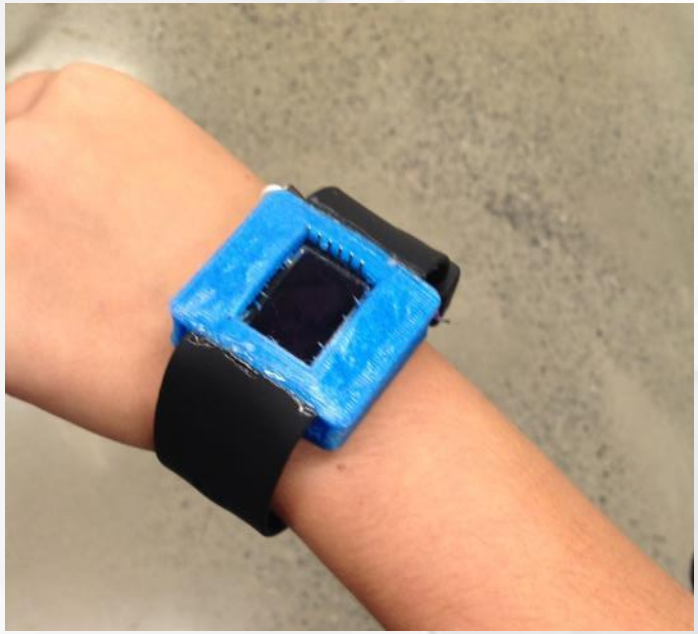
Work Completed

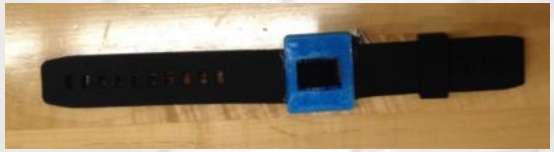
- Pulse sensor
- Vibration motor
- Contactless temperature sensor
- OLED displays messages
- GSR

Work Completed



Finished Product



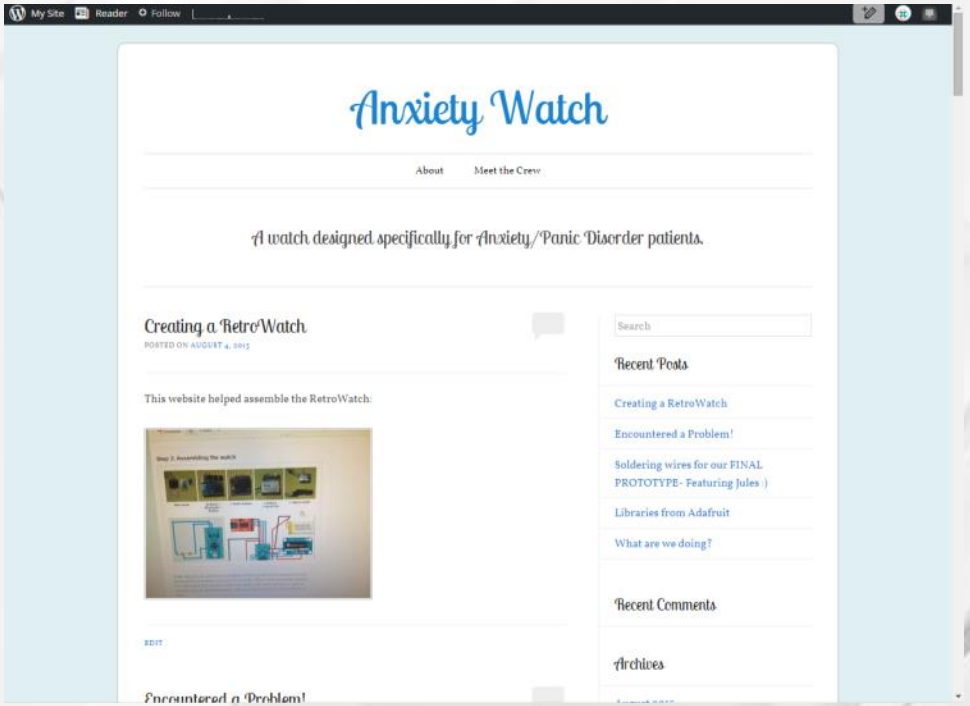


Future Work

- App
- Testing
- Design
- Licensing

Conclusion

- Our work will be monitored on our blog:
  - https://anxietywatch.wordpress.com/



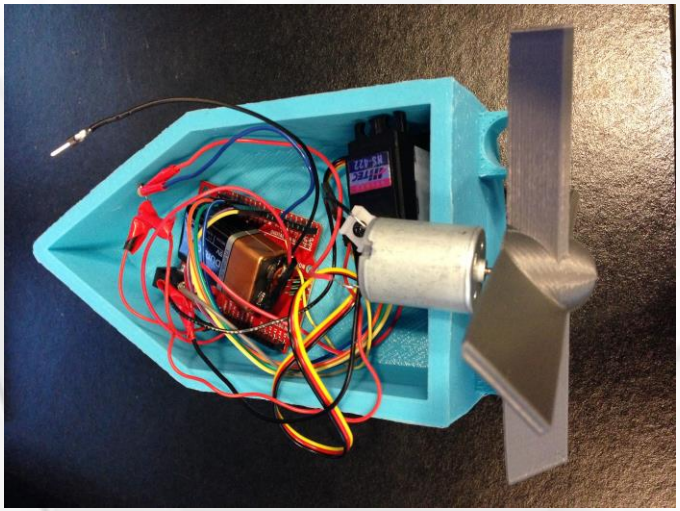
H.E.L.P. DRONE

Lauren Raynor, Yash Balaji, Dylan Kennedy, Paulo Serodio

Problems with Current Techniques

Introduction

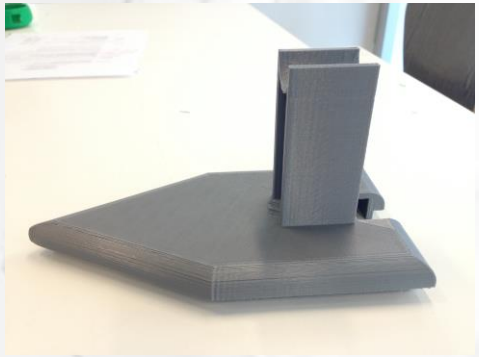
- Aim: To create a boat drone that delivers life preservers to drowning individuals

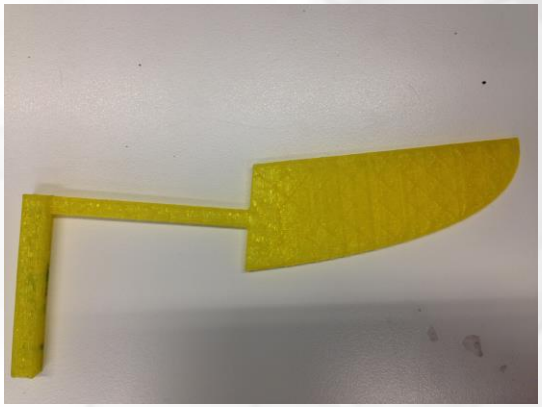


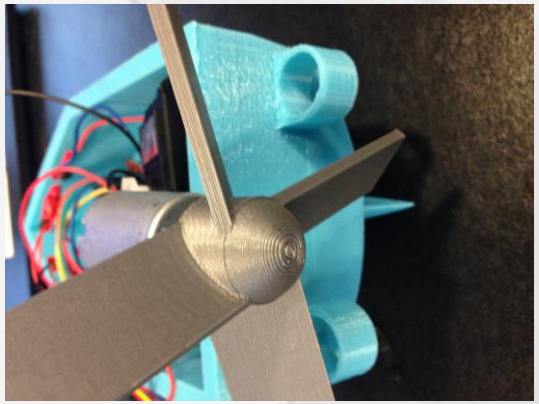
RC Navigation

- Nordic nRF 24L01+
  - The switches control functions on the boat
  - The alarm goes off when the sensor sends a signal
  - https://youtu.be/S249iorQMiE

Boat Design







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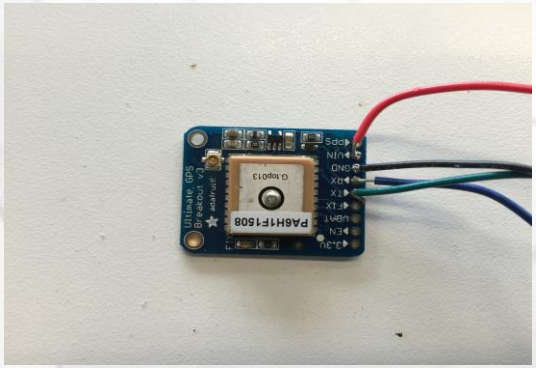
Future Plans

- Improve stability
- Implement a GPS navigation system
- Redesign wristband



Conclusion

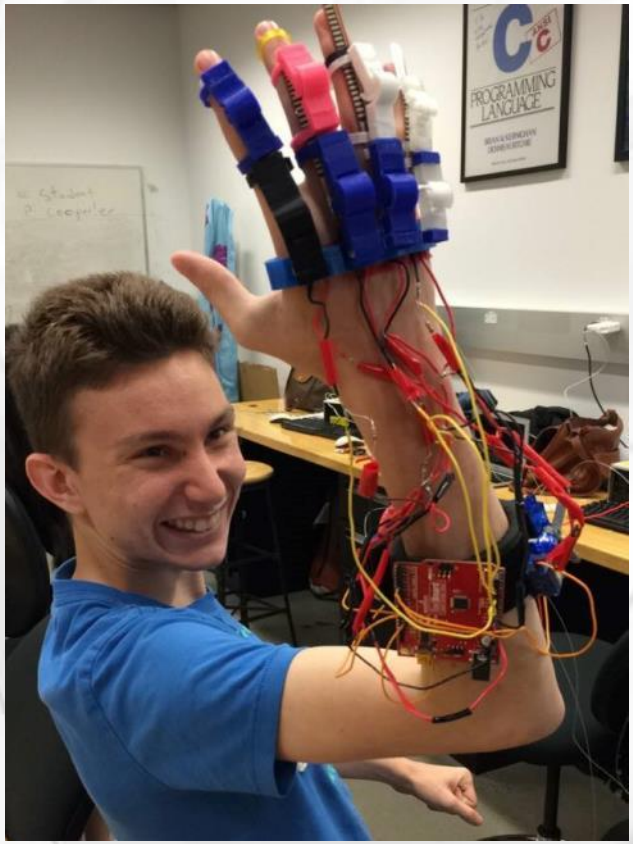
www.helpdrone.weebly.com

EXO-HAND

Tess Chan, Daniel Drucker, Max Miloslavsky, James Ng

Problem

Solution



Background Information

Exoskeleton Hand

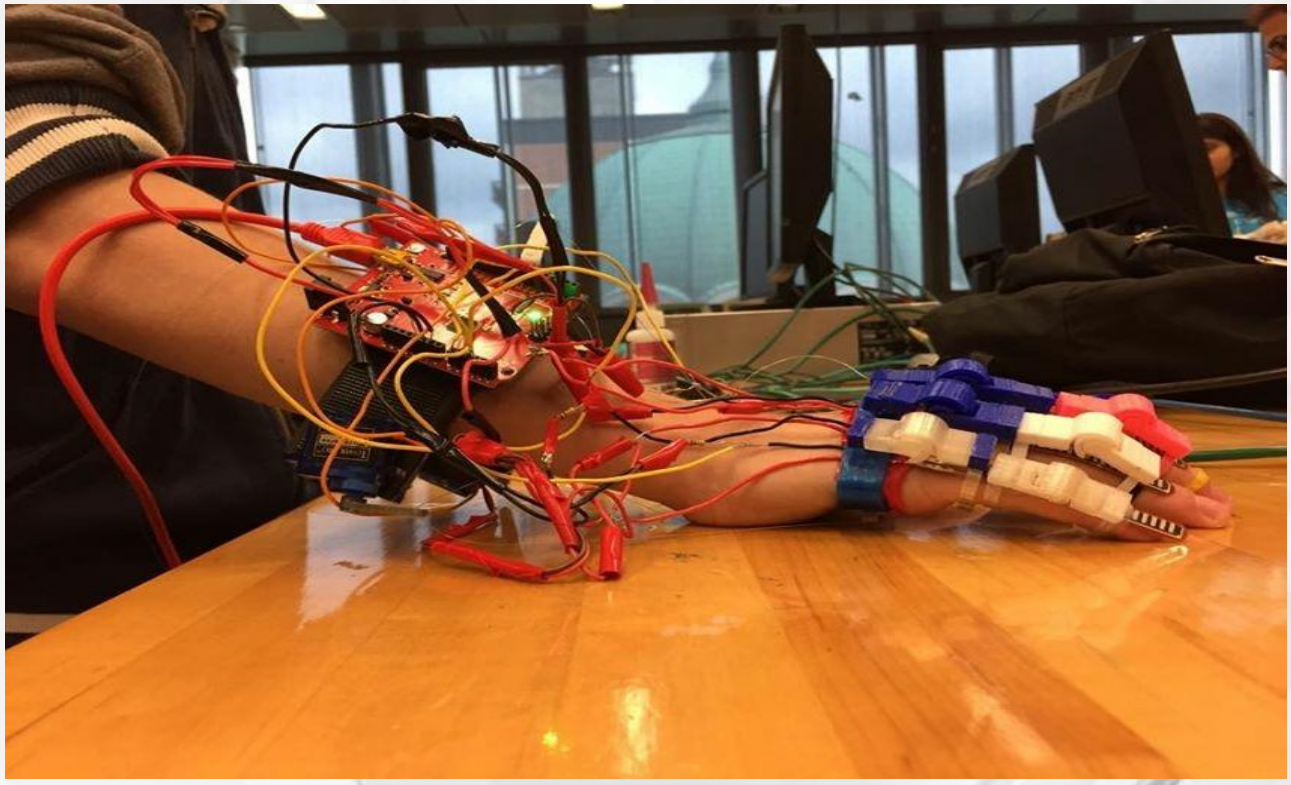
Servo Motor

Background Information

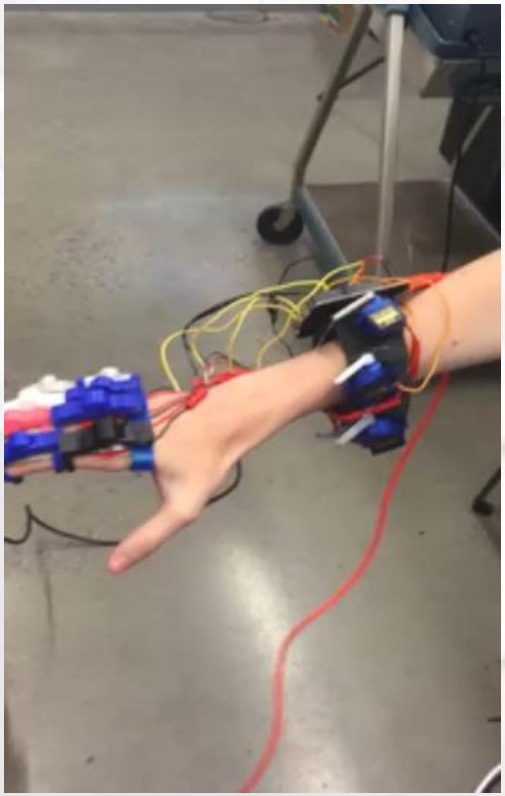
Finger Joints

Flex Sensors

Hardware



Hardware Demonstration

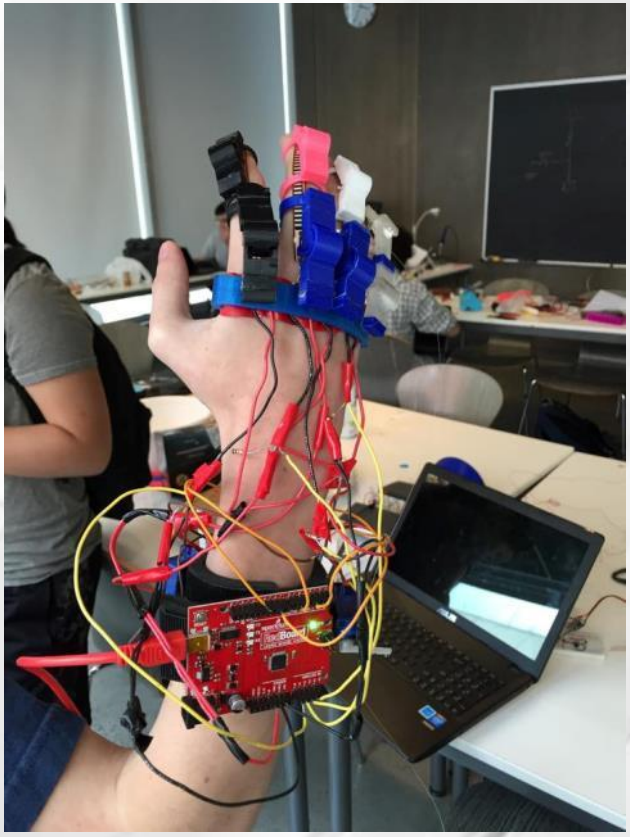


Software

1. Initializes the position of the servo motors
2. Checks if any finger is moving
3. Exaggerates the finger's movement using the servo motor

Conclusion

- A **handy** helper
- Inexpensive
- Large impact



Check out our work on:
myexohand.wordpress.com

Ideally

SEAHAWK

The amphibious bicopter.

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Nina Bhardwaj, Wilfredo Cueto,
Sommer Schneller, Rayhan Syed

Introduction

Hobbyists spend significant amounts of money per year on R/Cs and drones that perform on only one terrain.

Problem

$362.24

The average cost of buying both an R/C drone and an R/C boat

Solution

- What are we trying to accomplish?
  - Provide dedicated hobbyists with a cost-effective, multiple terrain vehicle.

Solution

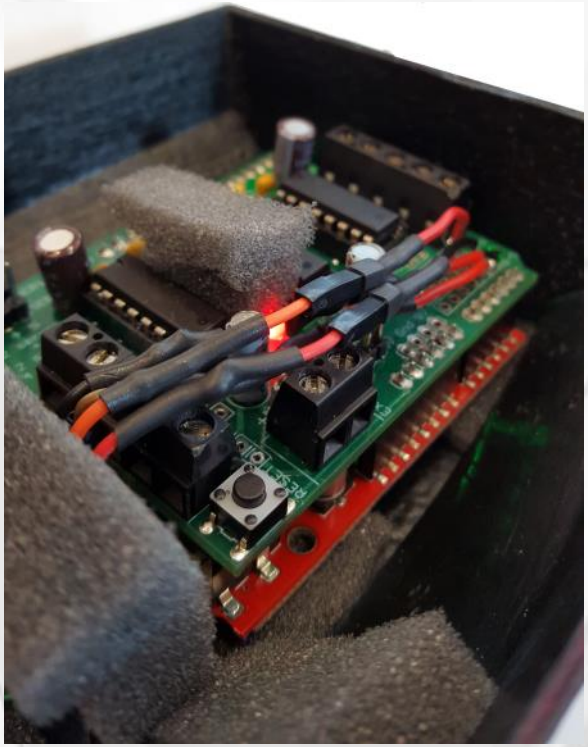
An amphibious bicopter with the capabilities of both flight and nautical exploration.

Background Information

RPM

Servo Motors

Software/Hardware



Waterproofing

Battery Supply

```
#include <Wire.h>
//#include <SparkFun_MMA8452Q.h>
#include <AFMotor.h>
#include <Servo.h>
//#include <SerialDebug.h>

//#define DEBUG true

AF_DCMotor motor1(1, MOTOR12_64KHZ);
AF_DCMotor motor4(4, MOTOR34_64KHZ);

Servo myservo1;
Servo myservo2;
int pos = 0;
//MMA8452Q accel;

void setup() {
  Serial.begin(9600);
  while (! Serial);
  Serial.println("Speed S0 to S255");
  Serial.println("Angle A0 to A180");
  //Serial.println("ACCEL Data begin ");
  myservo1.attach(9);
  myservo2.attach(10);
  //accel.init(SCALE_8G, ODR_800);
```

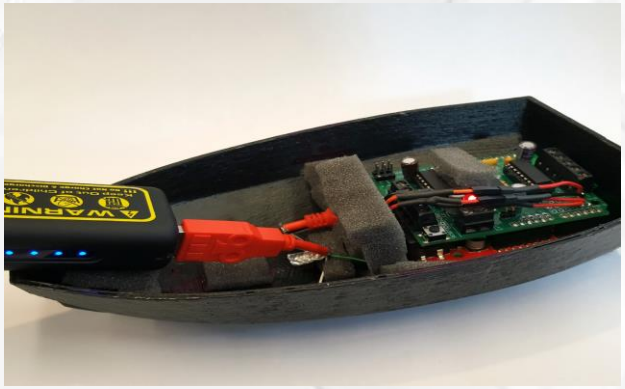
```
void printAccels()
{
  Serial.print(accel.x, 3);
  Serial.print("\t");
  Serial.print(accel.y, 3);
  Serial.print("\t");
  Serial.print(accel.z, 3);
  Serial.print("\t");
}

void printCalculatedAccels()
{
  Serial.print(accel.cx, 3);
  Serial.print("\t");
  Serial.print(accel.cy, 3);
  Serial.print("\t");
  Serial.print(accel.cz, 3);
  Serial.print("\t");
}

void printOrientation()
{
  byte pl = accel.readPL();
  switch (pl)
  {
  case PORTRAIT_U:
    Serial.print("Portrait Up");
    break;
  case PORTRAIT_D:
    Serial.print("Portrait Down");
    break;
  case LANDSCAPE_R:
    Serial.print("Landscape Right");
    break;
  case LANDSCAPE_L:
    Serial.print("Landscape Left");
    break;
  case LOCKOUT:
    Serial.print("Flat");
    break;
```

```
 if (Serial.available())
 {
  if(Serial.peek() == 'S') {
  int speed = Serial.parseInt();
  if (speed >= 0 && speed <= 255)
  {
    Serial.println(speed);

    motor1.run(FORWARD);
    motor1.setSpeed(speed);

    motor4.run(FORWARD);
    motor4.setSpeed(speed);
  }
 }

 else {
   int pos = Serial.parseInt();
   if (pos >= 0 && pos <= 180)
   {
   myservo1.write(pos);
   myservo2.write(pos);
   Serial.println(pos);
```

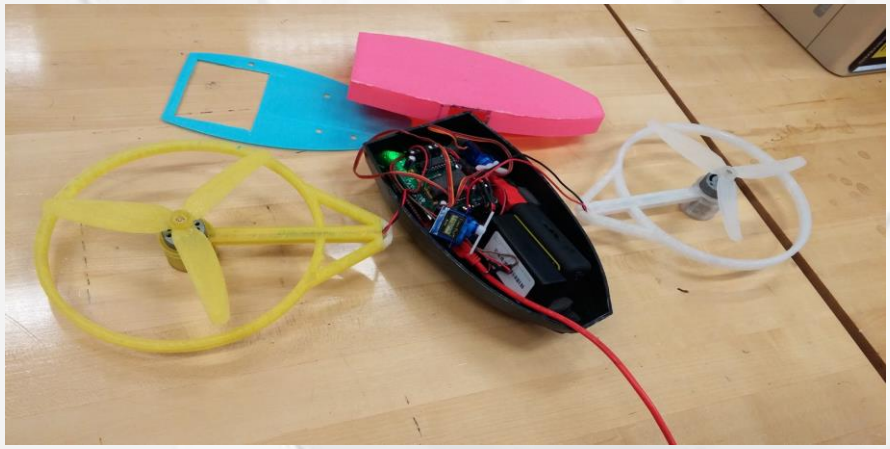
Brainstorming possible methods of production

Modeling with 3D printer and on paper

Begin coding arduino with redboard



3D printing and testing of parts with other parts



Hardware and software integration

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Future Work

- Integrate camera
- Add ground capabilities

wix.com/sschneller1/seahawk

SOULRUNNER6

Ashley Gonzabay, Aditya Nadkarni, Jon Nelson, Joanne Park, Lindsey Tarpinian

Introduction

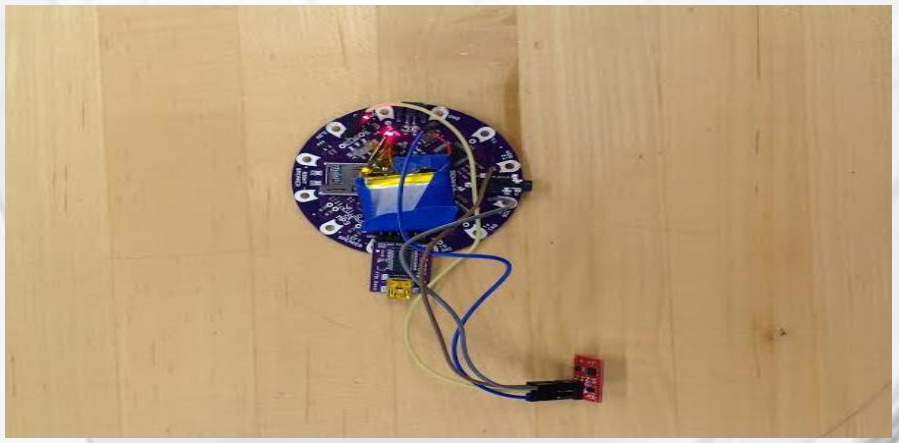
- Purpose of invention
  - To change the song an individual is listening to according to his or her pace
- Goals
  - To create a wearable independent of a cellular device for an enjoyable workout

Background Information

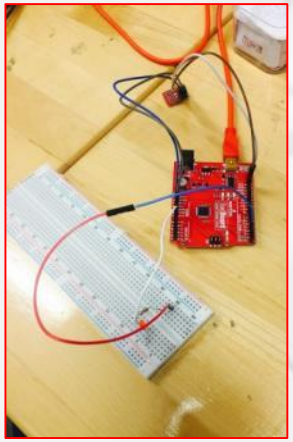
- C++ syntax in Arduino
- Accelerometer, SD card and Lilypad MP3 libraries
- Wire libraries
  - Data transport
- Vector formula: magnitude of the X,Y,Z coordinates

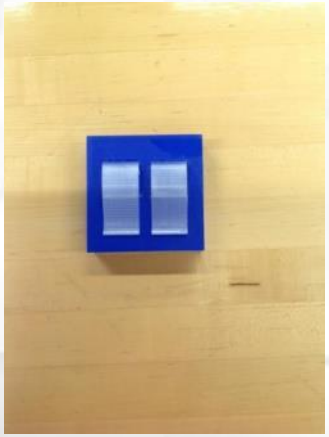
Work Completed

- Used accelerometer sensor and tested values
- Wrote algorithm to measure time between each step
- Connected accelerometer to Lilypad MP3
- Wrote code to play songs according to pace using BPM

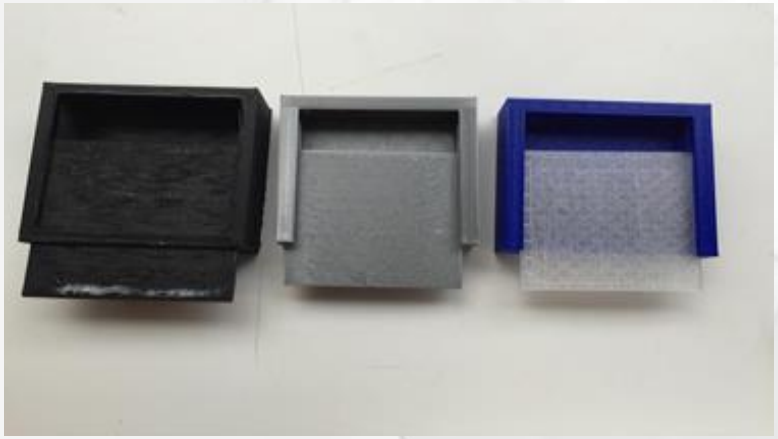


Prototypes





Prototypes

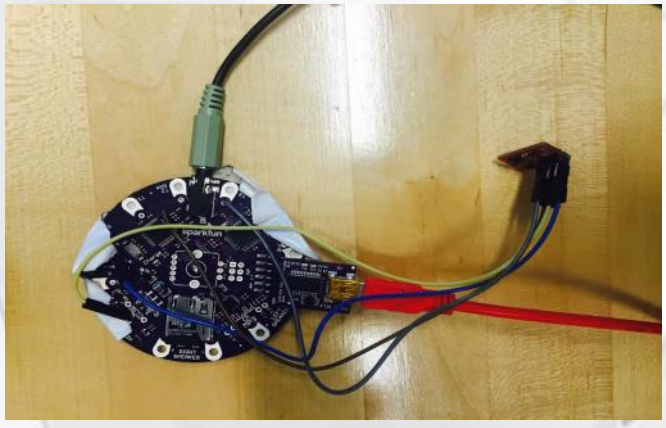


Future Plans

- A waterproof casing to prevent damage
- A Bluetooth function that will allow a runner to upload their own playlist
- A smaller version of the prototype

Conclusion

- Determined time between steps
- Hooked up accelerometer to a Lilypad MP3 board and got the accelerometer to sense movement and vibrations
- Successfully changed songs based on runner's pace



MY AIR

Tae Kyung Kong (TK), Ian Murray,
Nellie Spektor, Callista Ohnemus

The Problem

There is more than air out there.

On a Scale of 0 to 500, Beijing's Air Quality Tops 'Crazy Bad' at 755 - NY TIMES (2013)

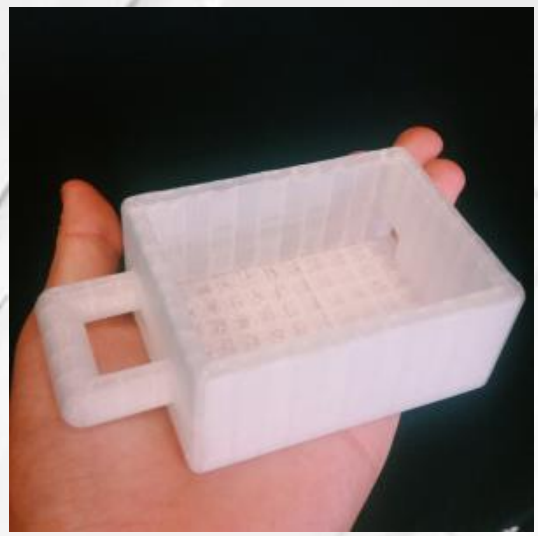
Smog Filling Up New York City's Atmosphere

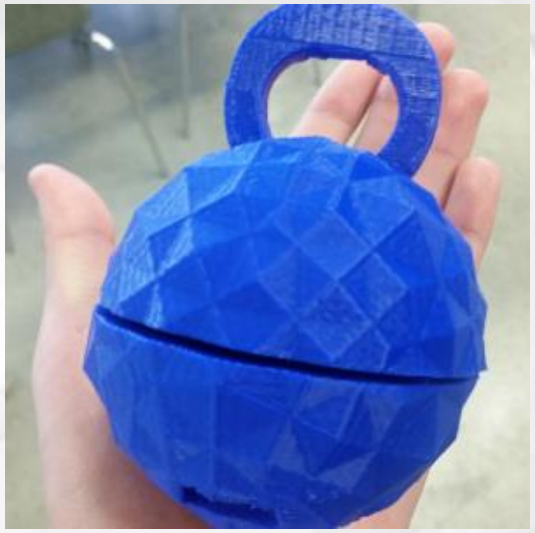
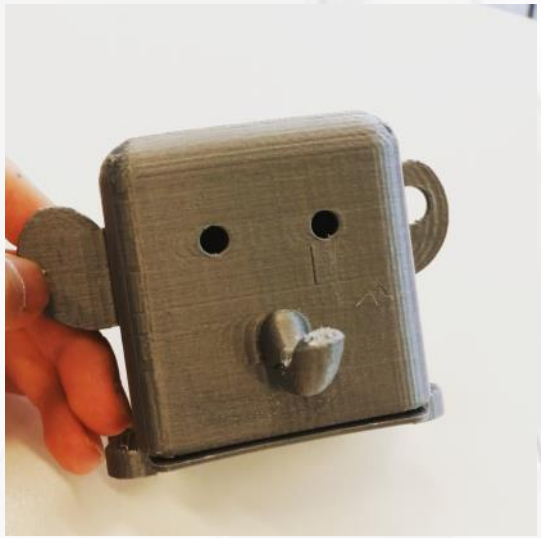
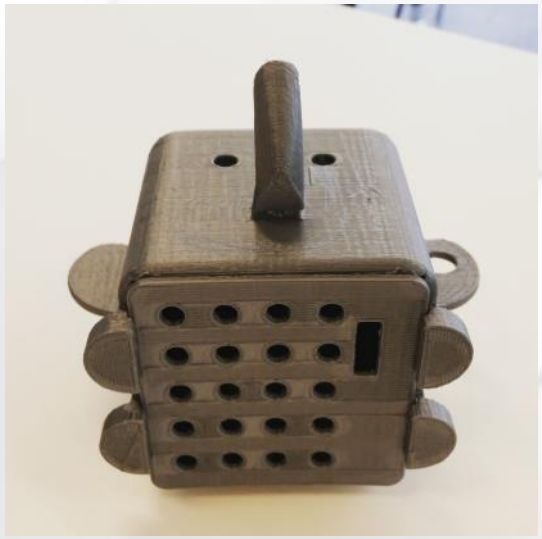
The Solution

There is more than air out there.

A portable device that is connected to a mobile application.

Materials

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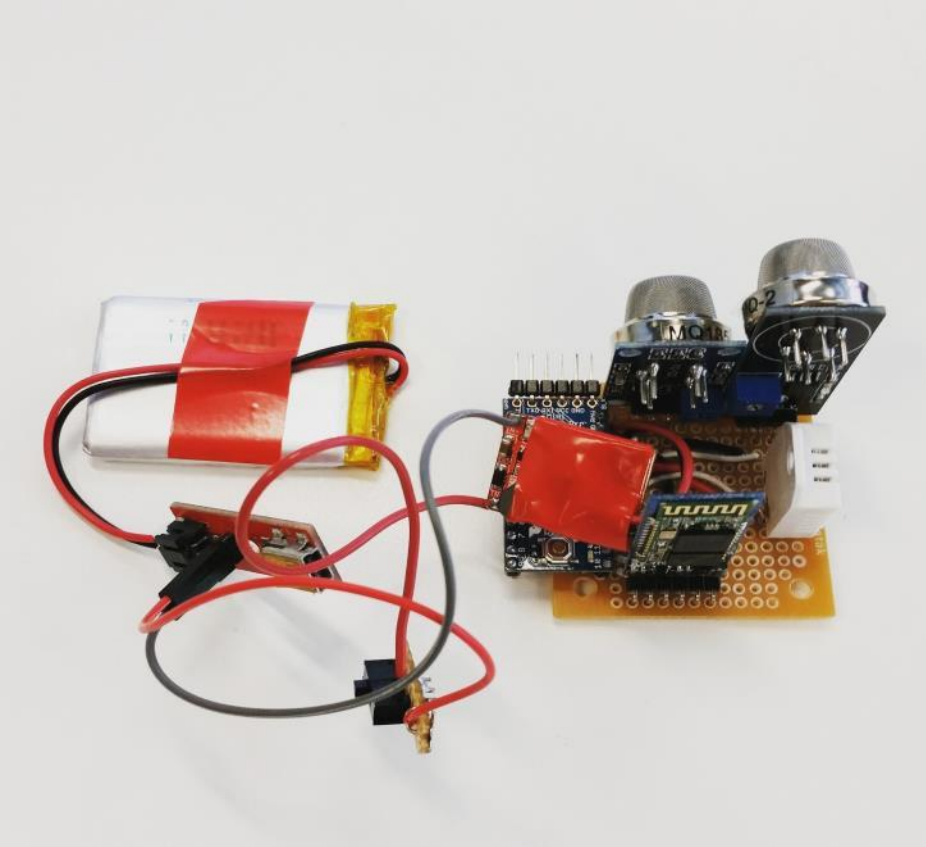
The Circuit



Android App


87% 10:36 AM
My Air
How's My Air?
What's out there?
Learn More
About My Sensor


84% 11:00 AM
My Air
not connected
LPG:
0ppm
CO:
0ppm
Smoke:
0ppm
CO2:
0ppm
Air Quality:
43
Humidity:
30%
Temperature:
75°F
Heat Index:
80°F
What Does This Mean?

Android App


84% 11:00 AM
ThisMeans
What does my air quality mean?
0-50 good
51-100 moderate
101-150 Unhealthy for sensitive groups
151-200 unhealthy
201-300 very unhealthy
301-500 hazardous
LPG is flammable gasses. Ideally, this should be 0 parts per million.

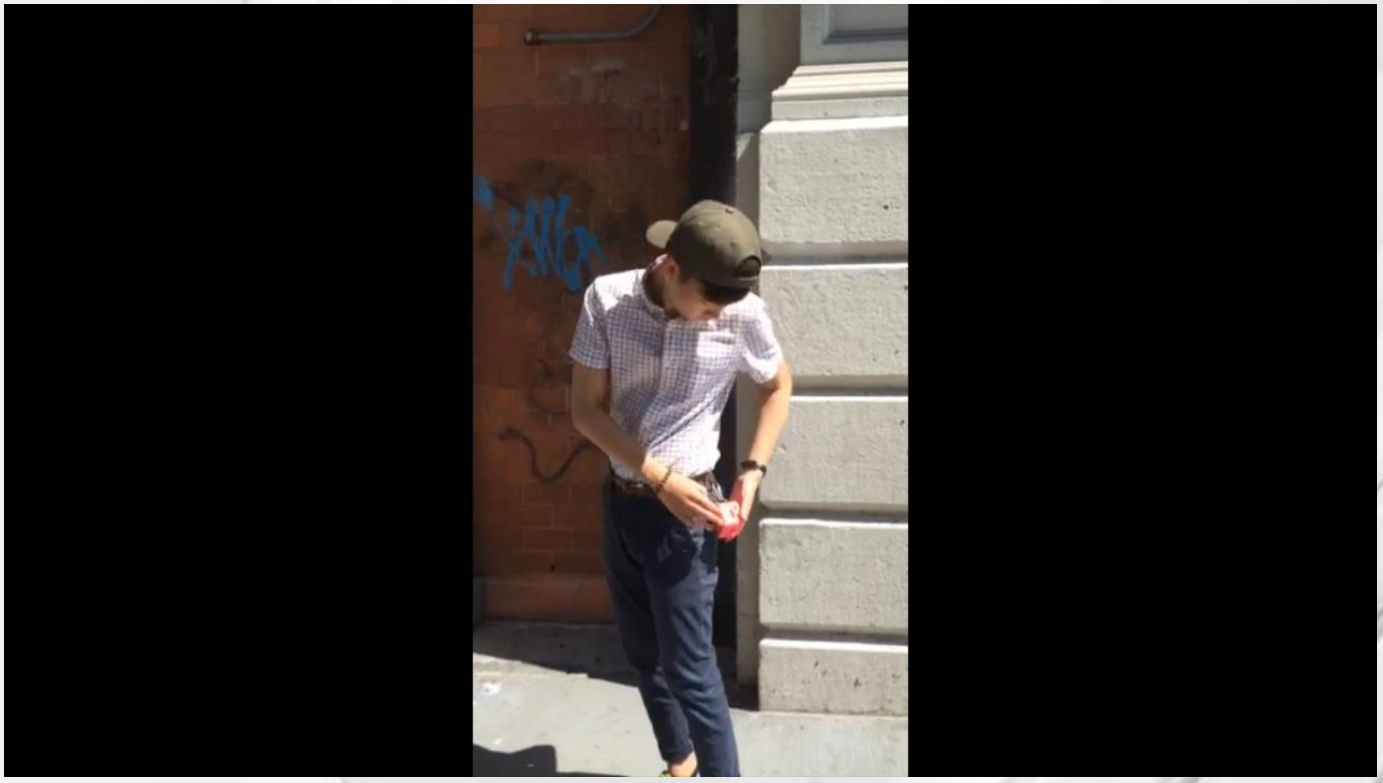

86% 10:37 AM
Map
Record My Air
Union City
MANHATTAN
Hoboken
The High Line
New York
Battery Park
Google

Android App


86%
10:37 AM
My Air
Visit Our Website!

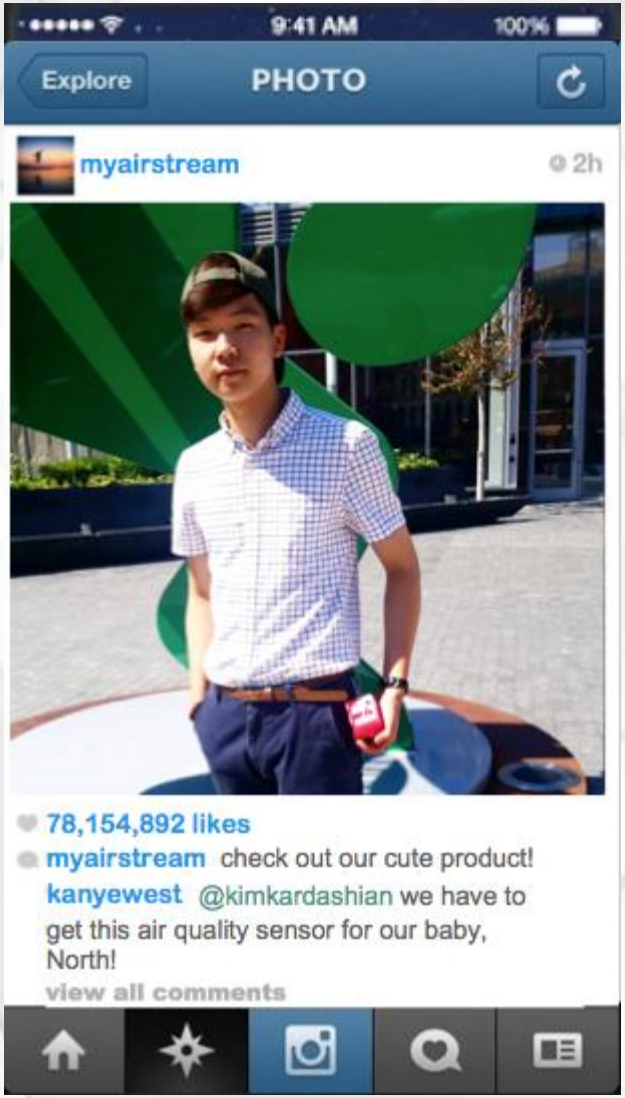

86%
10:37 AM
About
Our concept stems from the growing air pollution happening all over the globe. Every day, our carbon footprint becomes larger. This will ultimately lead to our next generation's breathing in toxic carcinogens and pollutants instead of the oxygen that humans were meant to breathe. Clean air is an essential to humans. Our ultimate mission is to spread awareness about the air around us.

Test Data



Future Plans

- Smaller
- Cheaper
- ThingSpeak
- Multiple Cases for User's Preference


9:41 AM
100%
Explore
PHOTO
myairstream
2h
78,154,892 likes
myairstream check out our cute product!
kanyewest @kimkardashian we have to get this air quality sensor for our baby, North!
view all comments

THE OMNISHOE

Darren Lin, Michelle Nissan, Shane Ngai, Patrick Schutz

Introduction

- Why are we doing this?
  - Alleviates the effect of shoe drag
  - Cheap Alternative to Buying Shoes
  - Very Student-Athlete friendly

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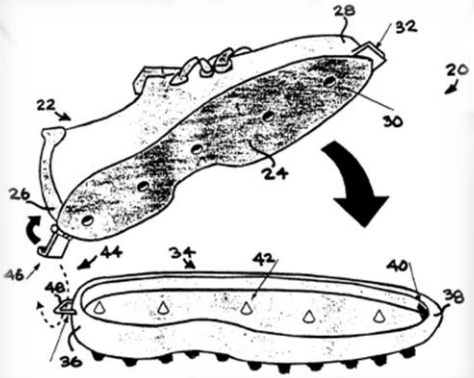
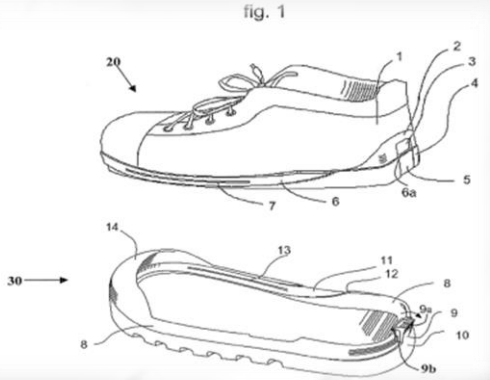
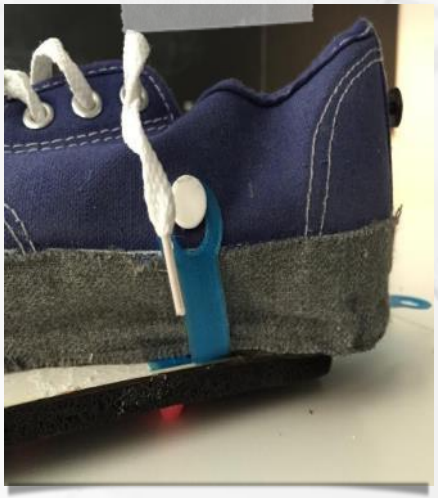
Background Information

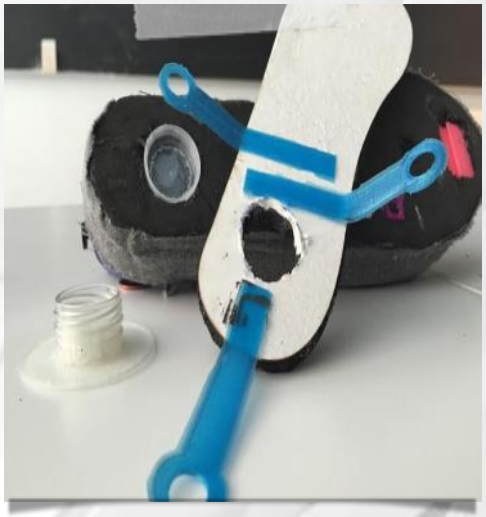
- Faults in past patents [6]
- Potential customer saving





The Sole Swap System





How to Put it Together

Materials

- Anti-vibration rubber
- Structural card stock base
- Foam insoles for comfort

Work Completed

- Two swappable soles
- 3L locking system
- Remade for pro-comfort/stability

Future Aspirations

- Make our product fashionable
- Make more specialized soles
- Perfect our sole swap system

TIPS

Technical Indoor Positioning System

Hoi Kwan, Sherry Wang, Kenny Yang, Dillon Zhang

Introduction

IPS for Commercial Centers

- Locating User
- Providing Navigation Instructions

Background

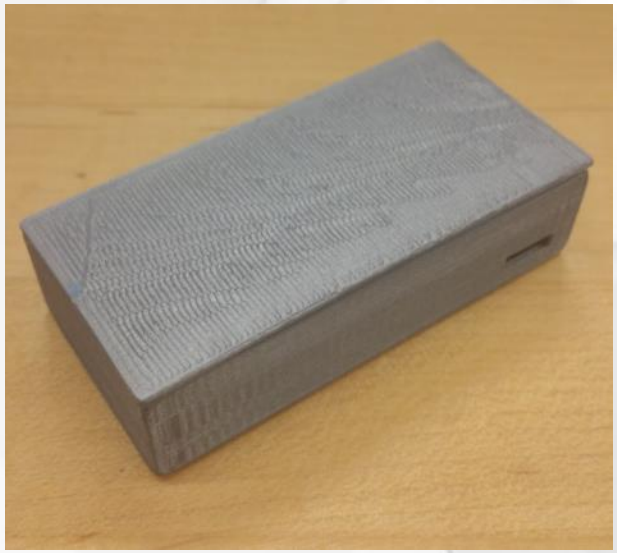
Google Maps (GPS)
iBeacon
Received Signal Strength Indication

Hardware

- ESP8266 Thing with a Lithium Ion Battery

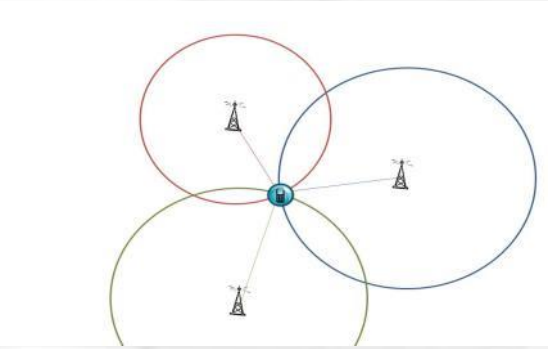
Hardware (cont)

- 3D Printed Containment Units



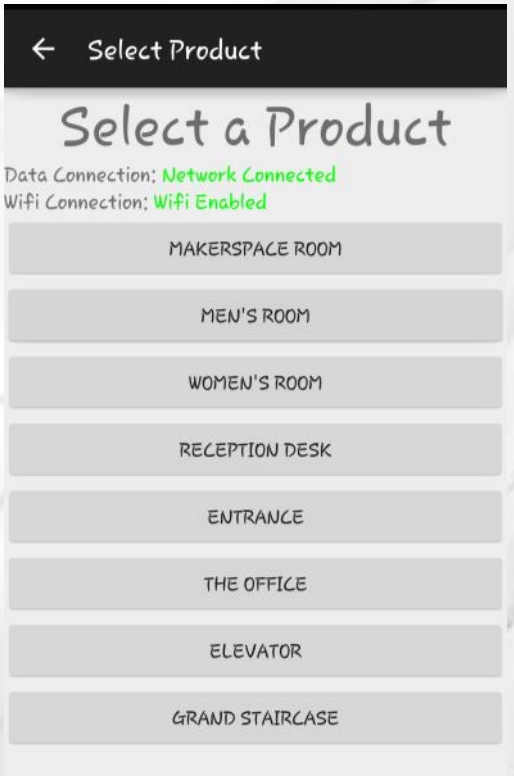
Software

Triangulation of User



```
public static double calculateDistance(double levelInDb, double freqInMHz) {
    double exp = (27.55 - (20 * Math.log10(freqInMHz)) + Math.abs(levelInDb)) / 20.0;
    return Math.pow(10.0, exp);
}
```

Software (cont)



Software (cont)

A* Search

Conclusion


TIPS
Indoor Naviagion Made Easier
WEBSITE: https://sdkips.wordpress.com/

TRAINTECH PRESENTS
LIGHTHOUSE

Jason Kurian, Michael Ye
Yair Gross, Yash Jain

Background Information

- 8,758,000 daily MTA passengers
- 954,000 daily NJ Transit passengers
- Over 3 billion annual riders use MTA transportation
- More people take the MTA daily than live in 37 of the 50 states.

Huge and Growing Available Market!

Background Information

- Most people try to catch a nap on their commute
- Missing your stop is extremely frustrating and time consuming

Time is a commodity you can’t get enough of!

Product Design

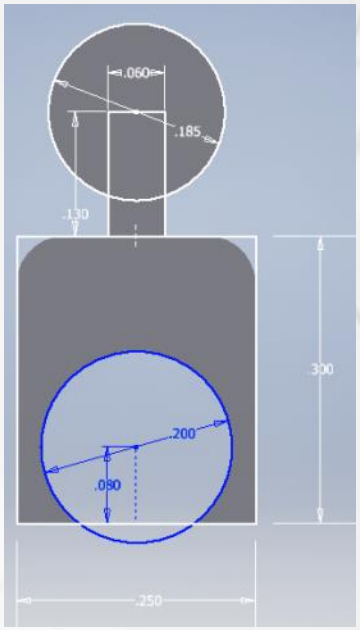
- Armband connected to app via Bluetooth
- App predicts where passenger is
- Built-in timetables determines arrival time
- Band vibrates moments before destination

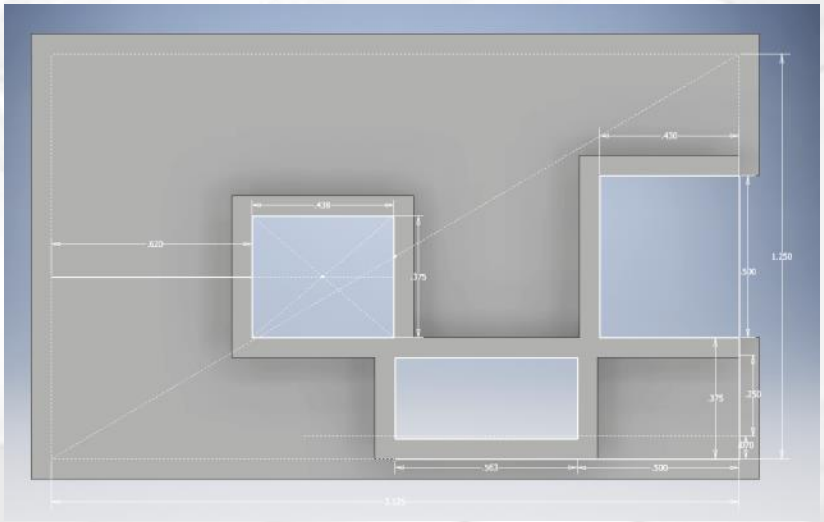
HARDWARE

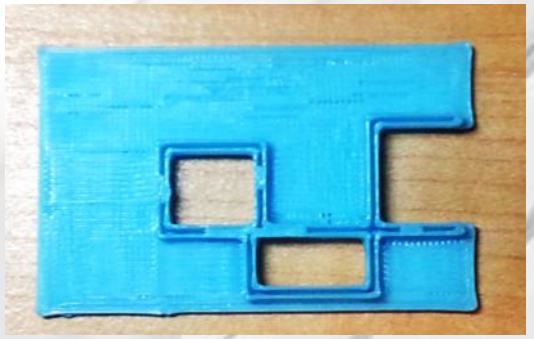
Hardware: Wristband

Continuous → **Clasp** → **Modular**

Hardware: Wristband



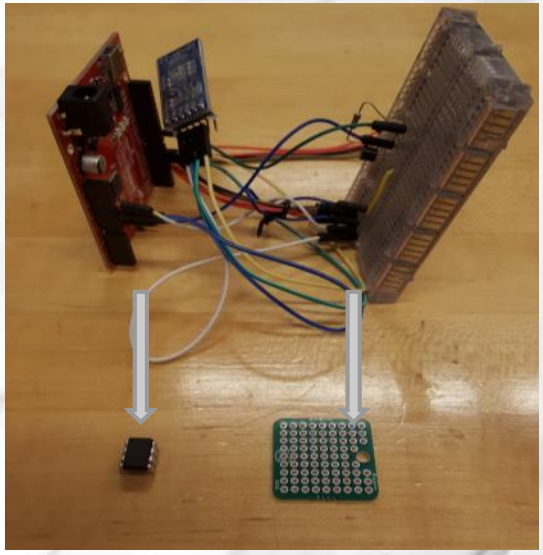




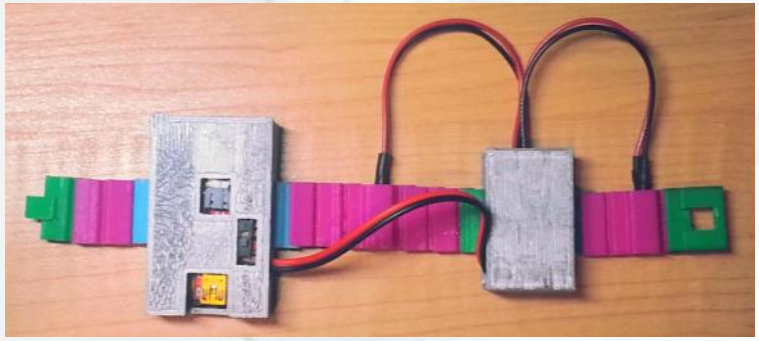
THECOOPERUNION

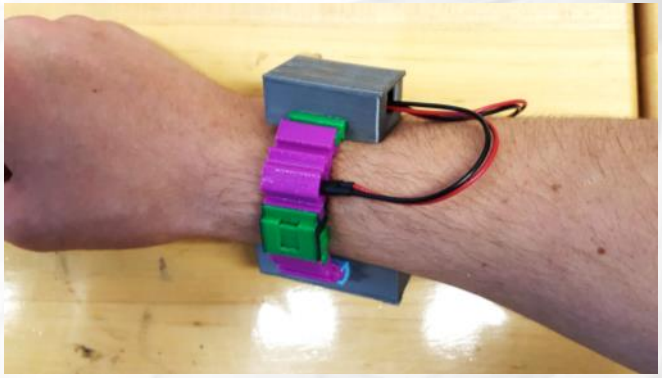
Hardware: Circuit

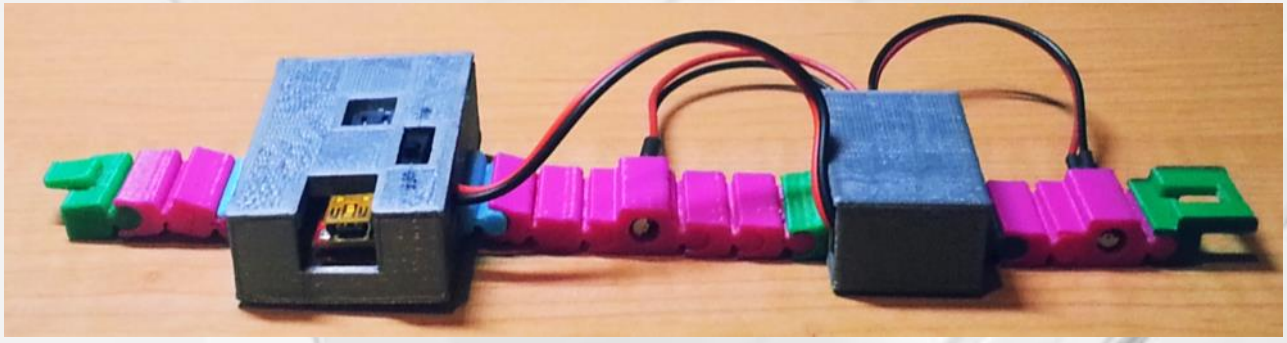
1. Draw schematic
2. Build and test circuit
3. Minimize size using proto board and smaller components
4. Solder final circuit and integrate power source



The Finished Wristband





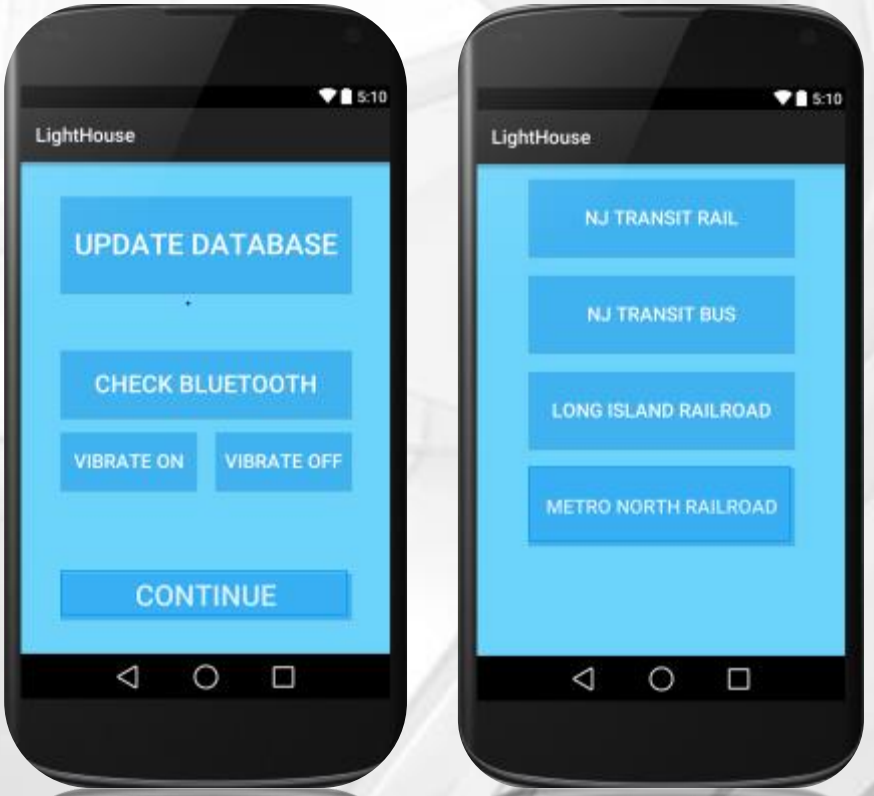


Android App: User Interface

- Select transit system
- Select starting point/destination
- Select departure time
- Set alarm or pin to home screen

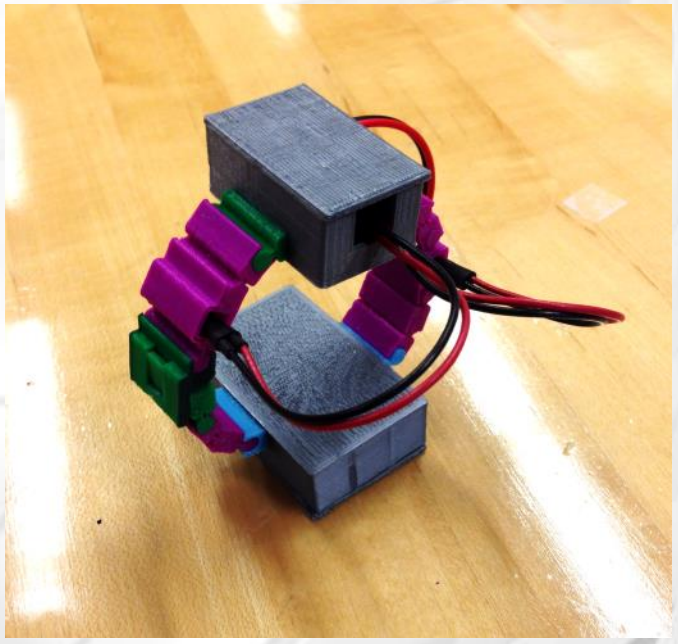
Android App

- SQLite database
- Internet-independent
- Bluetooth capability
- Simple interface



Future Plans

- Real-time data
- Decrease battery size
- Expansion to all MTA Systems
- Circuitry built into individual links



LightHouse

- Fresh
- Functional
- Fashionable
- Funky

lighthousetraintech10.wordpress.com