Cyclist Health Alert
Group 61

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COOL! COOLER! COOLEST!

More than 24,000 exercise related injuries were reported each year

Over-exercised?

Worried about children?

Riding in forests, mountains,or suburban cities?

http://www.activeazur.com/mountain-biking/south-france

Get to know us

User-friendly !

Android Phone APP

Track your physical condition !

Real-time heart rate

Protect yourself !

Warning window

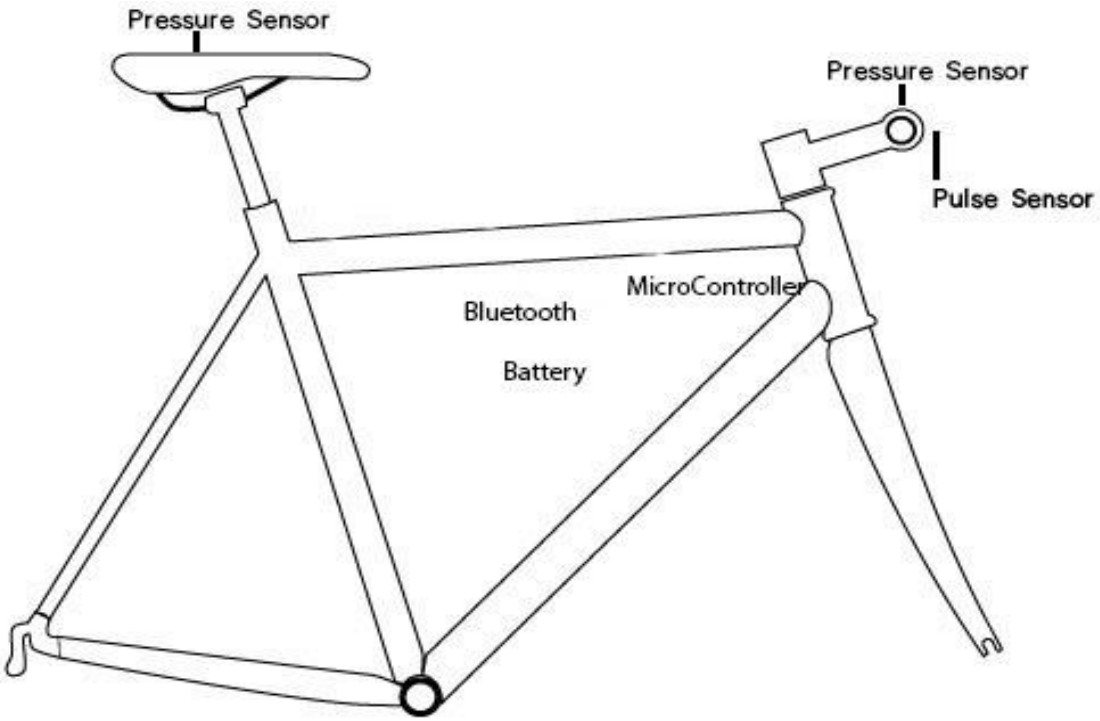
Guarantee your safety !

Emergency message

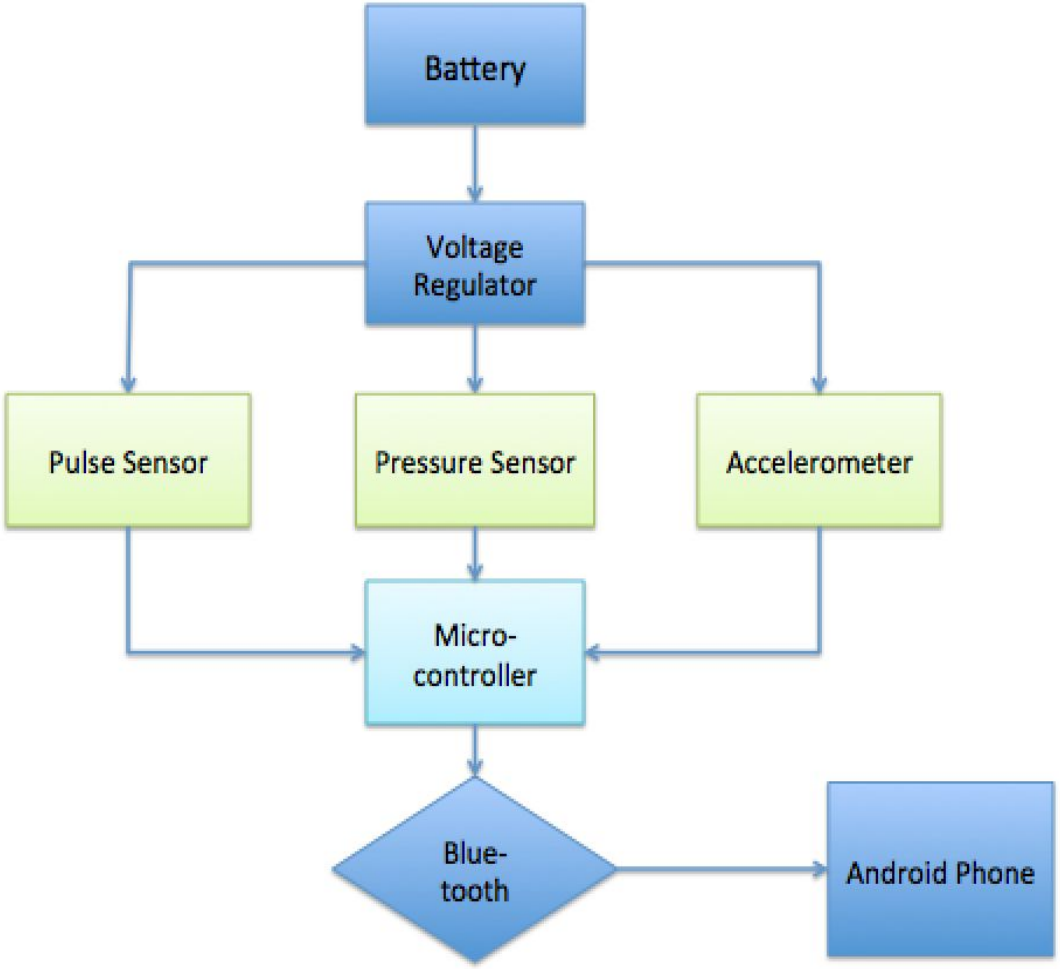
No need to be nervous !

Cancellation

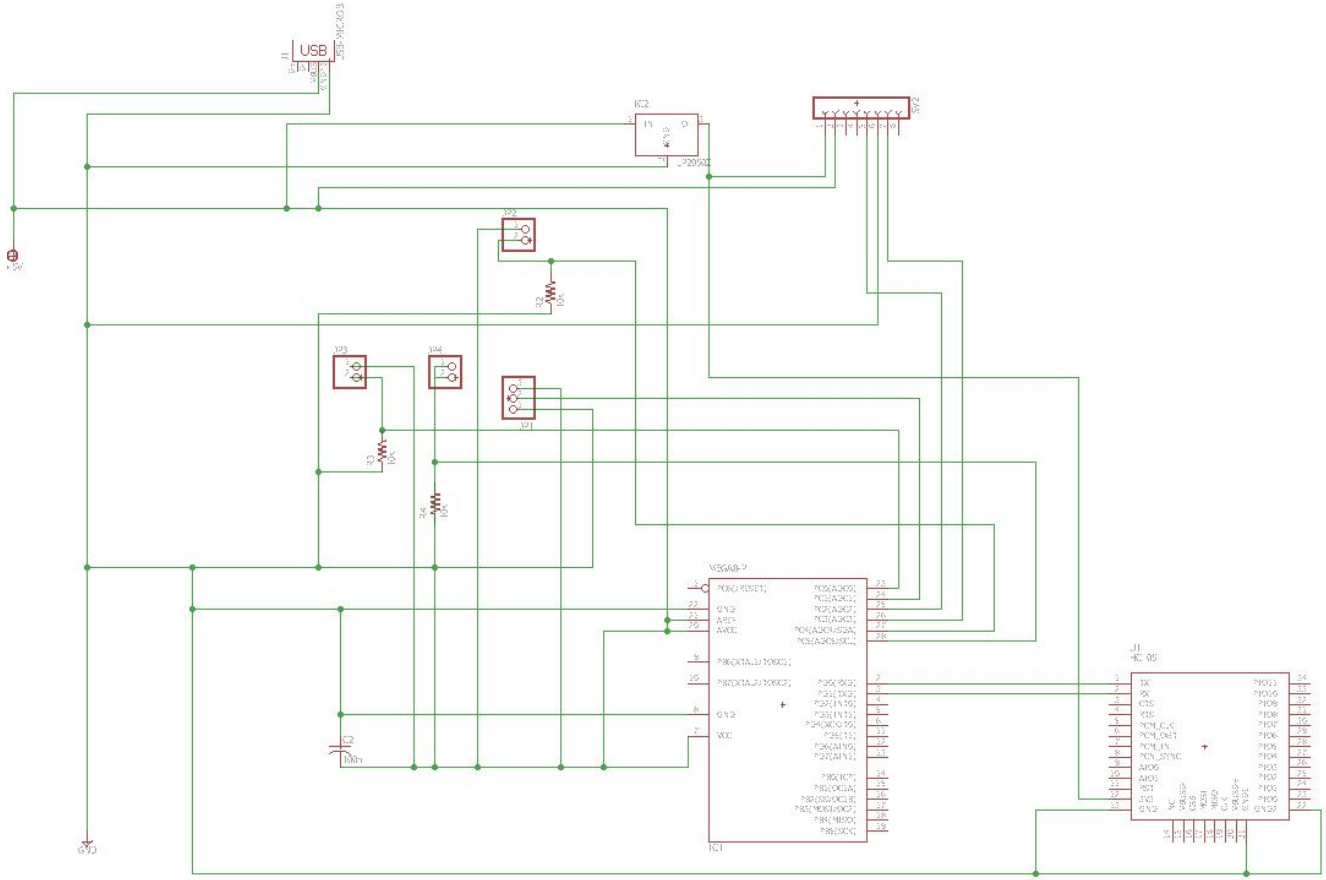
Location of Devices

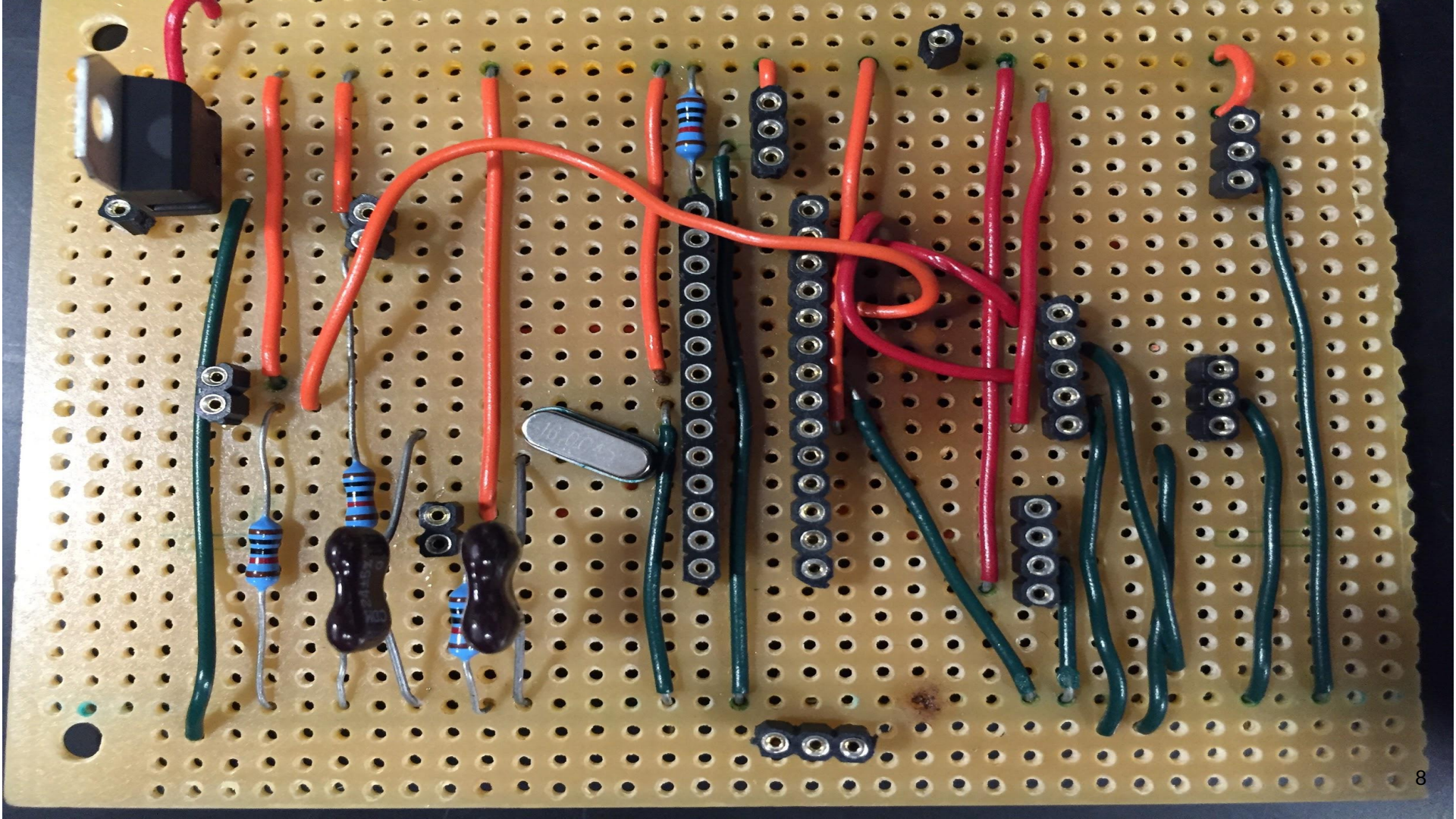


Block Diagram



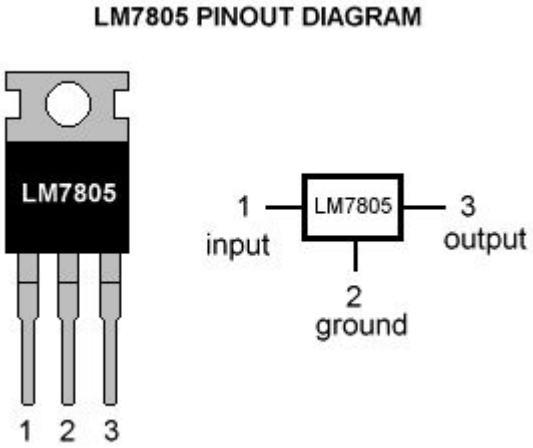
Overall Circuit





Power Supply

- Supplies +9 Vdc and ground
- Regulator LM7805
- Input voltage range 7V- 35V
- Current rating Ic = 1A
- Output voltage range VMax=5.2V ,VMin=4.8V



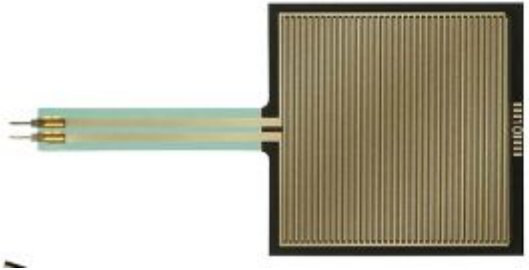
https://electrosome.com/power-supply-design-5v-7805-voltage-regulator/

Force Sensitive Resistor

Features:

1. Ultra thin
2. Robust, which can be used for 10 million times

FSR® 402
13mm Circle x 56mm



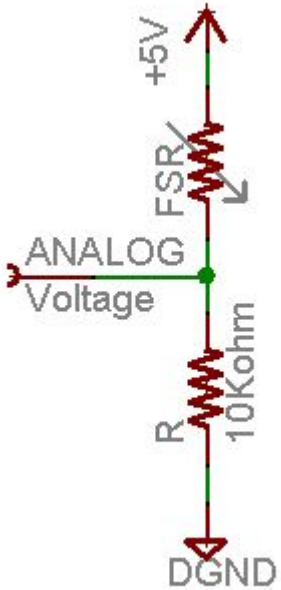
FSR® 406
38mm Square x 83mm

https://www.interlinkelectronics.com/datasheets/Datasheet_FSR.pdf

Input: Two FSR402 and one FSR406. The inputs are forces exerted by biker

Output: Range from 0 to 1023, map 0N to 20N

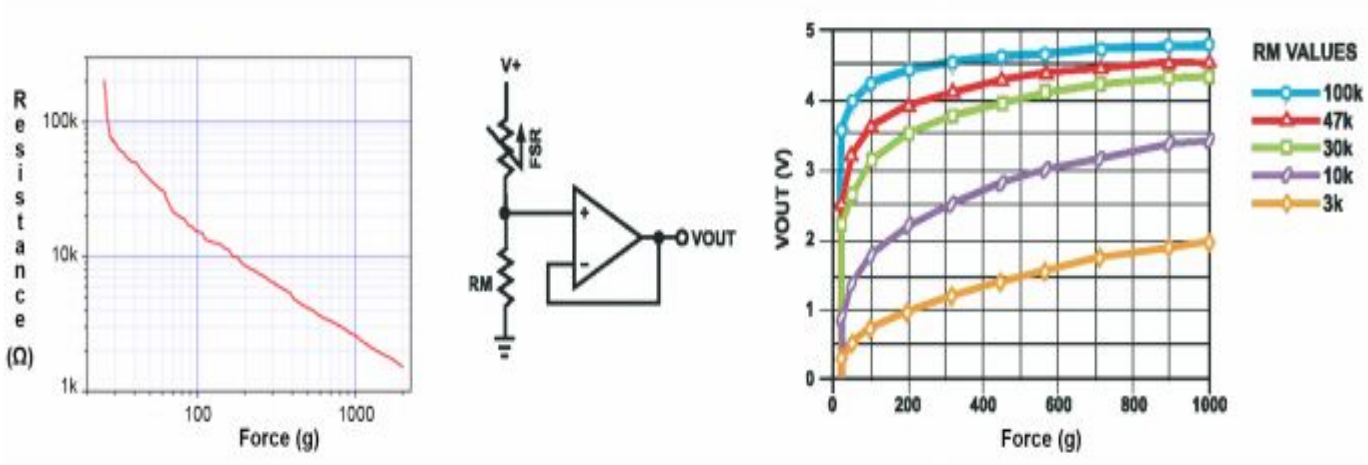
Connections with our circuit



https://learn.adafruit.com/force-sensitive-resistor-fsr/using-an-fsr

Theory

$$V_{OUT} = \frac{R_M V +}{(R_M + R_{FSR})}$$



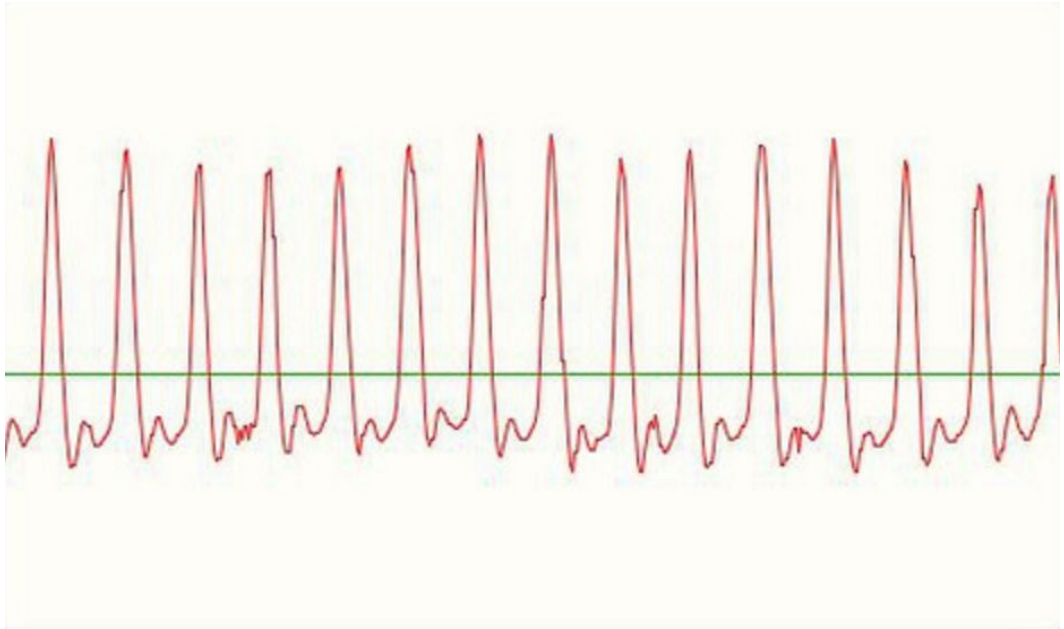
https://www.interlinkelectronics.com/datasheets/Datasheet_FSR.pdf

Pulse Sensor

More light, Signal goes up

Less, the opposite

https://www.sparkfun.com/products/11574



http://pulsesensor.com/pages/open-hardware

Input: Signals as raw data

Output: BPM (beats per minute)

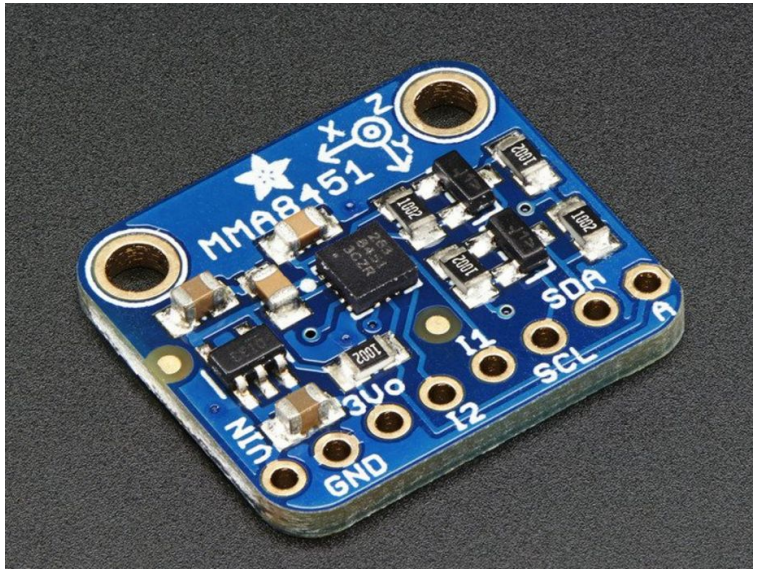
Pulse Sensor Timing

```
void interruptSetup(){
  TCCR2A = 0x02;
  TCCR2B = 0x06;
  OCR2A = 0x7C;
  TIMSK2 = 0x02;
  sei();
}
```

Factors influencing the reading from pulse sensor

- Long cable
- Outside noise
- Human interference

Accelerometer

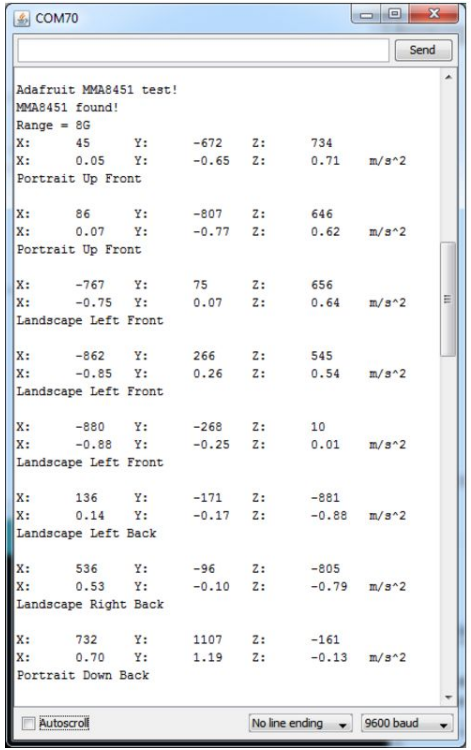


Triple-Axis Accelerometer MMA8451

- Range: 2/4/8g
- Built in 14-bit ADC
- I2C communication

https://learn.adafruit.com/adafruit-mma8451-accelerometer-breakout/overview

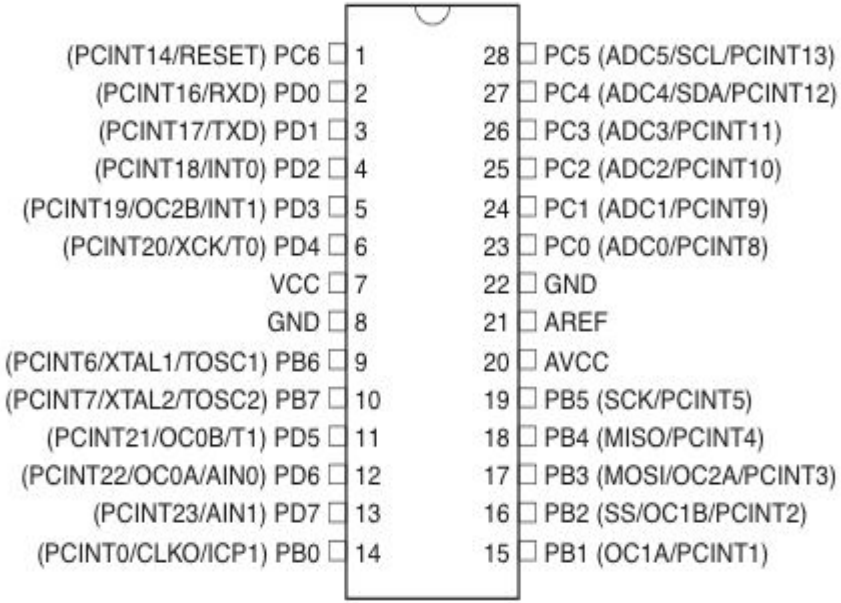
Testing results



- Raw data from sensor (14 bits, -8192 to 8191)
- Convert to m/s^2
- Detect acceleration of bike

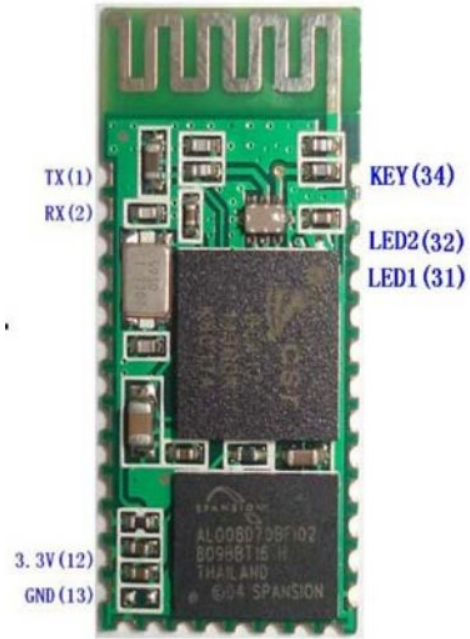
https://learn.adafruit.com/adafruit-mma8451-accelerometer-breakout/wiring-and-test

Microcontroller



http://www.banggood.com/Main-Chip-ATMEGA328-IC-Chip-For-DIY-M328-Transistor-Tester-Kit-p-966305.html
http://www.atmel.com/images/atmel-8271-8-bit-avr-microcontroller-atmega48a-48pa-88a-88pa-168a-168pa-328-328p_datasheet_complete.pdf

Bluetooth



HC-05 Bluetooth module

- Master and slave in one module
- V2.0 protocol standards
- Working voltage 3.3V
- Onboard regulator
- Default Baud Rate 9600

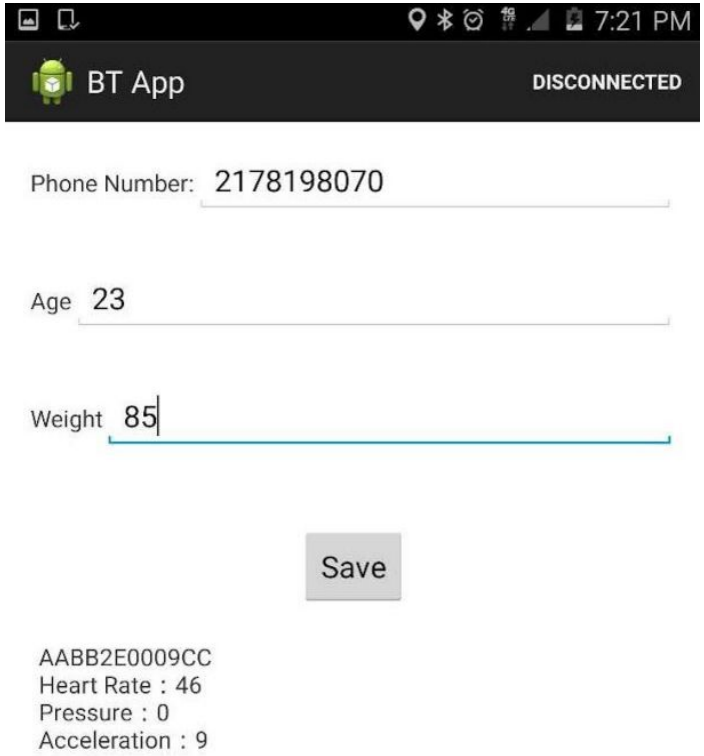
http://www.tec.reutlingen-university.de/uploads/media/DatenblattHC-05_BT-Modul.pdf

Connection with Microcontroller

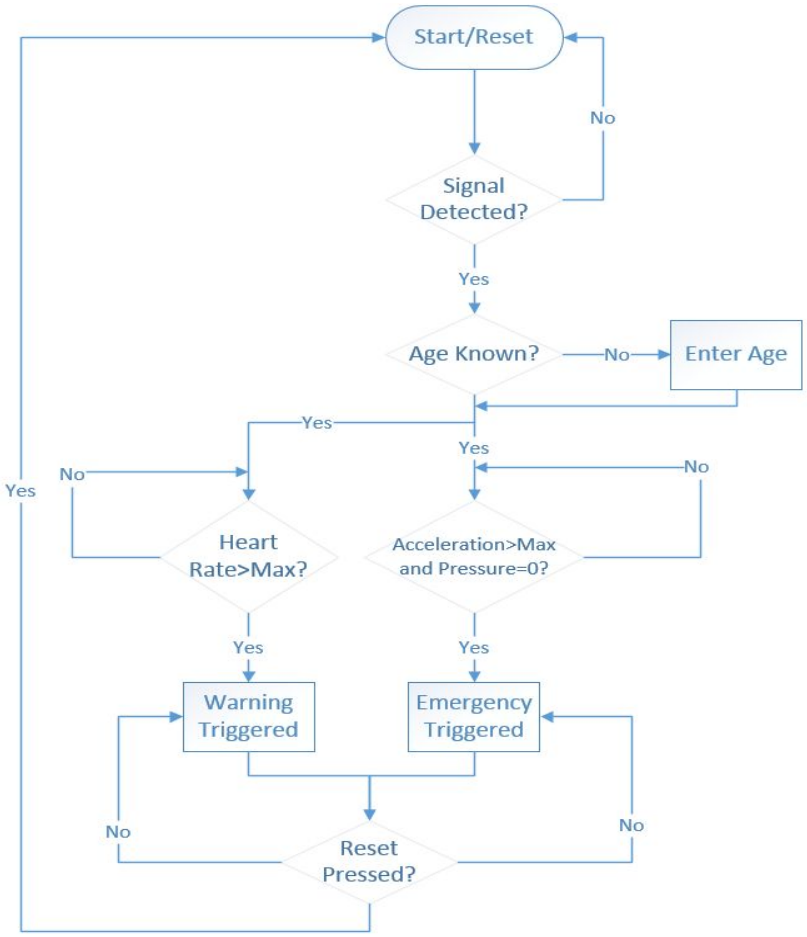
ATmega328p	HC-05
5V	Vcc
GND	GND
D11	Rx
D10	Tx

Communication with Smart phone

- Must write header “AABB” and tail “CC”
- Data length 6 Bytes
- 3 Bytes for sensors



Software Flowchart



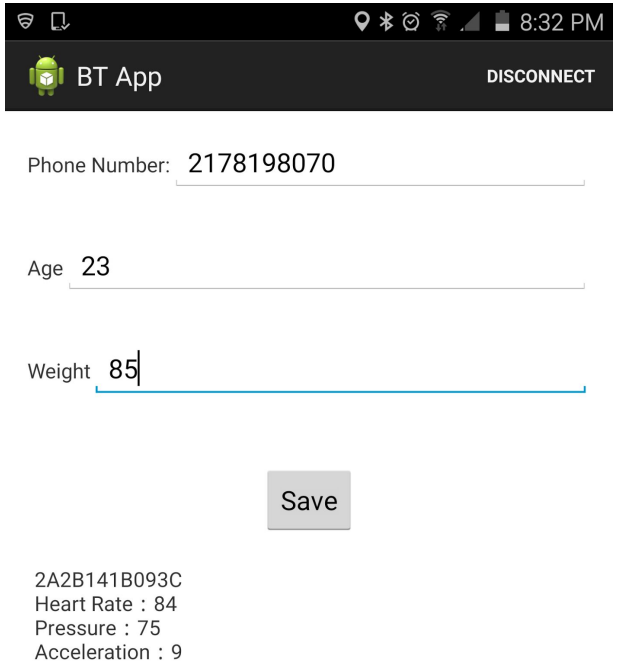
Smartphone App

- Communication with Bluetooth
- Analyze the information
- Enter the emergency contact, age and weight
- The maximum heart rate equation

Maximum heart rate = 211.415 - (0.5 * age) - (0.05 * weight in kg) + 4.5

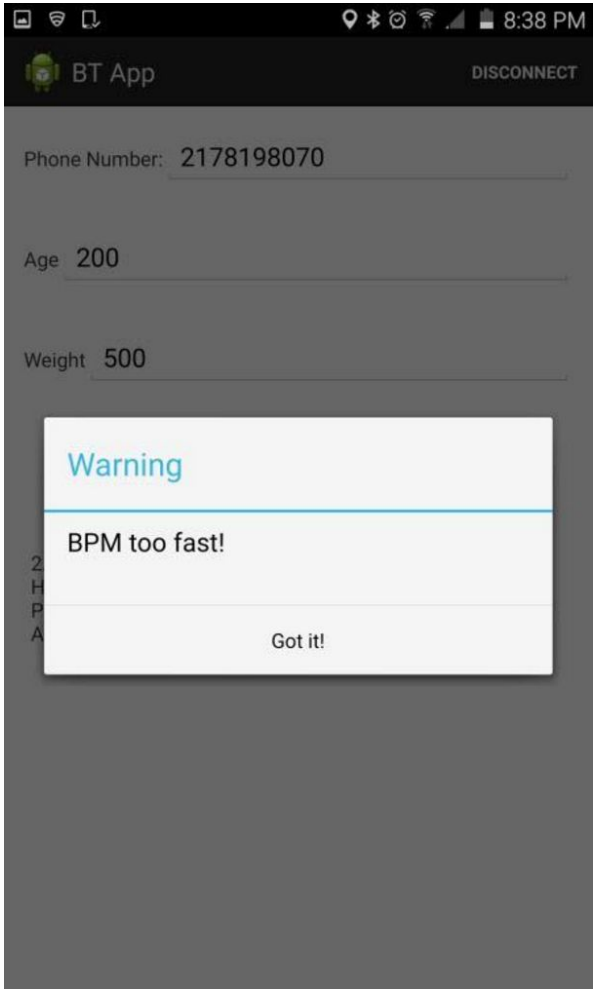
Real Time Data Transmission

- heart rate
- pressure
- acceleration



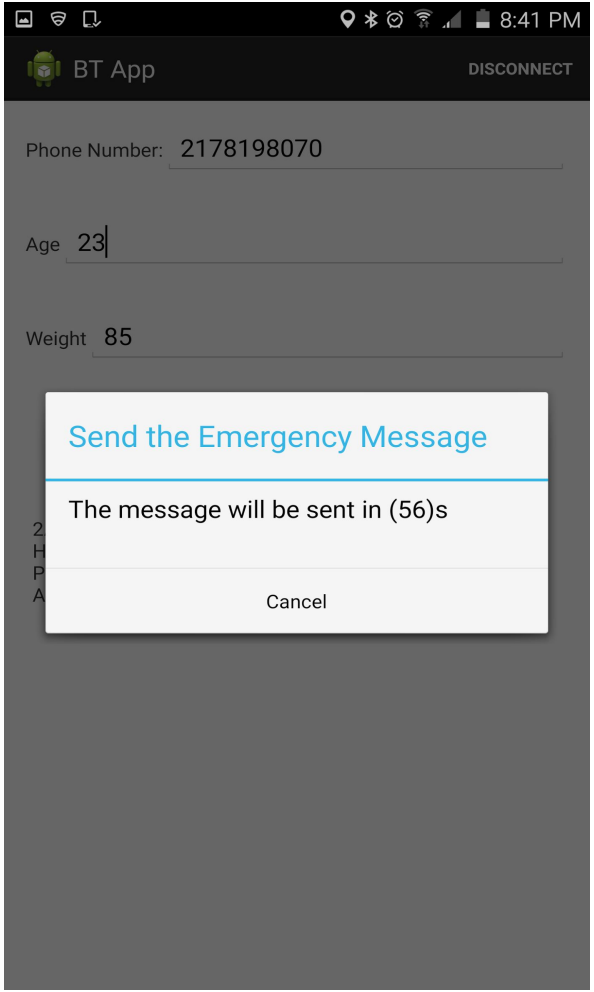
Warning Message

- Triggered when BPM above threshold

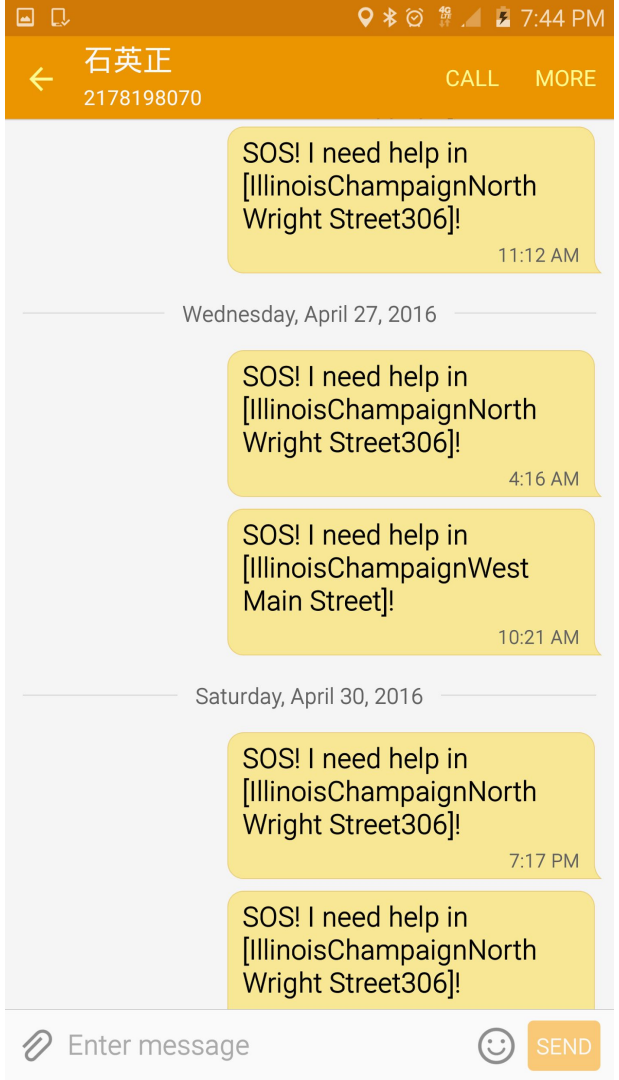


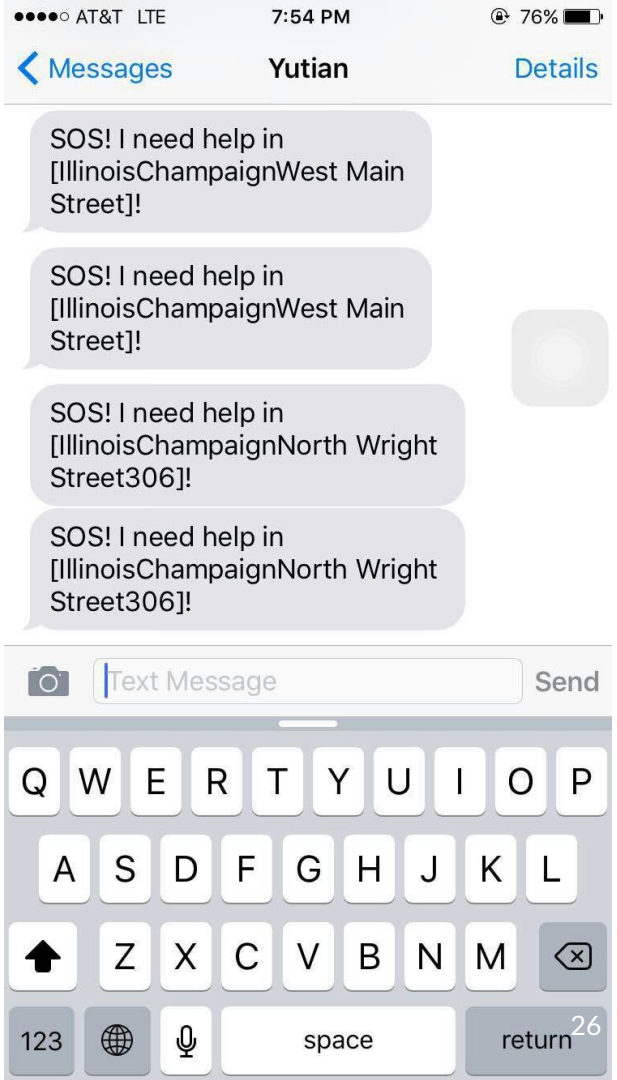
Emergence Message

- Texts message
- One minute delay
- GPS location



Text Message





Challenge

- Real time data transmission
- Android Phone App

Conclusion

- Real time data transmission
- Accurate data from accelerometer and pressure sensors
- Audio warning alert
- Emergency text message with location
- User friendly Android App

Future work

- Filter noise for pulse sensor
- Better integration of the wiring
- Increase the overall aesthetic of the bike
- Apple version of the App

Thank you!