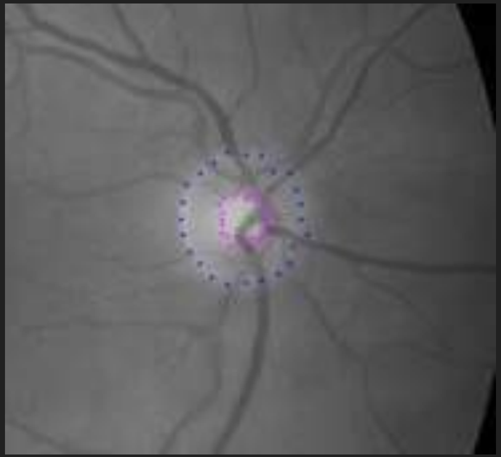
Glaucoma Evaluation on Retinal Images with Embedded System

Optic Disc and Optic Cup Center Detection → Optic Disc and Optic Cup Edge Detection Using Radial Lines → Shape Approximation and Area Calculation of Optic Disc and Cup

BLIP Development Board (Embedded System)



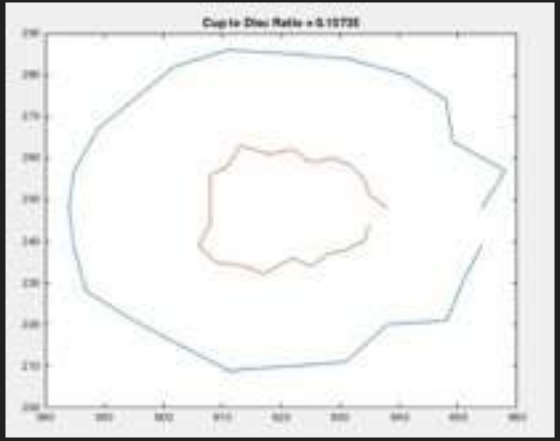
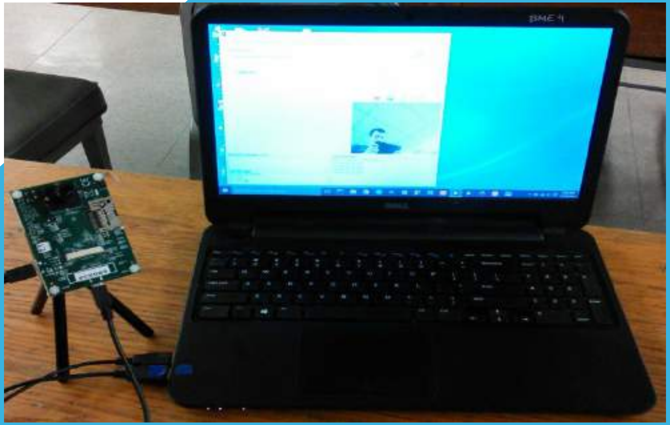


IMAGE-BASED EYE BLINK DETECTION USING EMBEDDED SYSTEM

Rory Makuch, John Paquet, Andrew Rosenberg

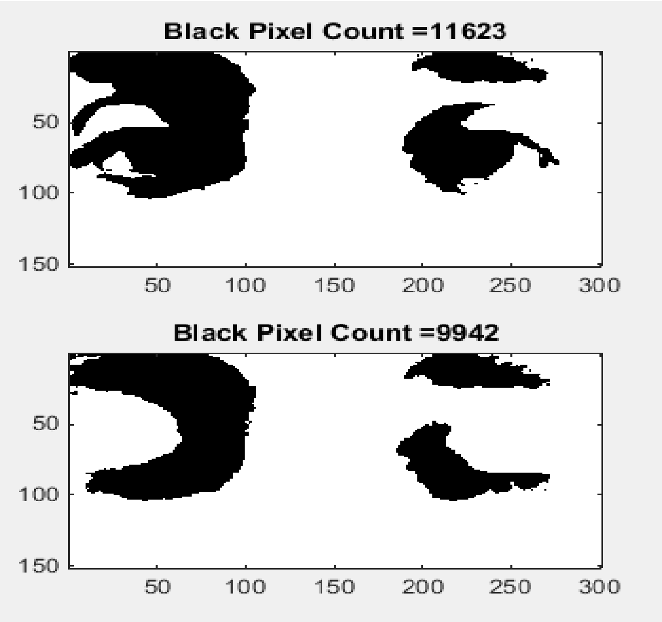


Normalizing images and converting them to grayscale to determine whether eye is open or closed

Processing image/video input from BLIP camera

Writing instructions in C++ to program the BLIP microprocessor

Potential applications and further research include alerting tired drivers and improving ability of people with spinal cord injuries to accomplish tasks



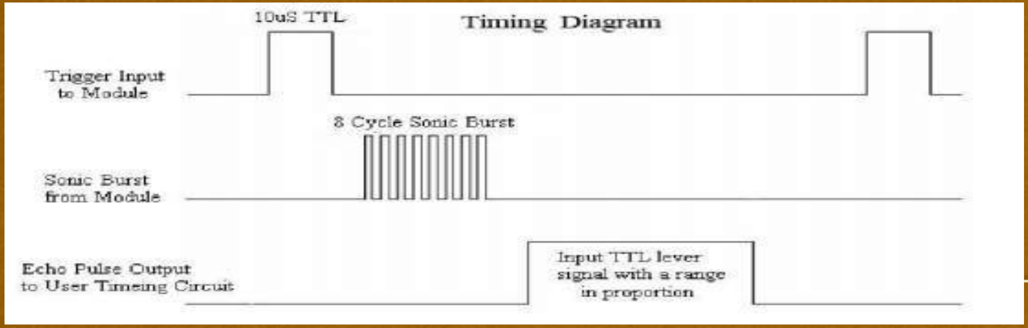
Black Pixel Count =11623

Black Pixel Count =9942

Height Measurements Using Ultrasonic Waves

Anthony Messina, Alexander Nguyen, Michael Heath

Goal: To create an affordable and portable device capable of giving quick and accurate height measurements.



Pros:

- Very quick and accurate height measurements
- Assist in determining BMI
- Cheap in comparison to other devices
- Accuracy within 2 cm

Cons:

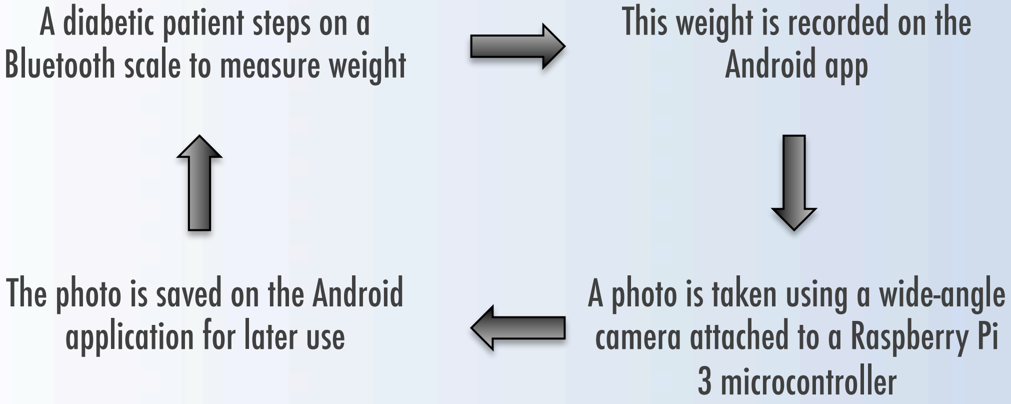
- Will not work if you are over 10 feet tall

Figure (a) and (b) 2 different measurements

diabeTECH

Michelle Bierman, Brian McHugh, Ryan Brown

- 29.1 million Americans have diabetes, 18.8 million have some form of neuropathy, 2.8 million develop foot ulcers
- DiabeTECH is an Android application designed to monitor weight and the progression of foot ulcers in diabetic patients who have peripheral neuropathy

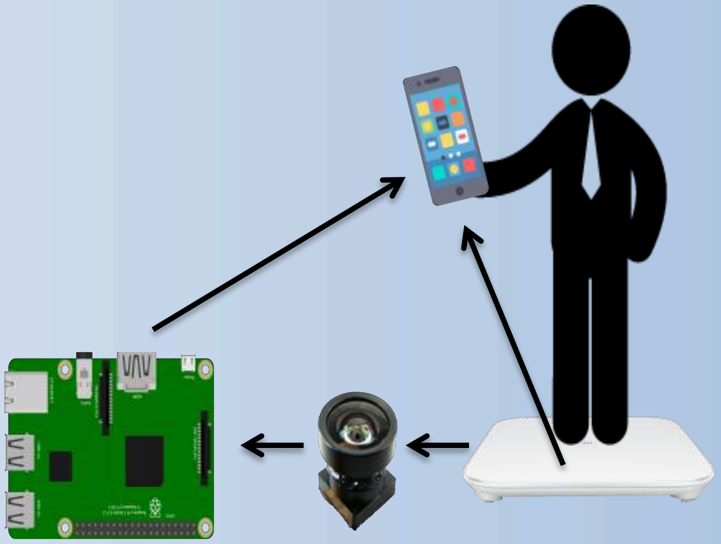


A diabetic patient steps on a Bluetooth scale to measure weight

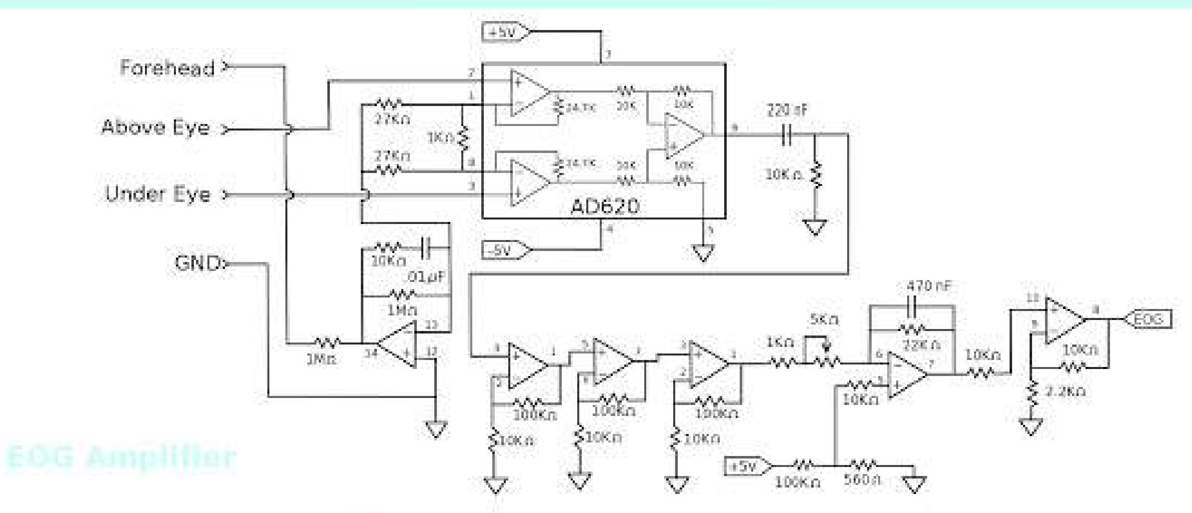
This weight is recorded on the Android app

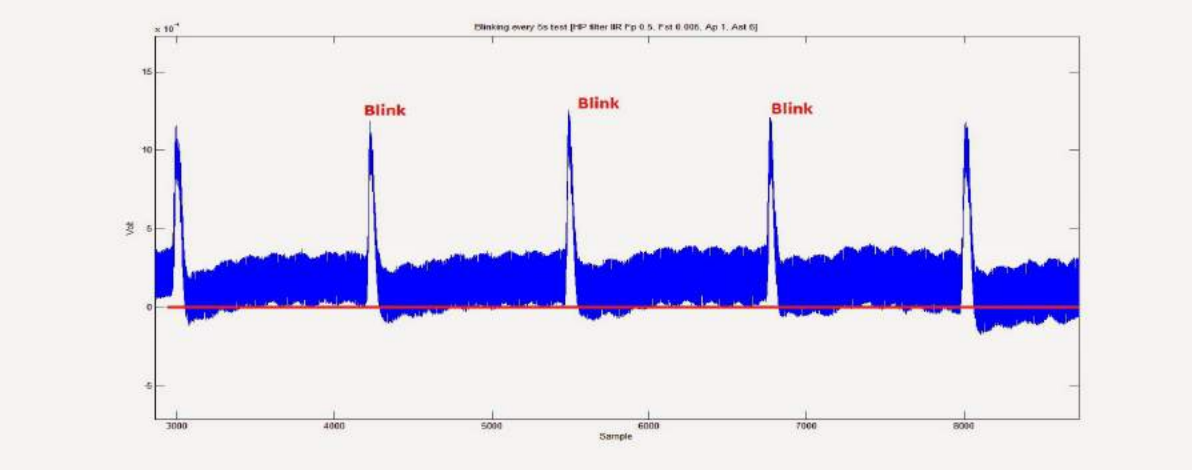
A photo is taken using a wide-angle camera attached to a Raspberry Pi 3 microcontroller

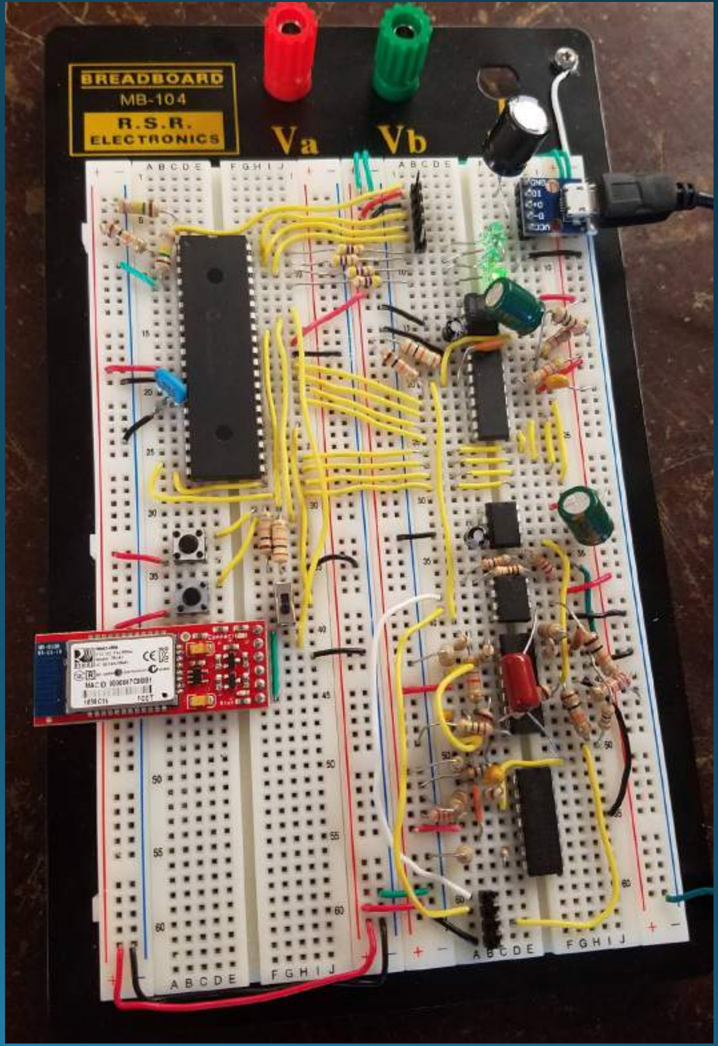
The photo is saved on the Android application for later use



Efficiently Differentiating Intentional from Unintentional Blinking Using Electrooculography







Testing Motion Detection With Tactile Sensors

Jack Donahoe Samuel Karnes Chris Morino

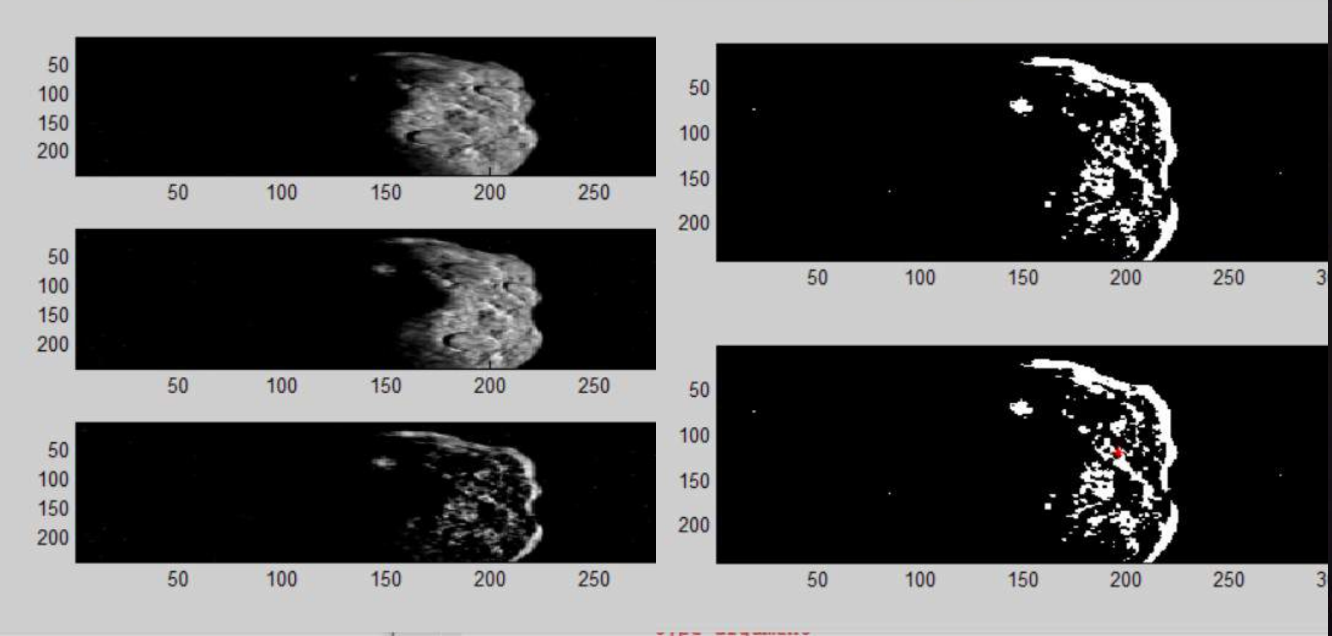
- **Objective: The goal of this project is to determine the efficacy of using vibrating motors to convey information about the size, speed, and direction of an object**

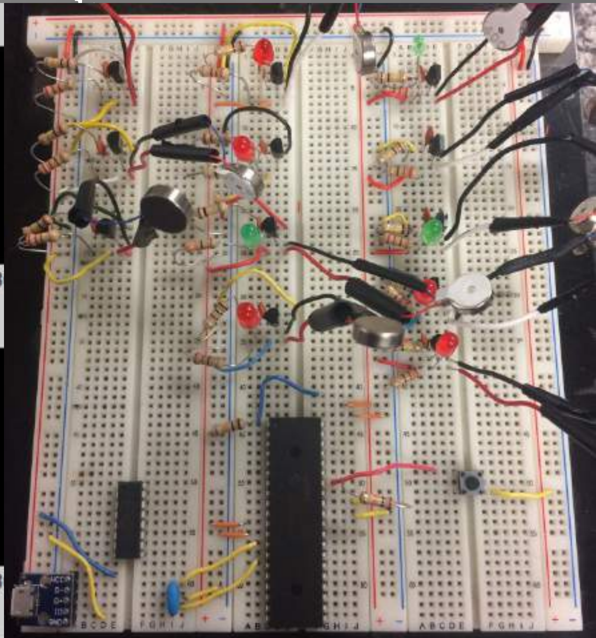
Progress:

- Developed motion detection algorithm
- Redesigned motor controls

Human Testing Procedure:

1. Training baseline
2. Randomly generating sequences





Characterizing Ankle Proprioception with Embedded Sensor Balance Board

Manager: Kelley Magill   Software Engineer : Ryan Buckley Hardware Engineer : Thomas Jancura

Aim:

- To decrease rehabilitation time for ankle injury patients
- Monitor real time data of the balance board direction and display to Android Application

Hardware:

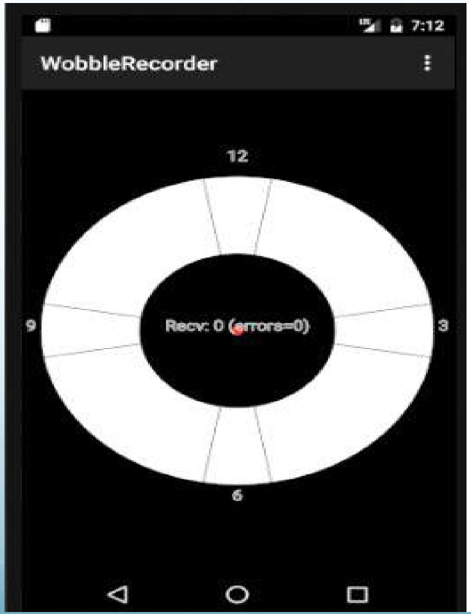
- Physical Therapy Balance Board with embedded circuit
- Arduino Nano
- Gyroscope

Software:

- Coded Arduino to process real time data from a gyroscope
- App for Android devices programmed through Android Studio

Future:

- IRB Approval for Human Subject Testing
- Recording of data in real time
- Assembly with a smaller design



Recv: 0 (errors=0)

Optimal Facial Placement of Customized Wearable PPG Sensor for Pulse-Rate Monitoring

Matthew Bailey, Colton Smaldone, Dr. Eugene Chabot, Dr. Ying Sun
Department of Computer, Electrical, & Biomedical Engineering, The University Rhode Island

PPG Sensor Prototype:

Objective:

Modify Pulse Sensor to be ideal for facial PPG signals

- -Amplification
- -Clarity/Consistency

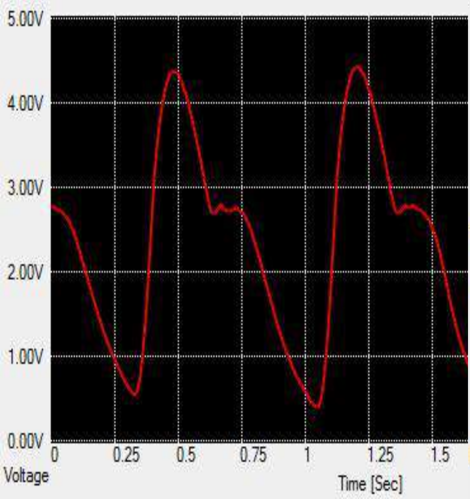
Methods:

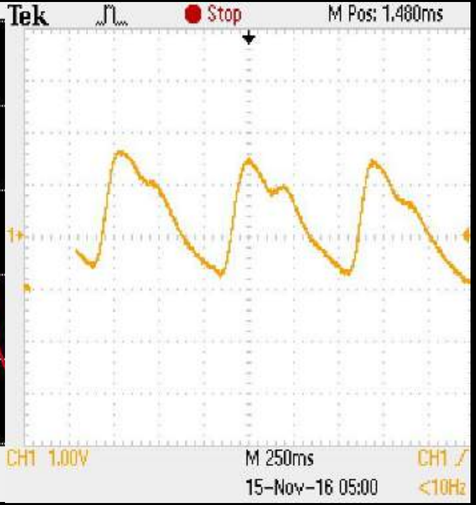
Multiple Gain Stages

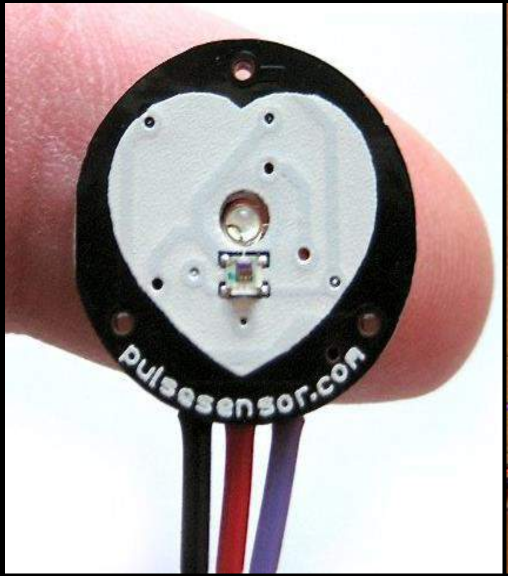
- -AD620 Instrumentation Amplifier (~20mV to ~1V)

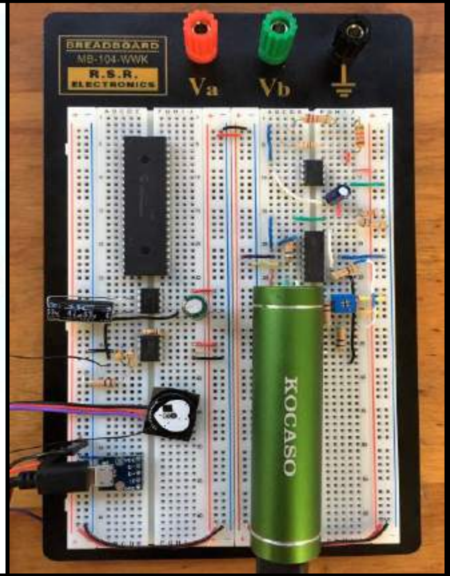
Analog Filters

- -High Pass, Low Pass, Bandwidth









Human Clinical Trials:

Objective:

With IRB approval, find ideal facial placement for most consistent and strongest signal

Methods:

Use prototype to determine ideal placement of PPG sensor

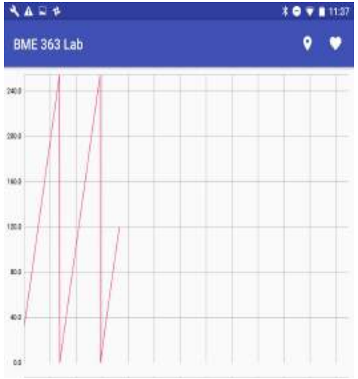
- -5 different locations, finger as reference
- -3 minute intervals
- -30 minute sessions
- -20 different people
- -Recorded with PIC18F4525

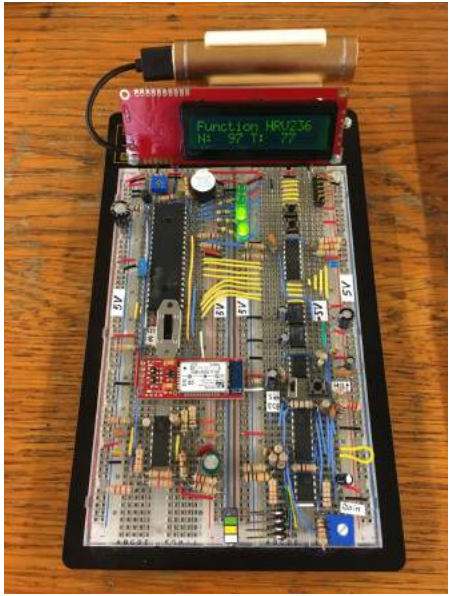
Why:

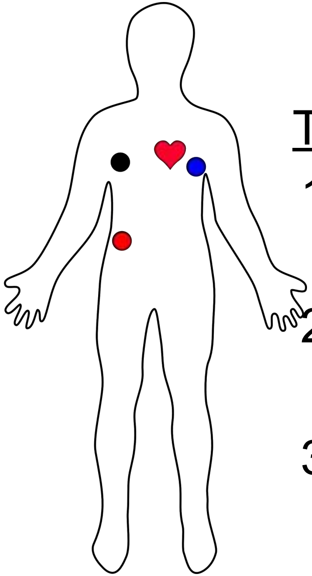
- -Finger is not always available
- -Provide insight for future wearable sensor applications (ex: bPASS)

HRAge: Determined through HRV by Valsalva Maneuver

- Uses PIC microprocessing
- Information displayed on LCD screen or on an android device over bluetooth







<u>To use the device</u> -

1. Attach leads to the participant in the fashion depicted to the left.
2. Breath normally during the fifteen second testing period.
3. Execute valsalva maneuver during the fifteen second testing period

Lil’ Rhody Riders

Objective: To implement an automatic collision avoidance system and other safety features into a ride-on car for children with disabilities

Automatic Collison Avoidance System

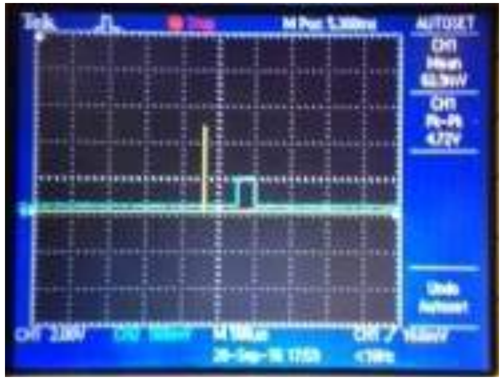


Figure 1. input pulse and output ultrasound response

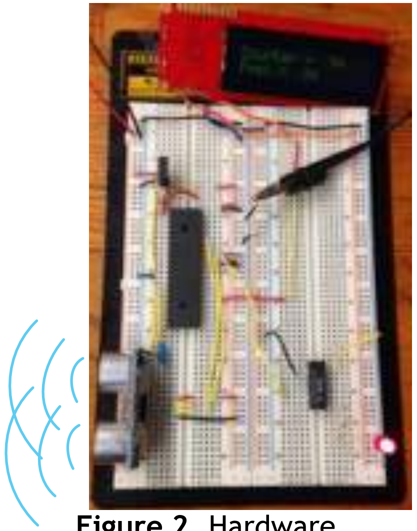
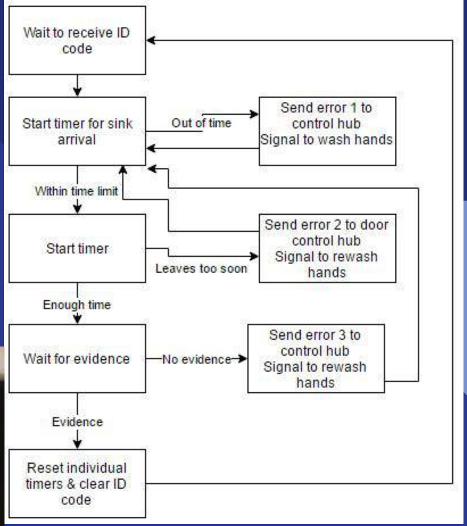


Figure 2. Hardware implementation of the ultrasound and LCD display with PIC

Future work : Incorporate parental control and feedback via Android App interface and Bluetooth

Tracking HealthCare Professional’s Hand Washing to Ensure Patient Safety



Wait to receive ID code

Start timer for sink arrival

Out of time

Send error 1 to control hub
Signal to wash hands

Within time limit

Start timer

Leaves too soon

Send error 2 to door control hub
Signal to rewash hands

Enough time

Wait for evidence

No evidence

Send error 3 to control hub
Signal to rewash hands

Evidence

Reset individual timers & clear ID code

Objective: To design a system to track the hand washing habits of healthcare professionals to prevent the spread of interpatient diseases.

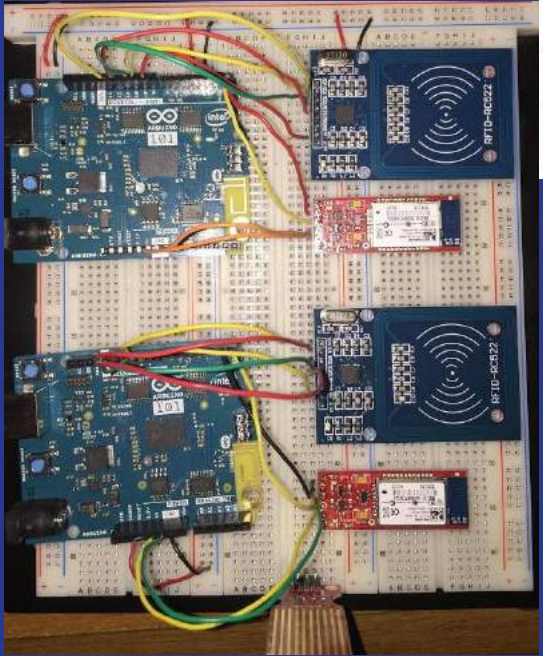
Methods:

Monitor:

- Radio-Frequency Identification (RFID)
- Arduino 101 Programmed to monitor
- Evidence through time, sensors. and position

Communication:

- Bluetooth to hub control at the door
- Door monitor relay to control station

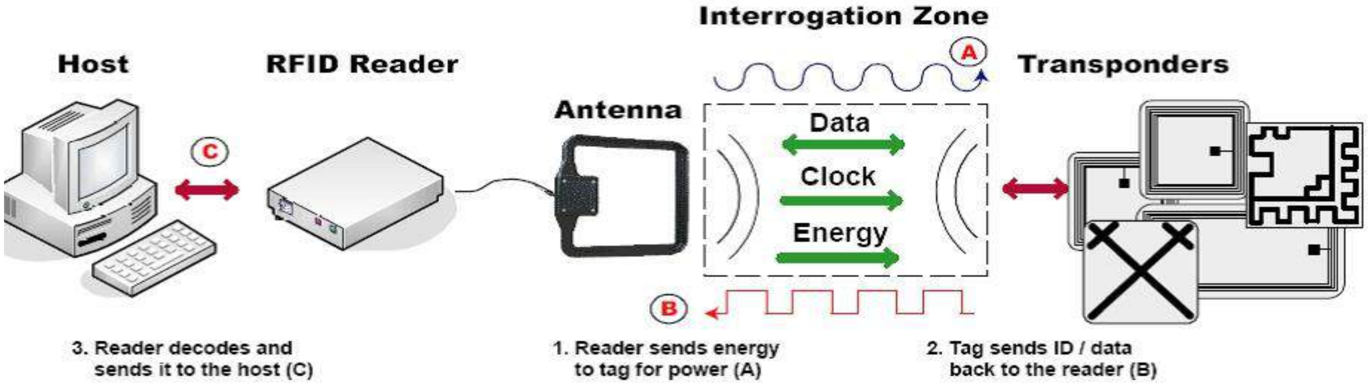


Results: Able to track an individual and detect if their hands were washed properly.

Goals: To track multiple individuals at a time.

Jacques Dorval, Tou Khang, Esteban Tamayo

Tracking Patient Movement in a Hospital Environment by use of RFID



Designed a Radio Frequency Identification tracking system using the Mifare RC522 card interrogator and an Arduino Uno. RFID tags containing patient information communicate with the RFID reader using radio waves, similar to the functionality of a barcode. By reading and logging these tags at specific doorways, medical facilities can have an active record of their patients locations.

Josh Powers, Mike McAfee, Rob Thottam

Magnetpeutics

Alex Gianos,
Rachel McAteer,
Daniel Wec

Objective:

To create a lightweight and comfortable Transcranial Magnetic Stimulation Helmet, that can be worn for extended periods of time, in order to make therapy home-based and more convenient for the patients.

Methods:

- Magnet Housing

Past design changed and improved upon via SolidWorks and 3D-printed.

- Magnets

Each magnet is a N52 neodymium disc (ranging from 1.45 to 1.48 Tesla) that is 1” in diameter and ¼” thick.

- Motor Control

Each motor has a specific resistor which allows approximately 2 rotations per second in “fast” speed or 1 rotation per second in “slow” speed.

Results:

- Developed a working proof-of-concept prototype.
- Improve upon this design, making the helmet lighter in order to begin clinical trials.

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