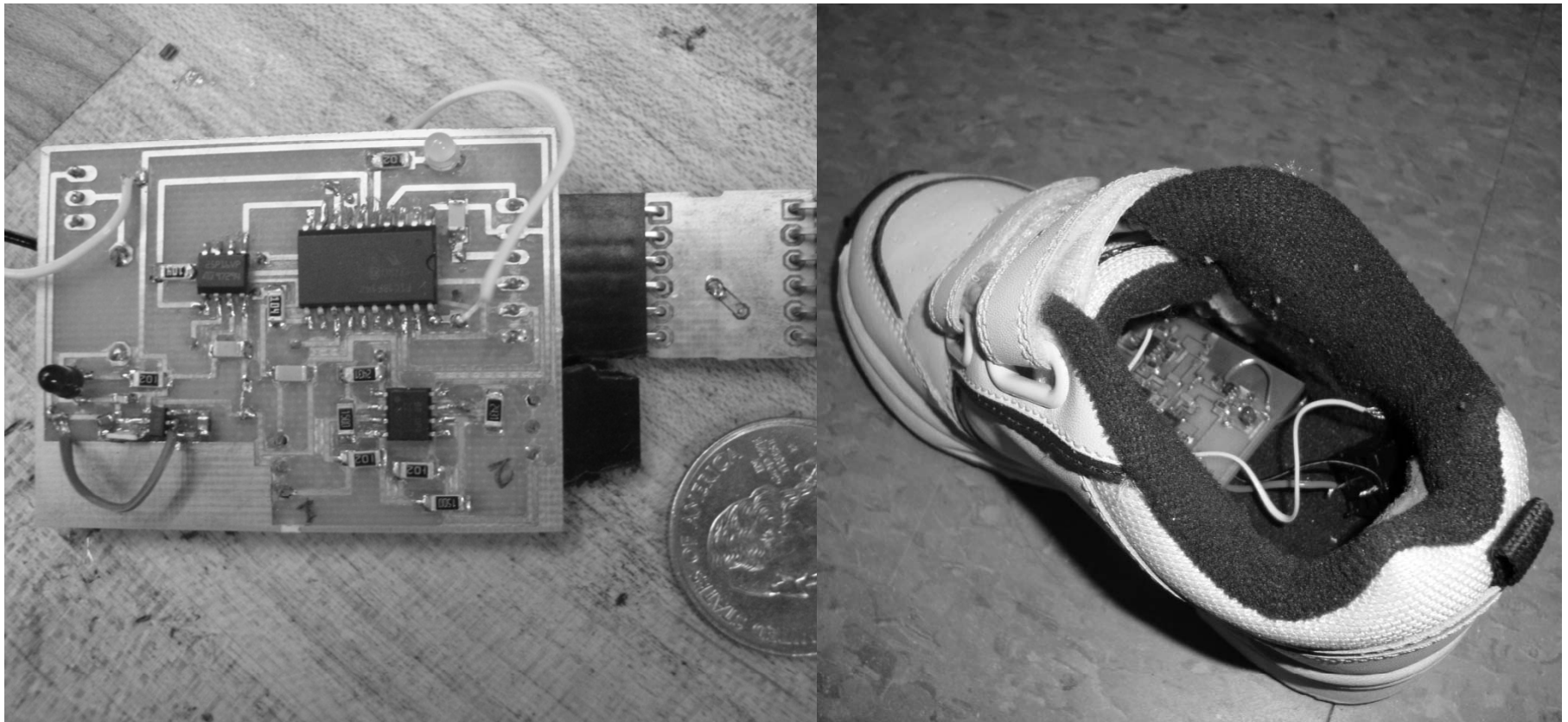


Pediatric Dynamometer Using Piezoresistance Sensors



Logan Osgood-Jacobs: Engineering, Swarthmore College
Jay Zemel: Electrical and Systems Engineering, University of Pennsylvania



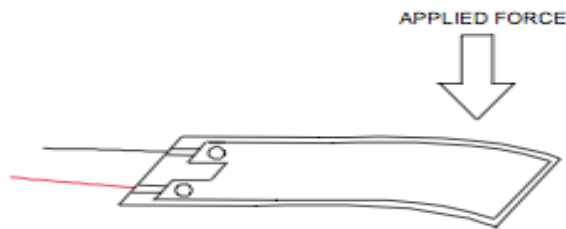
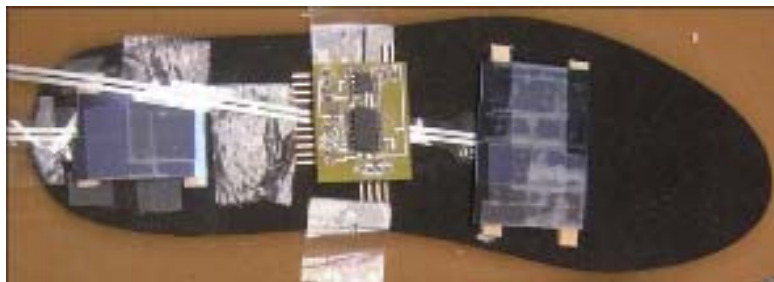
SUNFEST 2010

Need for the Pediatric Dynamometer

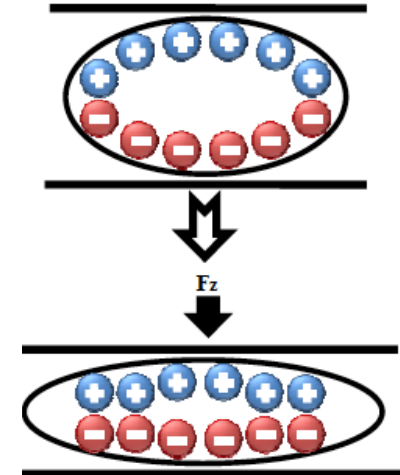
- Bone growth and Development
 - Bone disease is a prevalent cause of injury
 - Bone is developed primarily in childhood
 - Impact of exercise on bone density
- Current ways to study bone growth and development
 - Survey Data
 - Accelerometer
 - Force Plate



Past Work

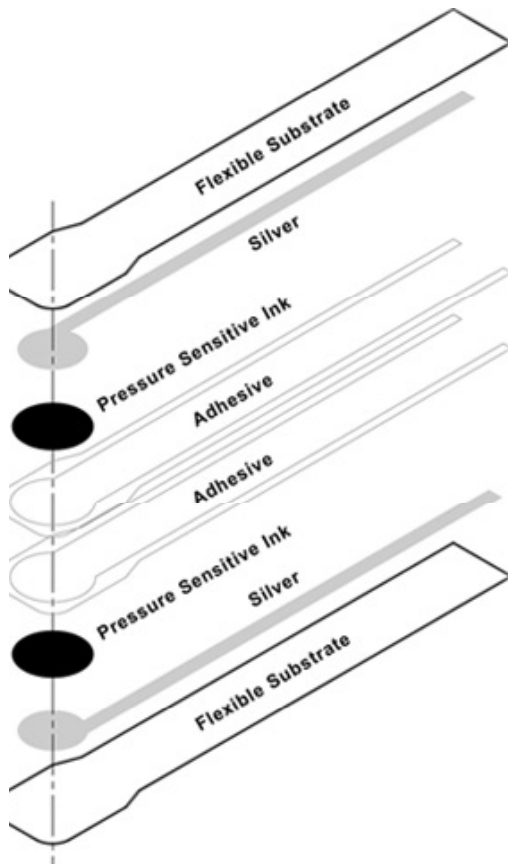


➤ PVDF Sensor



➤ Piezoelectret Sensor

Piezoresistance

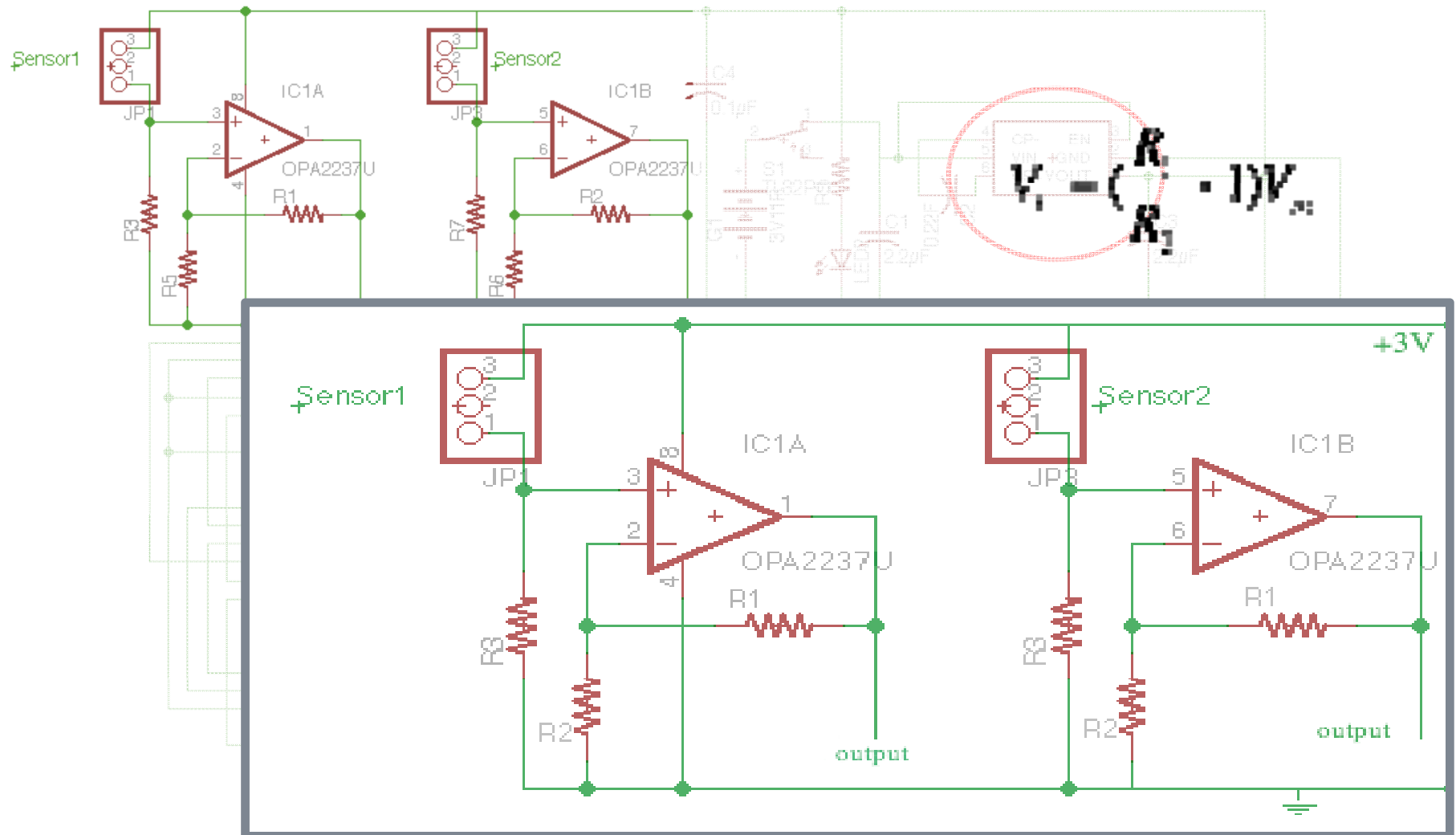


- Change resistance based on applied mechanical stress
- Made using a variety of metals and silicon
- Change in conductance is linear with force

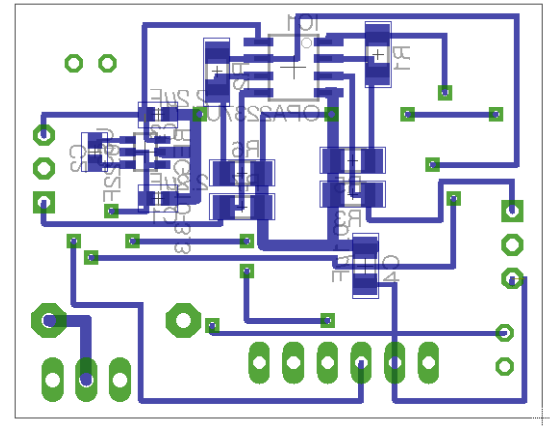
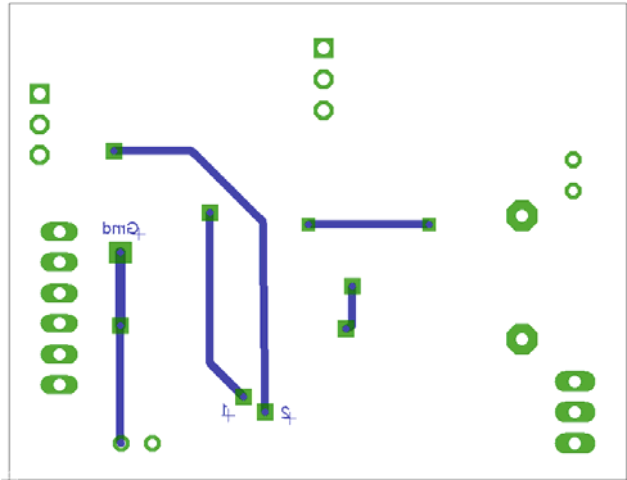
Goals

- Build a working circuit that is as small as possible.
- Modify the existing microprocessor program to take the necessary data and relay it to the computer.
- Calibrate the sensor.
- Modify the existing user interface to work with the new system.

Circuit Design

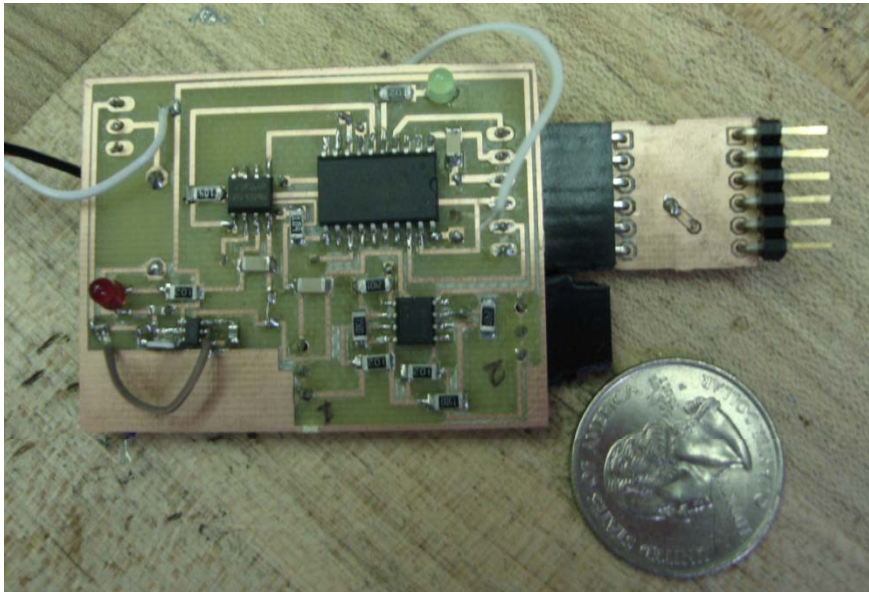


Circuit Layout

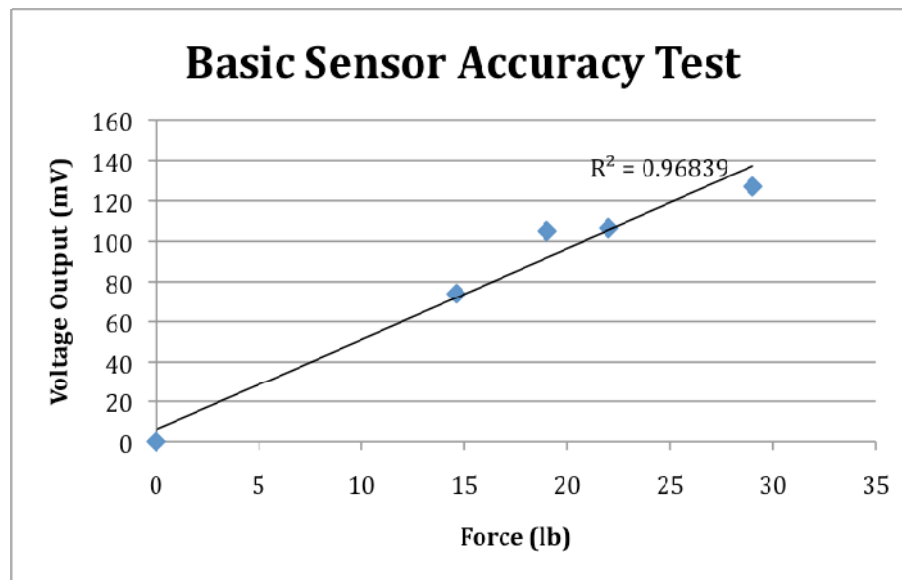


Device Construction

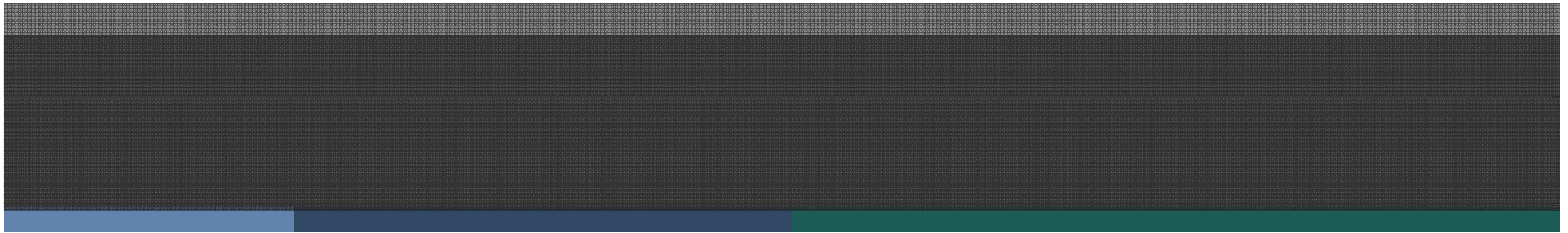
- Developed a protocol to use LPKF circuit board plotter
- Solder components to board



Testing

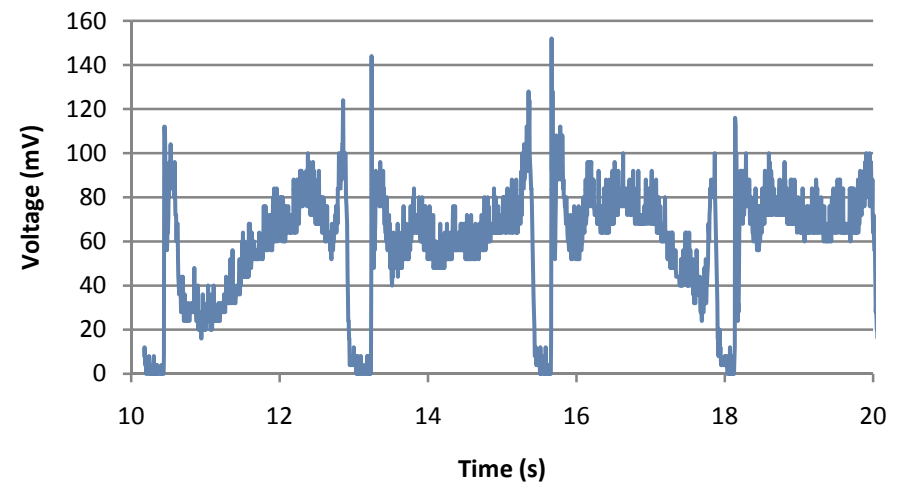
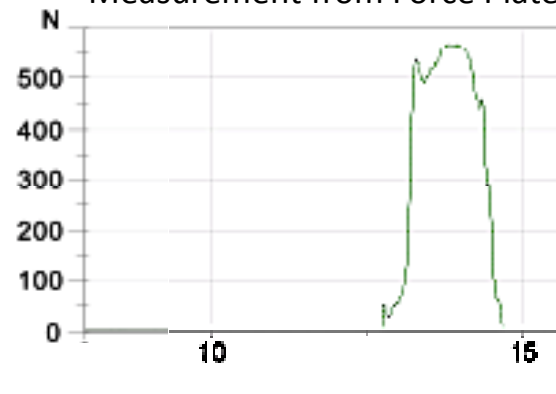


- Verification of sensor viability
 - Accuracy
 - Temperature Sensitivity
- Preliminary Device Walking Test

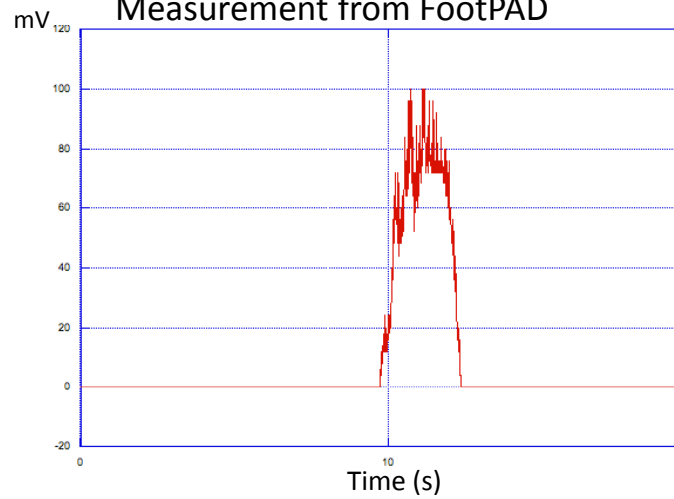


Jump Test

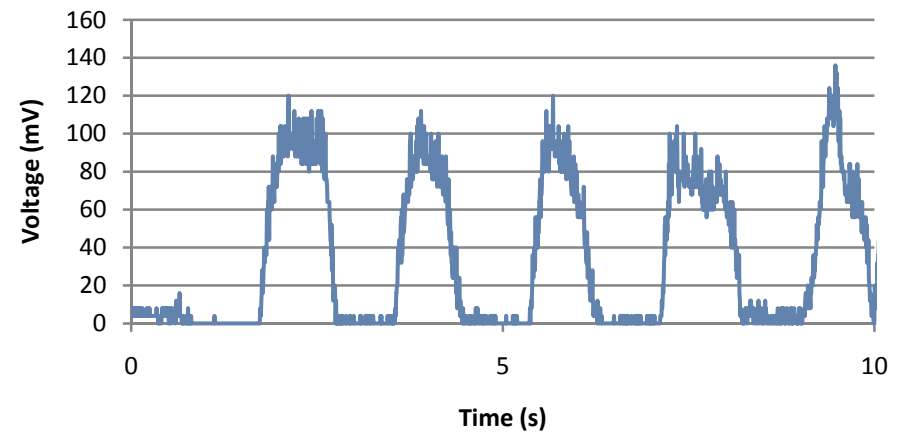
Measurement from Force Plate



Measurement from FootPAD



Walking Test



Conclusions

- Built a working circuit
- Modified existing software
- Demonstrated potential for the device



Future Work



<http://www.iofbonehealth.org/patients-public/more-topics/bone-development-in-young-people.html>

- Software
- User Interface
- Shoe Integration
- Device Testing

Acknowledgments

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➤ Sanket Doshi

➤ Dr. Van der Spiegel



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WHERE DISCOVERIES BEGIN

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