Prototype: Break Forcing Chair

Brief Description: This device will be a part of a work chair to ensure that someone does not sit all day for extended periods of time. It will log and monitor how long someone has been sitting all day and forcefully make them take breaks to walk around.

How participants will interact with the system?
- It will have a pressure sensor in the seat that will register how long someone has been sitting, after a given amount of time, a buzzer will sound until someone stands. It will go into a "timeout" where you cannot sit in the chair until the amount of time has passed or the buzzer will go back on.

How it meets the criteria:
- It will be electronic by using a pressure sensor to detect that a user is sitting down, and it will also require a buzzer and a basic arduino board.
- It will have a bridge for the wires, printed out by the 3D printer
- It will include an actual chair to attach to.
- It will have the code to monitor and log the amount of time someone has been sitting as well as the code to have it buzz

How it will be evaluated:
- We will be able to monitor the code by attaching a computer to our logic board and watch to see that it is correctly monitoring the 'sit time' as well as turning the buzzer on and off at the correct times.

Budget:
- Aside from the criteria budget (user incentive, spray adhesive, board, and poster) it will be built using a Lilypad system (assuming our pressure sensor works with it) with supplies, office chair, and various other necessities
    - Needed Parts:
        - Force Pressure sensors (4) $34.75
        - Office Chair $35
        - Alligator Clips $2.95
        - Conductive Thread $2.51
        - LilyPad FTDI Basic Breakout $12.71
        - LilyPad Buzzer $6.76
        - LilyPad LEDs $5.06
        - Arduino Mainboard $16.96
        - LilyPad Protoboard $5.91
        - Force Sensitive Resistor $31.80
    Total: $157.36
    Limit: 4 x 75.00 = $300.00

How people will interact with it at the expo:
- People will be able to view it in action
- At the expo, people will be able to sit down and have the chair "buzz" at them. We can set the timer to a really short interval for our tests.

Tutorials:
Pressure Sensor Tutorial: https://www.sparkfun.com/tutorials/389
Pressure Sensor with Sound:
http://www.instructables.com/id/Sound-Pressure-sensor-for-Arduino-based-on-ZX-soun/

Project Proposal

When a worker is sitting in the office, they tend to remain sitting in their chair for a length of time that is not healthy for their body. It is more beneficial for a person to get up and move around than to simply sit in a chair for a matter of hours. Our goal is to create a chair that alerts people when they have been sitting in a chair for too long. This will be done in two ways. The first will be a sound buzzer that will be connected to a pressure sensor. When the pressure sensor goes over a threshold, that we set, the sound sensor will continuously alert the person until they have moved out of their chair for a certain length of time. Our second way of dealing with this problem is through light sensors. The light sensors, which are also connected to the pressure sensor, will alert the user of how long they have been sitting in the chair by lighting up at certain intervals. The different colors of the lights will indicate a certain interval of time to notify the user of how much time has passed.

· **Problem Statement**: People typically remain seated in their chair for a period of time that is not healthy. These people need to stand up more and move around.
References:
http://apps.washingtonpost.com/g/page/national/the-health-hazards-of-sitting/750/
http://www.mayoclinic.org/healthy-living/adult-health/expert-answers/sitting/faq-20058005
http://www.huffingtonpost.com/2014/08/29/sitting-health-risks-_n_5692271.html
http://www.telegraph.co.uk/health/dietandfitness/10913737/Stand-up-three-hours-a-day-for-benefits-of-ten-marathons-says-top-medic.html

Summary: As the article "The Health Hazards of sitting," by Bonnie Berkowitz and Patterson Clark states, sitting can have detrimental effects on the health of person. From aspects of the mind to the organs and bones, sitting for too long can lead to

weaker body which will struggle in the long term. The visuals that are shown and described and shown in the article reflect how sitting does not help muscles and bones and thus hurts internal organs and causes long term harm. In the MayoClinic web article, "What are the risks of sitting too much?," James A. Levine writes "Researchers have linked sitting for long periods of time with a number of health concerns, including obesity and metabolic syndrome. (Levine 09)" James Levine then goes on to write that "sitting for too long can be related to heart and cardiovascular disease. (Levine 09)" Many individuals, such as Judy Gruen whose story is told in the 2014 Huffington Post article "The Health Risks of Sitting too much," are attempting to become more active as they read about more research everyday pointing towards health risks associated with sitting for too long. As Dr. Mike Loosemoore states in Miranda Prynnes Telegraph webarticle, "being on your feet for three hours, five days a week, is as effective as running ten marathons a year and can extend life by two years. (Loosemoore 2014)" What these articles are all pointing too is the health risks associated with sitting for too long and immense positives that come with standing for over three hours a day as well as exercise.

Timeline: JS->Jacob Senitza TP->Taylor Payne DO->Daniel Olsson KY->Kourtney Yamafuji
10/16 Website Started: JS and TP
10/19
10/21 Begin research and development of Arduino Code (will be based off hardware we know we will have and need): JS and TP
10/23: Begin Status Report (outline presentation, research, findings, website): KY
10/26: Update Website with weekly findings, Continue status report presentation: DO
10/28: Finish Status Report: DO (begin building design with material we have)
10/30: Status Report Due/Begin drafting protocol: DO
11/2: Update Website with weekly findings: TP
11/3: Draft protocol due
11/4: plan out logistics for User Study DO
11/6: Assess errors and reconsider new ideas for aspects of design
11/9: Update website with weekly findings KY
11/10: Finish protocol: JS
11/11: Logistics Due
11/13: Begin poster design KY
11/16: Update Website with weekly findings JS
11/17: Poster Draft Due
11/18: Demo/Begin final draft of protocol: TP
11/19: Final Protocol Due
11/21:
11/23: Update Website with weekly findings DO
11/24: Evaluate Demo and Design (group collaboration) JS
11/25: Implement changes TP

11/27: final design should be prepared or in final stages of preparation KY
11/30: Update website with weekly findings TP
12/1: Demo for class
12/2: Prep for expo
12/4: prep for expo
12/6: expo
12/7: Update Website with final findings (include expo pictures, comments, final report!!!!) KY
12/11: instructable/ peer review

Management- We elected to have Jacob act as our team leader. That being said, we will talk through all decisions as a group.

We will be communicating through a google doc that will hold all documents that we create or need to complete this project. An app called GroupMe will be our long term communication for chatting about key topics. We will avoid using texting and email. We will primarily coordinate meeting times based around class and weekends. Meetings times, however, are to be determined.

Exposure: The main exposures for this project will come with either hardware or software. The main issue that we are concerned with is that the pressure sensor may or may not be compatible with Arduino or the lilypad. If this is the case, we will look into new hardware to replace the lilypad board or new software to replace Arduino.

Implementation Environment and Rationale: need a fritzing diagram
We will be using Arduino C, Ardublocks, and lilypad material. Prototyping will go through many phases in which we determine how our chair will work with the designs we create. Since users would use this design regularly, this will take a long term effort in assuring that the final design does not hurt the user's ability to get things done and not have the design get in their way.

Budget Estimate: Our total planned budget is $300 total. That will be $75 per team member. The total cost of our hardware is currently $157.36. We will also purchase a pad to insert our device in.

Evaluation: For this to successfully run we will be able to run the chair through an infinite amount of sit/break periods. The code that we will be running will never require a reset during its runtime duration. For us to consider this a successful run, we will need to ensure that all variables reset by themselves at the end of the given "break" periods. We will need to conduct studies and tests with at least 6 users. During the test cases with these users, we will help guide them in an attempt to foolproof our code to make sure that it cannot be broken or exploited . We will need to have our arduino module connected to a pc to monitor

the system variables during the user tests. Someone will be in charge of instructing the user what to do, while we will have someone else taking notes, and monitoring the variables. The final person will ensure that the materials and pad are registering the user correctly. In order for this to be a successful evaluation, we will need to be at the final stages of our coding, and the user tests will help us ensure that it is not able to be exploited as stated before.