

Periodic measurement of nighttime weight change while asleep

Week: December 1 – December 8

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Team: Kyle Herzog – Team Leader
Ben Engel – Communications
Joe Ferris – BWIG
Eric Printz - BSAC

Problem Statement

We would like to be able to measure this weight change accurately on people who are in hospital beds, and be able to view and record the weight changes over various intervals through the night (such as weighing a person who agrees to lay in bed all night at intervals of every 10-15 minutes). This is important from a research perspective on numerous potential variables that may affect this weight change, such as medications as well as sleep stage changes. We would also use this to potentially track and eventually predict those at higher risk of developing obesity, correlate with body fat measurements, activity, and assess for metabolic changes when we do things to improve/correct sleep problems. There is popular concern in the most recent sleep literature about various sleep stages, insomnia, and their impact on obesity. This scale would likely have to support a hospital bed, which sits on 4 legs, and read at an accuracy ideally around 0.02- 0.05 lbs (many scales on the market record to such accuracy, the more accurate the better). I'm not sure how the zeroed weight of the bed would affect this. Ideally it would be a device we could move to a different bed without too much difficulty (such as in 1-2 hours time), without too complex recalibration.

Last Week's Goals

- Build amplifier circuit
- Write computer program to put weight values into Excel
- Put together entire prototype
- Test and calibrate load cell
- Complete Poster for presentation
- Meet to practice presentation
- Final Poster presentation on Friday
- Begin work on final paper and notebook

Accomplishments

- We met on Saturday morning at ECB to begin work on the poster, build the amplifier circuit, and put together our entire final prototype. Eric built the ideal amplifier while Joe and Kyle worked on the poster. Eric completed our first circuit, but when we tested it there was no amplification of the signal! We also bought the materials to make an alternate circuit that is not as compact and organized but nonetheless accomplishes our goal. We quickly built this circuit using the breadboard provided by Professor Block. This circuit worked and we were able to see the load cell operating on the DATAQ software on the laptop.
- Eric has had previous experience writing simple computer programs so he wrote a program that takes readings from the load cell at chosen intervals and import them into an Excel file. We tested the program and it worked to perfection. We slightly altered it so that it gave readings in pounds instead of volts. The conversion from volts to pounds was found using some weights we borrowed from a physics lab to calibrate the load cell.
- We met again on Monday night to finish up work on the poster and attempt to put together our final prototype again and make sure it functions properly. We spent about an hour putting the final touches on the poster, which Kyle then had printed at the CIMC on Tuesday. We were able to put the circuit together correctly again and the entire prototype appears to be functioning without any problems. When we placed known weights on the load cell it gave values that were accurate to about 10%. This is nowhere near as accurate as we would like, but our load cell is a very low quality load cell so this is to be expected. When a 1.1 lb weight was placed on the load cell a reading of about 1.19 lb was obtained.
- We will meet on Thursday night to run over our presentation several times and ensure we will be ready come Friday's presentation.

- We will also divide up the work for the final paper on Thursday night and then meet over the weekend and early next week to complete it. We would also like to schedule a meeting with Dr. Juergens at some point next week to give him a more detailed presentation of how our design works and answer any questions he may have.

This Week’s Goals

- Complete work on final paper
- Meet with Dr. Juergens
- Meet with Wally
- Complete peer evaluations
- Complete work on design notebooks

Difficulties

- The price of a precise enough load cell continues to be a problem

Successes

- We have completed our prototype
- We have begun the process of putting together our prototype.
- We were able to obtain a reading through the ADC
- We have a program that exports the weight readings to Excel
- Our presentation is ready and we accomplished all of our goals we set earlier in the semester

Team Effort

TEAM	WEEKLY ACCOMPLISHMENTS		
Joe Ferris	Team Meeting, Individual Work, prototype construction, prototype testing, poster work		
Kyle Herzog	Team Meeting, Individual Work, prototype construction, prototype testing, poster work		
Ben Engel	Team Meeting, Individual Work, prototype construction, prototype testing, poster work		

Eric Printz	Team Meeting, Individual Work, prototype construction, prototype testing, poster work		
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Project Schedule

TASK	SEPT			OCT				NOV				DEC		
	8-15	22	29	6	13	20	27	3	10	17	24	1	8	15
PROJECT WORK														
Brainstorming Ideas														
Research														
Designing Prototypes														
Choosing a Prototype														
Obtaining Materials														
Building Prototype														
Testing Prototype														
Modifications														
COURSE DELIVERABLES														
PDS														
Mid-semester Report														
Mid-semester Presentation														
Final Report														
Final Presentation														
Weekly Reports														
Notebooks														
MEETINGS														
Team Meetings														
Client Meetings														
Advisor Meetings														
BSAC Meetings														
OTHER														
Web Page														
Special Lectures														

Expenses to Date: \$118

- DATAQ computer software: \$25
- Aerocon 44 lbf load cell: \$25
- Digital Scale: \$25
- 9-V Battery: \$4
- Nuts and bolts: \$4

- Amplifier \$5
- Parts for circuits: \$30