

Sleep Apnea Therapy Device – Progress Report #5

Client: Dr. John Webster

Advisor: Dr. Megan McClean

Team Members: Calvin Hedberg, Taylor Karns, Jen Rich, Ben Mihelich

Date: Feb 17th – Feb 23rd, 2017

Problem Statement

Clinically significant sleep apnea is a sleep disorder characterized by interference of breathing during sleep. Those who suffer from sleep apnea experience interrupted sleep which develops an increased risk of heart attack, high-blood pressure, arrhythmia, stroke, and diabetes. Continuous Positive Airway Pressure (CPAP) machines are the current standard for treatment. However, approximately half of all patients suffering from sleep apnea do not adhere to it well due to complications such as nasal congestion, headaches, and continued tiredness. Continuous dead space rebreathing is an alternative that has been researched and shown to stabilize central respiratory output in patients with mild to severe obstructive sleep apnea without the complications of CPAP. Thus, our team has been assigned the task of designing and fabricating a variable dead space device based on guidelines and research conducted by our client Dr. John Webster. This includes developing an algorithm such that the device can detect sleep apnea and consequently regulate the amount of dead space for proper respiration.

Last Week's Goals

- Order parts for prototype
- Begin fabrication

Summary of Team Role Accomplishments

- Calvin (Leader) - filled out the week's progress report
- Taylor (Communicator & BPAG) – none
- Jen (BWIG) – updated the team website
- Ben (BSAC) – prepare for next BSAC meeting

Summary of Design Accomplishments

The team has now agreed on the use of a bipolar stepper motor to be used in the design. The motor will rotate a plastic cover piece that will be most likely be machined from high density polyethylene. New tubing will be ordered as well as single adapter for the stepper motor to fit in. In terms of power, the best option is most likely to use two 9V batteries as our motor requires 12V and the Arduino requires a constant 6-7V of power to run the algorithm. Other power options are still being explored and a printed circuit board (PCB) to control the electronics has yet to be designed. The immediate goal is to order parts for the fabrication of the physical prototype and begin building as soon as possible.

On Tuesday (2/21/17), the team met and wrote up a preliminary report for the design process thus far. Many of the same background and problem statement information remained relevant from last semester. The design matrix, testing and some background information was added and our new designs were laid out appropriately. Now that all preliminary deliverables are in, the team can focus on prototyping.

This Week's Goals

- Order parts for prototype
- Research power options
- Make Apnea Detection Algorithm more power efficient

Difficulties with Project

This week had many projects and midterms for our group members. This made meetings difficult to plan and delayed our original goals for the week.

Activities

Date	Person(s)	Task	Time (hrs)	Semester Total
	Calvin			2.5
	Taylor			1.5
	Jen			2.0
	Ben			2.5
2/21/2017	Team	Meeting – Write Preliminary Report	2.5	10.0

Project Schedule

Task	January		February				March					April			May		
	19	29	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11
Project R&D																	
Research	X	X	X	X													
Brainstorming			X	X	X	X											
Prototyping																	
Testing																	
Cost Estimation																	
Deliverables																	
Progress Reports	X	X	X	X	X												
PDS		X															
Mid-Semester					X	X											
Final																	
Meetings																	
Client		X		X													
Advisor	X	X	X	X	X	X											
Team	X	X		X	X	X											
Website																	
Update	X	X	X	X	X	X											

Filled boxes = projected timeline
X = task was worked on or completed

Expenses

None