



## Post Mortem

- Personal Electronic Stethoscope

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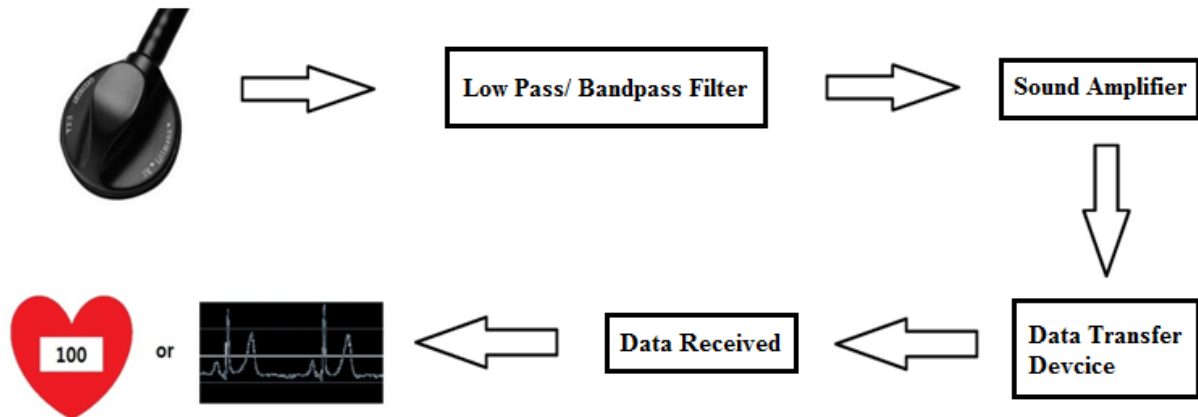
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## Glossary

<b>ECG</b>	Electrocardiography
<b>ICES</b>	Information Technology Equipments
<b>PCB</b>	Printed Circuit Board
<b>PES</b>	Personal Electronic Stethoscope
<b>SMD</b>	Surface Mount Device

## 1. Introduction

The Personal Electronics Stethoscope (PES) is a device for user to monitor their heart condition without any guide from doctors or specialists. Below has shown the basic block diagram of functions of the product we are aiming for.



**Figure1:** Block diagram of functions for PES

The project design consists of three different systems: the electronic stethoscope, a data transfer device to the mobile and a mobile user interface. Although the electronic stethoscope already exists on the market, they are made for doctors and other specialists. They are also not able to transfer data. To implement this device, Better Life Technologies are going to apply the software and hardware techniques so that the electronic stethoscope will be able to capture data from the user and transfer the signal to the user's mobile.

The circuit part of the electronic stethoscope will contain a low pass or bandpass filter to reduce the noise from the surroundings. The filter is designed to capture signal within 20Hz to 2k Hz range (Which is the heart beat frequency) [1]. Then the filtered signal will be amplified and ready to transfer via the data transfer device.

The data transfer device will convert the captured signal into digital form, and then analyze the signal and process to the mobile interface.

The mobile user interface will provide the heart condition and a beating graph to the user. If there is any abnormal behaviour, a message will be sent to the user.

Over the past few months, Better Life Technologies have been working continuously to produce a proof-of-concept model. This document provides a summary of the process and the challenges that Better Life Technologies had faced during the project.

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## 2. Current State of the System

### Current State of the System

Our device of a personal electronic stethoscope is currently at the 75% mark of completion. Prototypes are performed and have worked successfully, but there were some issues in both the hardware and the software. Thus, we cannot finish our project on time. The estimated budget and time are not fitted into the actual project. Data analysis of the heart rate in the iPhone application from electronic stethoscope device can be performed, but warning messages and some specific range for personal condition might not be working by the deadline.

### 2.1 Hardware

A 9V battery is supplied to hardware circuit board and it will generate an amplified heart beat sound signal. This sound signal is inserted into the iPhone application through audio cable. We made a prototype using a breadboard and it worked. We moved to create PCB using SMD components to make the device smaller and lighter. We tried to use 3V CR2032 battery to supply power, and we designed the device with a voltage regulator using a MAXIM680 chip and a 5V Zener diode for spike protection. After we designed these by using the Eagle PCB layout program, we soldered all the components by ourselves to save the money to build it. However, the PCB partially worked and there is a huge noise, and we conclude that there is something wrong with the voltage regulator design and the tolerance of some capacitors we used is at 20%. A 20% tolerance is very large, and it might affect the circuit to generate huge noises. We moved back through the whole components with the prototype. For the audio cable connector, we found a 4-pin earphone with microphone and we cut in the middle to connect wire into microphone sides. From the circuit board, the sound signal is supplied by this modified audio cable, and a voltage divider is used at output because i-device is required less than 1V peak to peak amplitude once the amplitude signal is going into i-device side as microphone signal. For the hardware package, a plastic container is used for the circuit board, and plastic cover and heat shrink tube are used for microphone side. There is also 2-pole single-through switch to provide +9V and -9V power into circuit board.

### 2.2 Software

#### 2.2.1 User Interface

Initial outlay includes subdirectories "Test", Settings, "About", with a Better Life Technology background. Under the Test directory, there are three functionalities; Heartbeat Rate, Analyze, History. The exact functionalities are incomplete; however, the App is partially functional. For the Test directory, Heartbeat Rate is to display the user's current heartbeat. The Analyze functionality in theory should perform calculations on sound input data from the microphone jack, and provide a concise result regarding on the received amplitudes. The History section will record all previously performed tests, and make the data available in archive for later access at any time.

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Under the Settings directory, there are two functionalities; Contact Info and User Profile. In this section, the user will provide personal information for record as well as to be used in calculations. The current available information includes user name, sex, and age. Additional information regarding physical traits will be included, such as body weight, height, blood pressure, and etcetera. The Contact Info section is used to record contact person information, whom will be contacted in case of emergencies.

The About directory provides information about general health knowledge regarding irregular heartbeat and symptoms. The “More” button displays additional information about the Better Life Technology information.

### **2.2.2 Sounds Strength**

This App takes sound inputs from a sound-input device, such as a microphone. The functionality is meant to be used for heartbeat inputs, and displays the amplitude of the sounds. The App can be used to handle calculations regarding the real-time sound amplitude inputs, and is able to output the results directly to the user or to the aurioTouch App. Sounds Strength is used to display instantaneous average heartbeat of the user. The refresh/update rate/interval is 0.05 seconds, and the average heartbeat is constantly updated. During periods of no input, the heartbeat/second displayed will constantly drop, as the time is continuous and the input has become low or none.

### **2.2.3 AurioTouch**

Modified from open source codes, aurioTouch is primarily used for its Sonogram functionality for testing and future work. Sonogram uses OpenGL to display audio waveforms of the input heartbeats. Originally, it is used to diagnose symptoms from ultrasonic inputs, and employs imaging techniques to visually represent the input data. For our purposes, it is used to calculate the heartbeat ratio, which represents the characteristics of a person's heartbeat rhythm compared to a regular baseline. We intended to carry out more complex analysis through calculations on heartbeat input data; however, it is not fully implemented.

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### 3. Problems and Challenges

#### 3.1 Hardware

The personal electronic stethoscope is supposed to consist of two amplifiers, butter-worth low pass filter, and Bluetooth to transfer sound signal. After lots of research of the Bluetooth technology for iPhone and we noticed that there is a license fee to use a Bluetooth. The license fee will be very expensive and only a huge company can afford it. Therefore, we changed our plan and decided to use an audio cable instead of wireless signal. 4-pin audio cable has microphone, so we opened the microphone side from the audio cable and found the plus and minus side to connect the output signal from the device. We are supposed to use two audio cables because if both sides of the cables are 4-pin connector and audio stereo wires and microphone wires are connected, it would look better and easy to connect it and easy to carry it in pocket.

We started the PCB design with the OrCAD program, but our version (free download) has an error inside and the error could not be solved. Therefore, we changed PCB layout program to Eagle which is freeware. Our PCB design has some problems. 3V battery cannot be changed to 6V power for TL072 and LM386 chips, which is minimum voltage to operate them. We tested without a voltage regulator, but there is a huge noise at the output. We concluded that the 20% tolerance of capacitors might affect the circuit and it generates the noise. Therefore, we decided to use the prototype board because we did not have a time and money to design and manufacture the PCB board again. With the prototype board, two 4-pin audio cables are not needed, so we used only one 4-pin cable and the positive and negative sides will be directly connected to prototype board. Due to these changes, we cannot design hardware packages for PCB. Therefore, we bought a plastic container for prototype board, and a switch and microphone with head and wire covered by heat shrink tube to prevent any interference by touch are installed in the case.

#### 3.2 Software

The software is able to obtain and record real-time heartbeat sound data, but is unable to perform real-time calculations on the waveform. The mathematical component is lacking to accurately obtain any conclusive results from the heartbeat amplitude data.

Object C is a brand new code and had to be learned from scratch to successfully implement on Mac devices, so we were delayed in the actual design and details of the code. We were able to design a functional UI using Object C, which is able to receive and store user inputs. The Sounds Strength App is also programmed using Object C, which is able to receive audio inputs from an audio device and display the amplitude in real-time.

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## 4. Future Plans and Recommendations

The current state of the device is not as perfect as originally planned. Therefore, there should be some modification and upgrade design of the system to produce a better performance. Better Life Technology believes that there is a significant potential for the future development of this product like professional device in market.

### 4.1 Hardware

We don't have enough time and money to make a new PCB and develop more about design for fixing the issues as we mentioned above. If we have a time and more money, we can modify the design of our PCB. After modifying it, actual device will be smaller and more portable. For hardware packaging, we tried to use AutoCAD 3-D design program, but because of budget and PCB design problems, we decided to use a plastic container to cover our prototype board. Therefore, if we make a proper PCB and have more money to build hardware package, we can make a nice designed hardware case for PCB. The device was made of SMD components for PCB but we can use through-hole components for PCB because the device cannot be very small. Some SMD capacitors which are almost the same size as though-hole components are huge, and some SMD capacitors have 20% tolerance in values. Thus, through-hole components might be better for performance of personal electronic stethoscope.

### 4.2 Software

Combine the three Apps; UI, Sounds Strength, and AurioTouch into an interconnected software, which is able to receive and record person user information, and provide useful information regarding the person's health in real-time. The specific tasks performed by the software include disseminating the heartbeat sound inputs into useful information, performing user-specific calculations on the data regarding the person's age, sex, and other physical characteristics. The software should be able to produce a conclusive and concise result to be presented to the user, regarding his or her immediate heart condition and health. AurioTouch can be used to further analyze heartbeat input data and perform more complex calculations to obtain detailed information regarding the user's heart condition.



## 5. Budgetary and Time Constrains

### 5.1 Budget

Table 1 outlines the estimated and actual cost for the project up to April 12, 2013.

**Table 1: Estimated and Actual Cost of PES**

Equipments List	Estimated Unit Cost (CAD)	Actual Cost (CAD)
<b>Hardware</b>		
Stethoscope	\$120	N/A
Sound Amplifier	\$35	N/A
PCB Layout Cost	\$100	\$147.84
SMD components (Capacitors, Resistors, Op-amps, voltage regulator etc.)	\$25	\$103.62
Through Hole Components (Capacitors, Resistors, Op-amps etc.)	\$25	\$80.70
Hardware Packaging	N/A	\$30.82
<b>Software</b>		
iOS App development Fee	\$100	N/A
Network Cost	\$100	N/A
<b>Unexpected Cost</b>		
Earphones	N/A	\$13.61
<b>Totals</b>	455	\$376.59

As shown on table 1, we got rid of the stethoscope and sound amplifier for the hardware part. We simply use a microphone to replace the stethoscope and the result came out great. Unfortunately, we experienced some technical problems for the PCB board. As a result, due to time constraints, we had to build our prototype on a PCB prototype board. We believe that the actual cost can be reduced under \$100 without any errors.

Better Life Technologies has received \$450 in funds from the ESSEF. On the final stage, our expense is slightly out of budget. However, before the project begins, the team in Better Life Technologies has compromised that we go over the budget, will split the extra equally.

## 5.2 Time Constrain

Table 2 shows the expected time for completion in blue and actual time for completion in red.

**Table 2: Expected and Actual Time for Completion**

	Spring 2013			
	January	February	March	April
Research	[Blue bar from Jan 1 to Mar 31]			
	[Red bar from Jan 1 to Feb 28]			
Proposal	[Blue bar from Jan 15 to Jan 31]			
	[Red bar from Jan 15 to Jan 31]			
Functional Specification		[Blue bar from Feb 15 to Feb 28]		
		[Red bar from Feb 15 to Feb 28]		
Design Specification		[Blue bar from Feb 15 to Mar 15]		
		[Red bar from Feb 15 to Mar 15]		
Order Parts		[Blue bar from Feb 15 to Feb 28]		
		[Red bar from Feb 15 to Mar 15]		
Test Parts		[Blue bar from Feb 15 to Feb 28]		
		[Red bar from Feb 28 to Mar 15]		
Build Module			[Blue bar from Mar 15 to Mar 31]	
			[Red bar from Mar 15 to Mar 31]	
Integration Testing			[Blue bar from Mar 15 to Apr 15]	
			[Red bar from Mar 31 to Apr 15]	
Debugging			[Blue bar from Mar 15 to Apr 15]	
			[Red bar from Mar 31 to Apr 15]	
Demo				[Blue bar from Apr 15 to Apr 30]
				[Red bar from Apr 15 to Apr 30]
Final Report				[Blue bar from Apr 15 to Apr 30]
				[Red bar from Apr 15 to Apr 30]

After we designed the PCB layout, it took more time than we expected to place an order. Hence, Better Life Technologies slowly fell behind schedule and were forced to modify certain deliverables.

At the beginning, we tried to transfer the data via Bluetooth or wireless. Nevertheless, by the end of January, we had noticed that based on the budget, time constraints and technical skills, we will not be able to finish the project by the beginning on April.



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## 6. Group Dynamics

Better Life Technology is consisted of a five-member team, all of whom are confident, skilled, and motivated. Real Yuen (CEO), Guntae Park (CFO), Jungioo Lee (CMO), Seven Yao (CTO) and Jesse Yang (COO) are all fourth-year engineering students majoring in electronics or systems engineering.

In order to achieve the goal for the project within the time limit, the team Better Life Technologies separated into two groups, Hardware and Software. Real, Ray and Daniel mainly focus on the Hardware part while Jesse and Seven focus on the Software part.

Just like all projects, arguments and misunderstanding occurs while we work together. However, the main goal of completing this project always prevailed and we always pulled through. Overall, the team Better Life Technologies worked pretty well beside delay for the milestone time line.



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## 8. Interpersonal and Technical Experiences

### Real Yuen

I am currently a fourth year electronics engineering student from Simon Fraser University. I worked for Honeywell and Verathon Medical for my first and second co-op work term. During those work periods, I was required to do testing and provide reports on the products to ensure they matched the specifications. Those jobs also helped me build a strong foundation for PADS, Visio, Electric Circuits, Matlab and the use of laboratory equipment which helped me through during the project.

As an engineering student, I have always wanted to invent something that can contribute to the society. Hence, after talking with Dr. Andrew Rawicz, we finally came up with an idea to detect human's heart condition. It is a challenging project, since we have to do research, trouble shoot, and build the prototype within 4 months. This was definitely one of the most challenging courses I have taken at SFU; however the amount of things I learned in this course was totally worth the time I spent on it.

As the CEO of the team, I was in charge of the team communication and decision making. Most of the time, I focused on the hardware part with Ray Park and Daniel Lee. There were definitely times where we felt frustrated. Fortunately, most of the time we can overcome the obstacles and continue to the next step. Although there were times where there were disagreements and animosity between us, the main goal of completing this project always prevailed and we always pulled through. Throughout the project, I have gain experience and able to see things that I was not able to see before; such as spike protection, create a PCB layout, how to write professional report etc.

Overall, I am very proud of everyone's accomplishments and contributions to the PES project. The personal and technical skills that I gained in this project are a milestone to my education career and SFU. It will be great if we can work again in the future.

### Seven Shun Hua Yao

I learned how to properly document my work timeline. At each stage of the project, I was actively communicating with my group members so we are on par with our progress, so we can integrate our work to perform testing on both software and hardware components. I learned how to use MobiOne in a PC environment to create the user interface, and design user interfaces using StoryBoard and Object C in Mac environments. Essentially the final project is a functional iPhone App to achieve the needed tasks for our project.

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At the offset of the project, I was unfamiliar with the Mac environment and its development tools. Now I am more fluent in the use of development tools in Mac, and hope to further refine my skills in developing in Mac. I am also more proficient with coding methodologies and processes, as well as debugging procedures in a larger development arena. I hope the additional experience in coding a working User Interface will help me in future work placements. I am also more efficient in problem solving in terms of coding and obtaining the needed functionalities.

### **Guntae (Ray) Park**

Before I start this project, I made a group with my friends, Real and Daniel (Jungjoo). But we were only three, so we tried to find 2 more members and we met Jesse and Seven. Our team noticed that composition of the project team is pretty good because Real and I have hardware experiences for development and testing, Jesse and Seven have software experiences, and Daniel is good at research and budget management. Before this semester started, we met and discussed about project topics and we decided three just in case. However, all three nominated topics were rejected, so we discussed more in first two weeks of this semester. It means that our team starts the project late compared to other teams and followed by project curriculum. Finally, we decided project and got an advice from Dr. Andrew Rawicz about heart beat rate measurement. The project hardly started and we split work by roles. At this time, my role was hardware design, researching technology, and writing about documents.

There were some challenges and tough decision to make it work. However, this project was fun and valuable for me especially because I learned a lot in technical parts and communication parts. For our project, it is supposed to use Bluetooth technology with iPhone to transfer sound signal. However after researching about it, I realized that the license fee is not \$100 and it costs a lot. Therefore, I made an alternative ways by using audio cables. The amplitude from output side of the device cannot be larger than 1V peak to peak because i-device is set limit of input amplitude of signal. After building the board, it did not work. Therefore, we spent lots of time to find out the problem. The problem was the amplitude limit. PCB layout program OrCAD was also challenge because nobody in our team has an experience of this program. We had some errors with OrCAD therefore we switched the program with Eagle. Eagle was freeware so using this, we can figure out PCB layout. These are the main technical challenges. The interpersonal challenges are scheduling and communicating with teammates. Everyone is busy with other courses and hard to appoint the time for team meetings. In addition, everyone does not have enough understanding of details of our project. Thus, I tried to explain each steps and all the details in person. I learned a lot of technical skills such as designing, testing, soldering, troubleshooting and a lot of interpersonal skills such as making a decision, shrinking the gap among different opinion, scheduling, and communications. Documentation skills were improved a lot for this. I have never had any experience like writing up professional documents. Capstone project gives me really good experiences to deal with project, and it was great time to work with our teammates.

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### **Jungjoo (Daniel) Lee**

Before the semester started, Ray, Real and I made the group. I left Vancouver soon after, because I have to get married. I kept in touch with my group members when I was in Korea. I came back a few days after class started. The first meeting, we have to get a new idea because the idea that we had was not good enough. The beginning of the idea that passed used blood pressure to find if there was problem with patient. When we are talking to Dr. Andrew Rawicz about our idea, he modified our idea to using stethoscope to check the heart condition. I am working in hardware part with Ray and Real. We meet at least once a week to develop and modify the products. We have figured out that if we connect the machine and the smart phone such as iPhone, we have to pay at least 1000 dollars for license. Because we cannot afford this, we have changed the method to sending signals. With a wire connection, and using schematics from database, we could generate PCB layout from the documents. We have spent lots of hours to learn and use OrCAD to built files for PCB. With minor error, OrCAD not allow us to built PCB files. It has been three weeks fixing and trying to implement PCB. However, it is not fixed. The other program called Eagle. Another week to learn about new PCB program and it was working well. The advantage of the product is that it is a free software, so we could find a lot of information which are relate to. Ordering PCB and SMD parts are most expensive part in our projects. Soldering for SMD is hard because legs between the part are tiny each other. Voltage divider is not working and PCB makes a lot of noise, because the tolerance is quite higher than regular part. Finally, we bought a prototype board, and it is working. Lots of soldering and changing the circuit in the board, I could learn that how to make simpler and better products.

I have learned a lot of skills for professional documentation, and writing formal essays. It is a really good experience for my Engineering studies. Also, it was great chance working my group mates. Finally, I now know that teamwork is really works.

### **Chao Yang**

Throughout this project, I've introduced myself to the Mac OS, and discovered many interesting features, such as my unfamiliarity with its keyboard and mouse layout. I was able to learn a new coding language; Object C, to design and implement a User Interface using framework, in the Xcode IDE. Object C is coded in the Xcode IDE, which also allows for calculations of input data from the microphone jack of a Mac device, using math libraries inherent in the language. Complex calculations can be performed, however, due to insufficient time the mathematical applications are delayed. I've detailed and documented my progress in learning Object C in my Engineering Journal.

I've learned how to properly document a project throughout the development process, through the use of journals. Other skills include time-management for a large scale coding project; to properly quarter time slots for the development of each functionality and stage in software. I've improved myself in proper communication with teammates in charge of other software components or hardware integration, to ensure the group is on schedule and is able to conduct integrated testing at different stages in design and development.



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## Conclusion

The document explains the general function of our project (PES). It also indicated the problem that Better Life Technologies had faced during the process. All the materials, costs and schedule with both estimated and actual are included. Overall, the team Better Life Technologies had tried extremely hard to completed the project. However, due to technical issue and lack of experience, some of the features on the project needed to be abandoned. We promise that during our spare time, we will improve the product and complete it.



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## Reference

[1] D.Balasubramaniam and D. Nedumaran (2010, August) Efficient Computation of Phonocardiographic Signal Analysis in Digital Signal Processor Based System. [Online] <http://www.ijcte.org/papers/219-H304.pdf>



Appendix

**Better Life Technology  
Minutes  
January 4<sup>th</sup> 2013 (Friday)  
12:30pm-01:30pm  
Simon Fraser University (Outside Lab 1)**

**Present:** Ray, Real Jesse and Seven

**Purpose of Meeting:** Discussing Ideas

**Minutes:**

- Ray - Design and implement a sensor to avoid car collision (Gives alarm when car is getting close to others)
- Jesse – Design a stand that can hold computer or tablet. Use remote control for movement so it moves up, down, left and right.
- Real – Wireless Charger, a platform that you just put on your electronic device and it automatically charge up

Will talk to professor Rawicz and decide which topic is the best

**Next meeting:** January 13<sup>th</sup> 2013

**Location:** TBD

**Reason:** To discuss proposal and roll for the project

**Better Life Technology**  
**Minutes**  
**January 13<sup>th</sup> 2013 (Sunday)**  
**12:30pm-05:00pm**  
**Metrotown Library**

**Present:** Ray, Real, Daniel, Jesse and Seven

**Purpose of Meeting:** Ideas are banned from professor Rawicz, need to discover new ideas

**Minutes:**

New ideas:

- Ray/Daniel – Heart bit measurement that connects to smart phone. When things happened, contact emergency station immediately.
- Jesse – Ultraviolet rays system on elevator to kill bacteria on the button
- Real – Double layer mirror for cars, automatically change the layer of mirror on side mirror when vehicle is changing lane
- Seven – Parking meter system, development a card that connects to the parking meter. Once the car is parked, clock in, then clock out when it's done. So the operator does not lose any money by paying extra

Waiting for professor's reply and decide which topic we should work on

- Company Name: Better Life Technology (Sounds like Butterfly)
- CEO (Chief Executive Officer and President) – Daniel
- CMO (Chief Marketing Officer) – Real
- CTO (Chief Technical Officer) – Seven
- CFO (Chief Financial Officer) – Ray
- COO (chief Operating Officer) – Jesse

**Next Meeting:** January 15<sup>th</sup> 2013

**Location:** School (Simon Fraser University Engineering Lab 1)

**Reason:** Work on the funding and proposal, research

**Better Life Technology  
Minutes  
January 18<sup>th</sup> 2013 (Friday)  
11:30am-09:00pm  
Waves Coffee Shop (Metrotown)**

**Present:** Ray, Real and Daniel

**Purpose of Meeting:** Work on the proposal paper and research on hardware components

**Minutes:**

**Topic:** Personal Electronic Stethoscope (PES)

- Purchas material already exist on the market and group them together and make sure our idea works
- Once confirm the device works, we will decide our own circuits in order to reduce the price
- Real. Ray and Daniel focus on hardware and Seven and Jesse focus on writing

**Three Goals for the product:** affordable, portable and intuitive

**Next Meeting:** January 25<sup>th</sup>, 2013

**Location:** School (Simon Fraser University Engineering Lab 1)

**Reason:** Getting start to order parts and built the product

**Better Life Technologies**  
**Minutes**  
**January 21<sup>st</sup>, 2013 (Monday)**  
**8:30pm-9:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** How to start our software

**Minutes:**

**Topic:** Starting point

- Simple code
- Message Sending
- Data connect to hardware
- Algorithm

**Next Meeting:** January 23<sup>th</sup>, 2013

**Location:** School

**Reason:** Processing check in software part

**Better Life Technologies**  
**Minutes**  
**January 23<sup>st</sup>, 2013 (Wednesday)**  
**8:30pm-9:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Processing check in software part

**Minutes:**

**Topic:** Processing check

- Idea of our new data connection
- Need more research
- Input as audio cable

**Next Meeting:** February 12<sup>th</sup>, 2013

**Location:** School

**Reason:** Two type of coding environment

**Better Life Technology**  
**Minutes**  
**January 25<sup>th</sup> 2013(Friday)**  
**1:00pm-05:00pm**  
**Simon Fraser University Engineering Lab 1**

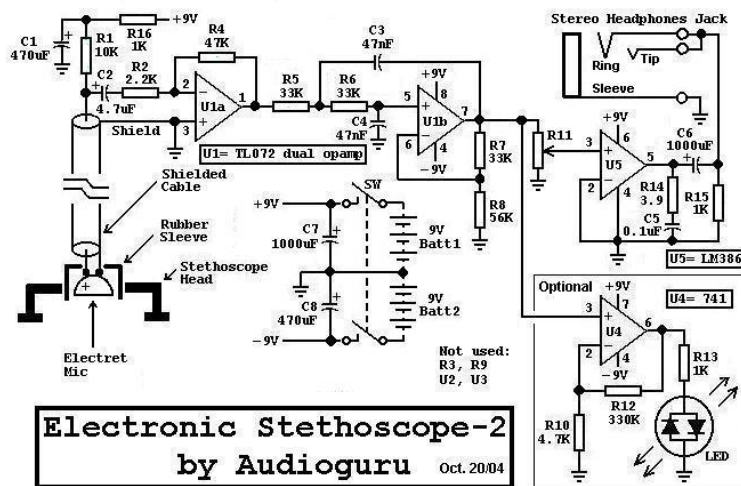
**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Building the circuit and do testing before ordering a PCB

**Minutes:**

**Topic:** Building circuits for PES

- Buy the components from LEE'S Electronic and RP electronics. Spend \$28.38 on components
- Build the circuit and test the analog signal



**Figure.1-Electronics Stethoscope Circuit**

If it works, we are going to order a PCB board and let Jesse and Seven to work on the software part

**Next Meeting:** February 5<sup>th</sup>, 2013

**Location:** Ray's apartment (Simon Fraser University Engineering Lab 1)

**Reason:** Work on the functional specification report

**Better Life Technology**  
**Minutes**  
**February 4<sup>th</sup>, 2013 (Monday)**  
**1:00pm-10:00pm**  
**Ray's apartment**

**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Work on the functional specification report and check the components from digikey

**Minutes:**

**Topic:** Work on the functional specification report.

- Order components from digikey and built the PCB board.
- Finish the function specification report.
- Should improve the circuit to avoid noise from surrounding.

Talk to Professor Ash and Professor Daniel about the circuit and how to improve it.

**Next Meeting:** February 21<sup>st</sup>, 2013

**Location:** School

**Reason:** Oral Presentation Progress

**Better Life Technologies**  
**Minutes**  
**February 12<sup>st</sup>, 2013 (Tuesday)**  
**2:30pm-3:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Choose coding environment

**Minutes:**

**Topic:** Mobile-me and Xcode

- Mobile- me :on PC (Java)
- Xcode :on Mac (objective C)

**Next Meeting:** February 18<sup>th</sup>, 2013

**Location:** School

**Reason:** Processing check in software analyze



**Better Life Technologies**  
**Minutes**  
**February 18<sup>st</sup>, 2013 (Monday)**  
**8:30pm-9:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Software analyze

**Minutes:**

**Topic:** Method analyze

- Study the wave analyze idea by some reference
- Ask doctor (seven's grandpa) how does the sound of heartbeat work, what kind of information we can get from the sound

**Next Meeting:** February 21<sup>th</sup>, 2013

**Location:** School

**Reason:** Oral Presentation Progress

**Better Life Technology**  
**Minutes**  
**February 21<sup>st</sup>, 2013 (Thursday)**  
**11:00pm-03:00pm**  
**Simon Fraser University (Lab 1)**

**Present:** Ray, Real, Daniel, Jesse and Seven

**Purpose of Meeting:** Prepare for the Oral progress presentation and research

**Minutes:**

**Topic:** Oral progress presentation

- Presentation to all the TAs and professor.
- Research on how to improve the circuit

**Next Meeting:** February 23<sup>th</sup>, 2013

**Location:** School

**Reason:** Research and improve the circuit for the electronic stethoscope

**Better Life Technology**  
**Minutes**  
**February 23<sup>th</sup>, 2013 (Saturday)**  
**1:00pm-04:00pm**  
**Simon Fraser University (Lab 1)**

**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Test the circuit and improve it

**Minutes:**

**Topic:** Research and improve the stethoscope circuit

- Research on about how to protect the spike from battery.
- Order components from digikey.
- Draw the schematic diagram for the circuit.

**Next Meeting:** March 1<sup>st</sup>, 2013

**Location:** Ray' apartment (Metrotown area)

**Reason:** Work on the Design Specification paper

**Better Life Technology  
Minutes  
March 1<sup>st</sup>, 2013 (Saturday)  
1:00pm-10:00pm  
Ray's apartment (Metrotown area)**

**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Work on the Design Specification paper

**Minutes:**

**Topic:** Work on the Design Specification paper

- Work on the design specification paper.
- Draw the circuit diagram.
- Find the dimension of the components

**Next Meeting:** March 2<sup>nd</sup>, 2013

**Location:** School (Simon Fraser University, Lab 1)

**Reason:** Continue on the Design Specification paper

**Better Life Technologies**  
**Minutes**  
**March 2<sup>rd</sup>, 2013 (Saturday)**  
**1:30pm-3:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** User interface

**Minutes:**

**Topic:** Build user interface on Mac

- New block diagram
- Start up page, Test Page Setting Page, About page

**Next Meeting:** March 10<sup>th</sup>, 2013

**Location:** School

**Reason:** Discuss the subproject

**Better Life Technologies**  
**Minutes**  
**March 10<sup>rd</sup>, 2013 (Sunday)**  
**1:30pm-5:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Subproject

**Minutes:**

**Topic:** “MicBlow”

- Read the sound signal from the mic-phone
- Display the value of sound
- The value should update by change(time)

**Next Meeting:** March 20<sup>th</sup>, 2013

**Location:** School

**Reason:** Test plan for “MicBlow”

**Better Life Technology**  
**Minutes**  
**March 14<sup>th</sup>, 2013 (Thursday)**  
**10:30pm-02:00pm**  
**Simon Fraser University (Lab 1)**

**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Work on the PCB design

**Minutes:**

**Topic:** Work on the PCB Design

- Design the PCB schematic
- Connect to the PCB Manufactory
- Find the dimension of the components
- Quote the price from the PCB Manufactory

**Next Meeting:** March 15<sup>th</sup>, 2013

**Location:** Ray's Apartment (Metrotown Area)

**Reason:** Continue on the PCB Design

**Better Life Technology**  
**Minutes**  
**March 15<sup>th</sup>, 2013 (Saturday)**  
**1:00pm-07:00pm**  
**Ray's apartment (Metrotown area)**

**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Continue on the PCB design

**Minutes:**

**Topic:** Continue on the PCB Design

- Design the PCB Board
- Research on sound signal
- What heart beat can tell us

**Next Meeting:** TBD

**Location:** TBD

**Reason:** TBD



**Better Life Technologies**  
**Minutes**  
**March 20<sup>rd</sup>, 2013 (Wednesday)**  
**8:30pm-11:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Test plan for “MicBlow”

**Minutes:**

**Topic:** “MicBlow” and another subproject

- Discuss the test plan for “MicBlow”
- Plan for next steps of software
- Thinking a new subproject to show the sound wave

**Next Meeting:** March 26<sup>th</sup>, 2013

**Location:** School

**Reason:** “aurio Touch”

**Better Life Technologies**  
**Minutes**  
**March 26<sup>rd</sup>, 2013 (Thursday)**  
**1:30pm-5:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Figure does the “aurio Touch” work for our project

**Minutes:**

**Topic:** “aurio Touch” analyze

- How does it work
- What kind of output data
- If possible write the similar app by ourselves

**Next Meeting:** April 6<sup>th</sup>, 2013

**Location:** School

**Reason:** Last week plan

**Better Life Technology  
Minutes  
April 04<sup>th</sup>, 2013 (Thursday)  
11:00am-03:30pm  
Simon Fraser University (Lab 1)**

**Present:** Ray, Real, and Daniel

**Purpose of Meeting:** Soldering the components on the PCB board

**Minutes:**

**Topic:** Solder components in the PCB board

- Testing the output and input

**Next Meeting:** April 06<sup>th</sup>, 2013 (Saturday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Solder components on another PCB board.

**Better Life Technology**  
**Minutes**  
**April 06<sup>th</sup>, 2013 (Saturday)**  
**11:00am-05:00pm**  
**Simon Fraser University (Lab 1)**

**Present:** Ray and Real

**Purpose of Meeting:** Continue on trouble shooting the PCB

**Minutes:**

**Topic:** Solder components on the second PCB board

- It works, but have a lot of noise
- Build on the bread board again, and is perfectly fine  
We believe the noise is from the capacitance
- Use through hole technique for prototype

**Next Meeting:** April 09<sup>th</sup>, 2013 (Tuesday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Testing the input and output on iPhone

**Better Life Technologies**  
**Minutes**  
**April 6<sup>rd</sup>, 2013 (Saturday)**  
**1:30pm-5:30pm**  
**Simon Fraser University (Lab 1)**

**Present:** Chao (Jesse) and Seven

**Purpose of Meeting:** Plan for last week

**Minutes:**

**Topic:** Final rushing

- Post Mortem software part
- Demo PPT
- Try to make the code better
- Think about the test in the demo

**Next Meeting:** April 10<sup>th</sup>, 2013

**Location:** School

**Reason:** Work on paper

**Better Life Technology  
Minutes  
April 09<sup>th</sup>, 2013 (Tuesday)  
02:30pm-08:00pm  
Simon Fraser University (Lab 1)**

**Present:** Ray, Daniel and Real

**Purpose of Meeting:** Testing the PCB board

**Minutes:**

**Topic:** Testing input and output from the prototype

- Both input and output work fine
- Need to figure a way to send signal into iPhone (iPhone only takes low signal)

**Next Meeting:** April 10<sup>th</sup>, 2013 (Wednesday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Testing the input and output on MacBook

**Better Life Technology**  
**Minutes**  
**April 10<sup>th</sup>, 2013 (Wednesday)**  
**12:00pm-08:00pm**  
**Simon Fraser University (Lab 1)**

**Present:** Ray, Daniel, Jesse, Seven and Real

**Purpose of Meeting:** Testing the PCB board

**Minutes:**

**Topic:** Testing the prototype

- Use a voltage divider for the prototype and act as input to the iPhone
- Best ratio between 10k Ohm and 18k Ohm

**Next Meeting:** April 12<sup>th</sup>, 2013 (Friday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Work on paper and the hardware case

**Better Life Technology  
Minutes  
April 12<sup>th</sup>, 2013 (Friday)  
10:00am-08:00pm  
Simon Fraser University (Lab 1)**

**Present:** Ray, Daniel, Jesse, Seven and Real

**Purpose of Meeting:** Testing the PCB board

**Minutes:**

**Topic:** Testing the prototype

- Modified the hardware circuits
- Work on the Post Mortem paper
- Build the hardware case

**Next Meeting:** April 13<sup>th</sup>, 2013 (Saturday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Combine the software and hardware part and work on the power point presentation



**Better Life Technology  
Minutes  
April 13<sup>th</sup>, 2013 (Saturday)  
10:00am-08:00pm  
Simon Fraser University (Lab 1)**

**Present:** Ray, Daniel, Jesse, Seven and Real

**Purpose of Meeting:** Testing the PCB board

**Minutes:**

**Topic:** Testing the prototype

- Continue on the hardware case
- Testing input from the hardware
- Work on the PowerPoint

**Next Meeting:** April 14<sup>th</sup>, 2013 (Sunday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Working on the presentation power point

**Better Life Technology  
Minutes  
April 12<sup>th</sup>, 2013 (Friday)  
02:00pm-08:00pm  
Simon Fraser University (Lab 1)**

**Present:** Jesse, Seven and Real

**Purpose of Meeting:** Working on the Presentation

**Minutes:**

**Topic:** Modify the presentation

- Try to improve the software as much as we can
- Try to solve the issues from software
- Build the power point presentation

**Next Meeting:** April 15<sup>th</sup>, 2013 (Monday)

**Location:** Simon Fraser University (Lab 1)

**Reason:** Practise for the presentation

**Better Life Technology  
Minutes  
April 15<sup>th</sup>, 2013 (Friday)  
08:00am-11:00am  
Simon Fraser University (Lab 1)**

**Present:** Ray, Daniel, Jesse, Seven and Real

**Purpose of Meeting:** Testing the PCB board

**Minutes:**

**Topic:** Presentation practise

- Practise the presentation