



Post Mortem Report

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Issue date	November4, 2014
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Revision	1.0
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Table of contents

List of figures	3
List of tables	3
Glossary	3
1. Introduction/Background	4
2 Overall System Design	5
2.1 System Overview	5
2.2 Budget.....	5
2.3 Schedule.....	6
3. Problems and Challenges	7
4. Group Dynamics	7
5. Workload distribution	8
6. Personal Reflections	9
6.1 JabarJung Sandhu.....	9
6.2 Wei Lu	10
6.3 Di Luo	11
6.4 Henson Truong.....	12
7. Conclusion	13
8. References	Error! Bookmark not defined.
9. Appendix.....	14

List of figures

Figure 1. System Overview Of Comfort Mat System..... 5
Figure 2. Original Milestone Chart..... 6
Figure 3. Original Schedule Of CMS..... 7

List of tables

Table 1. Estimated And Actual Budgets Of CMS..... 6
Table 2. Workload Distribution..... 8

Glossary

APP - Application
BLE - Bluetooth 4.0 Low Energy
CMS - Comfort Mat System
FSR - Force Sensitive Resistor
LCD - Liquid-crystal display

1. Introduction/Background

Pressure sores are defined as the breakdown of the skin under long lasting pressures. This can lead to lack of blood flow and prevent blood from bringing oxygen and nutrients to the skin and underlying tissues. Another factor to consider besides pressure is the temperature and humidity. Increasing temperature and humidity under pressurized skin increases the rate at which the pressure sore is developed. The most common locations where pressure sores emerge are on the back of the heels, the buttocks, the backbone, and the shoulder blades.

Most pressure sores occur while sitting or lying on bed so wheelchair-bound people or people who are paralyzed are at high risk. As a matter of fact, there are increasing number of people studying and working using computers and other electronic devices while sitting for prolonged periods of time. The pressure sore has already become a common skin disease for normal people.

Once the pressure sore appears, it takes a lot of effort, care and time to heal. It also costs ample amount of time and money to get treated, especially for the disabled people who cannot reposition their body by themselves or those who are paralyzed and the nervous system doesn't tell them where there is high pressure developed or developing. To solve this we need to find a way to prevent pressure sores from developing. Hence continuous measuring and monitoring of the pressure and environment is the best approach for preventing pressure sores, which is considered to be beneficial from both health and economic viewpoint.

Svasth Healthcare has designed a *Comfort Mat System (CMS)*, which can collect all of the monitoring data from sensors (pressure, temperature, and humidity sensors) and process it by a software system displaying the result in user-friendly graphical user interface in real time. Another feature is that once the collected data meets some preset threshold value, the system can automatically turn on different vibration motors to increase blood circulation in the affected area and sending an alarm to the user to reposition their body or to the person who is in charge of taking care of that user. The *Comfort Mat System* has also been integrated with Android, which allows people to be able to monitor and control the system by using their own smartphone devices.

2 Overall System Design

The general system design of the CMS is presented in this section. This includes a high level overview of the hardware components, as well as the flow of the information through the system.

2.1 System Overview

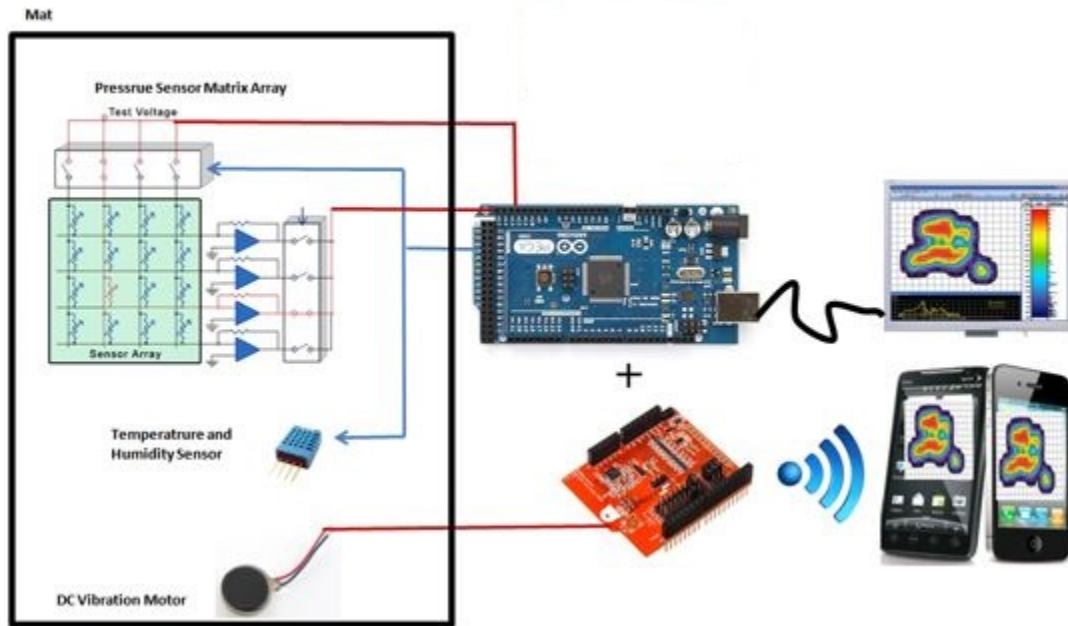


Figure 1. System Overview Of Comfort Mat System

Figure 1 illustrates the overview of CMS. It consists of a pressure sensitive mat, a smartphone, and a microcontroller. When the user is sitting on the mat, the mat outputs the pressure, temperature, and humidity sensors' data to the microcontroller. The microcontroller processes the data and sends the data to the attached device to be display. There are two devices we can use to display the pressure mapping data – either a computer using Matlab or a smartphone. The vibration motors can be set to vibrate whenever long lasting pressure is detected or whenever the user sets it off.

2.2 Budget

Table 1 shows our original projected cost to build the Comfort Mat System (CMS). We have spent approximately \$655 of our estimated budget \$750 for this project. We have got \$650 in funding from the Engineering Science Student Endowment Fund (ESSEF), which is almost even to cover all cost of this project. We also managed to borrow some parts to get further reduce the cost of our project. The current breakdown of parts used is shown below

Component name	Estimated Cost (\$CAD)	Actual Cost (\$CAD)
Arduino mega 2560 R3 board	80	74.8
Temp. and Humidity Sensor	15	15
Copper foil tape	12	12
Vibration motor	30	22
Multiplexer 4051N	1.5	1.5
Shift register 74HCT595N	1.5	1.5
Bluetooth 4.0 low energy - BLE Shield	30	30
DMI Med convoluted foam chair pad	20	41
FSR 402 0.5"	384	352
Jump wires (Male and Female)	40	40
Conductive wire	30	30
Resistor	Free	Free
Battery connector	5	5
Plexiglass sheet	20	10
LCD screen	75	Free
L293D motor driver IC	20	18.4
Total cost	\$750	\$653.2

Table 1. Estimated And Actual Budgets Of CMS

2.3 Schedule

Figure 2 and 3 are the original schedule of our project, but we have to extend our presentation time to Dec 10 because of phone application of CMS is still under developing. A back up plan is also needed if phone application part does not working as what we expected. All other parts including documentation and hardware parts are nearly done at this point.

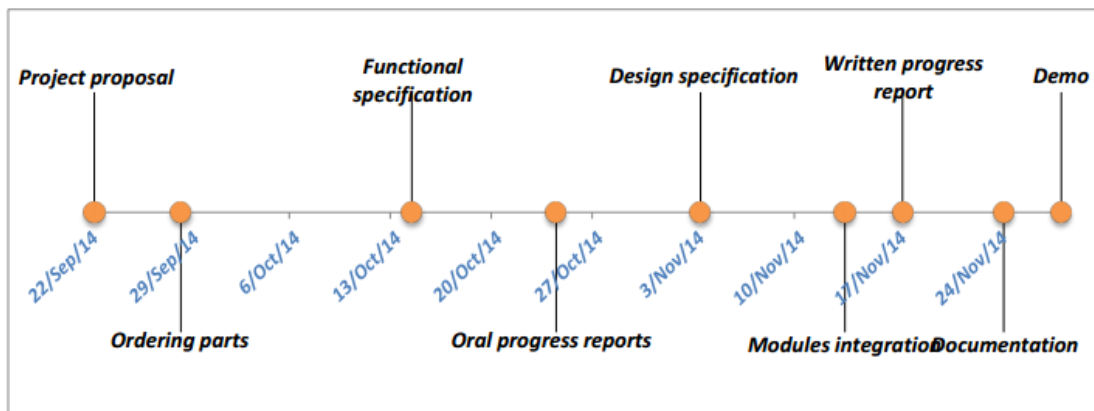


Figure 2. Original Milestone Chart

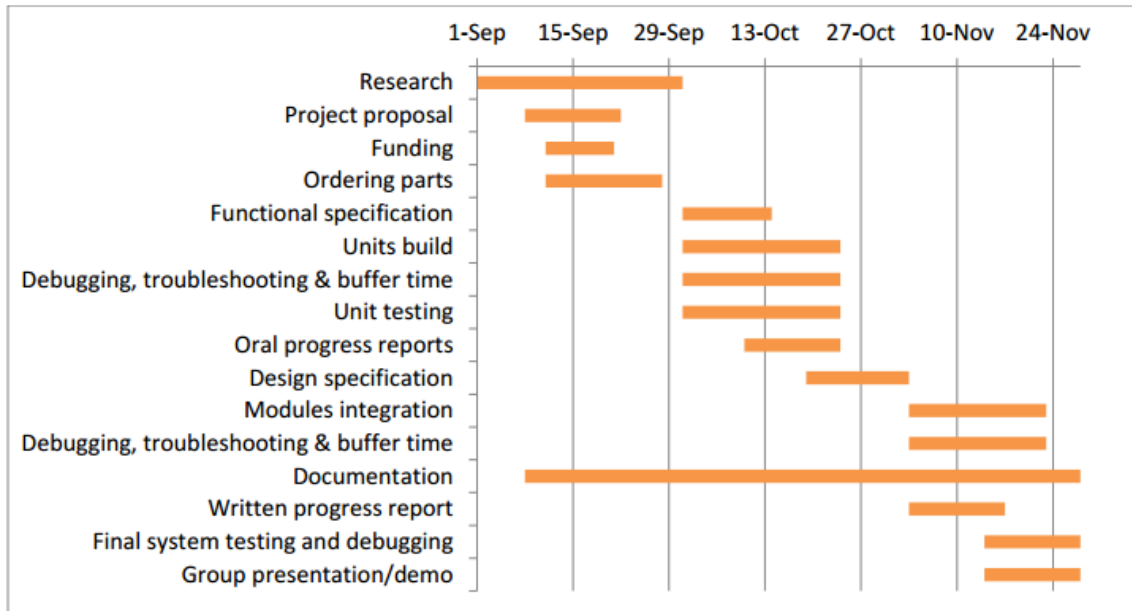


Figure 3. Original Schedule Of CMS

3. Problems and Challenges

We have encountered many challenges and problems. Some of the problems are rather difficult to solve, but we are glad that we have conquered the most of challenges and made solid progress. During the process of debugging and troubleshooting, we have learned lots of knowledge and skills that are not from textbook.

The phone application is one of the biggest problems for us because we don't have any experience in developing an application before by using JAVA language. The Internet is the only source we could think of to help us; we have to study the code as a beginner. Although some open source codes are provided online, we are afraid to use them directly without understanding codes. The difficulty of developing the phone application resulted in delaying our progress. Until now, we are still working on the application, but a backup plan, using Matlab on computer as GUI, is under developing and nearly done.

Another big challenge is the integration of all the parts together. As a matter of fact, we have used so many components to build this Comfort Mat System. For pressure sensors alone, we have used 64 FSRs. That is a meticulous work, because a simple mistake may cause a serious problem on the entire system. Furthermore, we have to make sure all CMS features works properly after integrating together. Teamwork plays an important role in solving this problem, and all team members can question and provide suggestion to others' work in order to improve the efficiency of the integrating work.

4. Group Dynamics

Most of our group members have similar course schedules this semester so we were able to meet quite frequently. We always knew what each and every team member was doing in regards to the project. Our team does not really have a structure to it. Any one

of us can speak up and the whole team listens to what that person has to say and give opinions on it. This catered to a friendly and open work environment which worked pretty well.

Meeting minutes (in Appendix section) were made prior to the meeting we attend to so our meeting would be more organized. These worked surprisingly well as it cut down on wasted time because we don't just sit there and think of what we need to talk about while the meeting is in progress. In the event where someone cannot make a meeting, the person would then call one of our group members who is attending the meeting and that person would be put on speakerphone throughout the meeting.

5. Workload distribution

The table that is shown below provides a clear picture of workload distribution of each team member.

Task	JabarJung	Wei	Di	Henson
Hardware Design		xx	xx	xx
PCB Layout		xx	xx	xx
LCD Display		x	xx	x
FSR Array		xx	x	xx
Vibration Motors	x	x	xx	xx
System Integration	xx	xx	xx	xx
System Testing	xx	xx	xx	xx
Budget and Finance	xx	xx	xx	xx
Part Sourcing	x	xx	xx	xx
Matlab		xx	xx	xx
Phone App	xx			
Documentation	xx	xx	xx	xx
Administrative Tasks	xx	xx	xx	xx

Table 2. Workload Distribution

6. Personal Reflections

In this section, team members will talk about their learning and lessons from this project course.

6.1 JabarJung Sandhu

This all started as a part of Capstone project. We were asked to do something that's beneficial for the society as a whole, which can make this world a better place. During brainstorming process we went through several ideas and eventually settled on this one. One thing is for sure even though if a project is straightforward and simple in nature and use, if it does some good to the society, then it's better than any other project which is complicated in terms of technical details but doesn't contribute much to the society. We started with an idea and worked on it along the way and finally at the end of the semester we got it done. Main thing to grasp is only when we start working on it only then we get to know it's implementation and execution details and we should give it lot of buffer time. As usually things go past the deadlines and we encounter the errors we didn't expect. So always have some spare time on hand when planning for projects such as Capstone.

I would like to thank my team members for their hospitality and always listening to what I had to say. They offered help wherever they could. Beside the technical skills I had lot to gain from this course project in terms of interpersonal, team management, time management, communication, group dynamics, tasks scheduling and task assigning. I made mistakes at the start of the course, as I wasn't able to pin point the exact deadlines and didn't give enough buffer time to manage any delays. That's the reason I got late during the initial days of the project.

In terms of technical learning this course offered a massive opportunity. I worked with some of the health care professionals to get their views and learned what and how they do things. Then it came to designing the logo and tagline for the company that's when Adobe Illustrator came into play. It was fun learning the software. Beside that I learned the programming of Arduino microcontroller board, in C language, which I had to because usually I had to fix and update the code to send the data in a particular format from the board to the Bluetooth device. Learned communication protocols of how the Bluetooth devices connect to each other, Android application programming which were huge tasks. Java and XML language, which proved to be an asset for the phone application. I learned how to schedule the project deadlines by making use of Gantt charts, which was a new and interesting thing to learn.

Lastly to wrap up I would say start working on the course as early as possible, leave buffer time for the group deadlines, pay attention to scheduling, communicate well with your team members and do ask for help when needed and don't wait until the last minute to finish something. Overall, working in a Capstone project was a great learning experience.

6.2 Wei Lu

In the last three months during the process of this project, I have developed numerous skills and obtained much valuable experiences. By using the knowledge from many different areas of engineering, this project simulates a real life design situation that will be experienced by people in the near future. This project not only give me a chance to learn something new, but most importantly, it helped us in improving interpersonal skills such as teamwork, leadership, time management, and utilizing specialists in a group or company to achieve a common goal. Lastly, this project also gave me a big picture of how the process of developing a new product in the real world is approached and developed, from the process of brainstorming to the process of prototyping and documentation.

From the technical aspect, I have learned a lot during these past three months on research and development. I gained an experience on programming Arduino microcontroller board, in C language. In the earlier phase of our project, a lot of time was spent on evaluating the functionalities of the microcontroller and designing the interface for our 8x8 FSR matrix sensor mapping system, which also integrated with temperature and humidity sensor. Then Bluetooth communication module interface with MCU with serial communication format also be well designed and verified. And finally a very simple PCB was build to make our project as a whole part. It is very amazing that these interfaces turn well together in an overall system. In the later phase of our project, I also worked on building up the Matlab GUI as our backup plan with another two teammates.

Aside from all of this, I would like to share some more about this course. During the development period, we have encounter many problems, which relate to hardware failure, programming bug, unpredictable error, comes from out of nowhere, and even time conflict and personal issues. I have only one suggestion to students who will take this course in the future in the following:

- Start working on your project as earlier as possible

6.3 Di Luo

First I want to say thank you to my teammates. We have been through a lot during this 4 months project class. I believe we will all appreciate what we have experienced and learned from this class in the near future. From discussion, design and implementation, we made many mistakes, but we drew the lessons from them in order to ensure success in building our product.

I believe this course is very challenging for all of us, and we had to write the documents and build the product at the same time. The one of the most important things I have learned is the time management. Time management is critical for this course. There is no doubt that the course load of ENSC440/305 is very heavy, so I have to manage the time so that it will not conflict with other classes I have. I had written down all upcoming events on the very first day and start planning my work ahead. Things go pretty smoothly at this point. A teamwork skill is also the key point to success. As a team, we should help each other. When I am helping with my teammates, I also get the opportunities of learning.

At first, I did some researches on causes of developing bedsores. That is also the reason why our team had integrated pressure relief mat, bamboo fabric cover and humidity/temperature sensor into our original design. From the researches, I had also learned lot knowledge on pathobiology. Beside design point of view, I did coding on Arduino board in order to read all sensors' analog value from the customized circuit and deliver them to a wireless device for further analysis. I also did some coding on Matlab in order to get the data and display those data on the pressure-mapping plot on computer. I was responsible for debugging on both hardware and software sides as well. In addition, I edited and wrote the documents. The job duties were equally assigned on each team member in the meeting.

In summary, I have learned a lot during this project course no matter on interpersonal skills and technical skills. As a fourth year student, I believe this experience will definitely benefit me in my career life. I would like to thank my team again for hard working and supporting each other, thank TAs and professors for giving us suggestions and encouragement.

6.4 Henson Truong

Everything worked out in the end. It was an amazing four months how my teammates and I got together and worked on this amazing project. It all started out as a meeting in a coffee shop discussing our ideas, and before we knew it our project was done. After being involved with this project, I realized the great amount that I have gained on both the interpersonal level and the technical level.

I never worked in a big group before for technical projects at school and I always did things by myself so I did, and even for the projects given to me from other courses I have taken at SFU, the project was well defined already so I did not get to choose what I wanted to do. Within the time frame of this project, we had many weekly meetings to discuss what everyone was doing, if there are any roadblocks, and what everyone will continue to do for the next few days. If someone is having trouble with something, I always try and help to resolve the problem so we can continue progressing through our project without delay. From this, I learned how to work as a group and being able to communicate effectively with each and every teammate.

I did a bit of everything regarding the technical side of this project, such as planning out what parts we need, building our functional units, drilling holes in Plexiglass, and coding for both Arduino and Matlab. I finally got to put what I learned in school to use. When I first started this project, I knew nothing about what Arduino is but I caught on pretty quickly because of what I already knew from what school taught me. From the many components we used for our project, I learned how to read datasheets effectively to quickly take out what I need from the manuals. I also improved my soldering skills greatly from soldering a great deal of electrical connections throughout this project.

As for the documentation, mostly everything was evenly distributed amongst the team members so no one person has to bear all the weight. Every team member would take turns integrating all the documents together. As for engineering journals, after writing countless entries, I realized that these journals were well worth writing because it allows me to look back and remember what I did throughout this project.

All in all, this capstone project course was a fun experience. It has provided me with a great deal of hands-on experience, by allowing myself and my team to create a real world-engineering project. This project has allowed me to grow both interpersonally, and technically as an engineer. I really enjoyed working with everyone over this semester of 4 months.

7. Conclusion

The Comfort Mat System as designed by the team Svasth Healthcare is intended to help people prevent pressure sores from developing by creating a Comfort Mat System, which informs the user about how much pressure, is exerted in a specific area. Also by incorporating a temperature and humidity sensor, we can detect unfavorable environmental conditions where pressure sores develop more quickly. To combat against pressure sores, we incorporated vibration motors into our mat, which helps circulate blood in the affected region when activated. We believe the CMS will benefit and help patients prevent from developing bedsores.

Our team also comes up with some future plans and suggestions to further work in order to improve the CMS. We believe that only if keep improving our product, we are able to increase awareness and competitiveness of our product on the market so that more patients could be benefited from it. Here are some plans:

- Test alternative types of cushions on the wheelchair market such as Jay-cushion on their comfort level and pressure level.
- Make the entire CMS easier to integrate different sizes of mat. The CMS will not be limited by the cushion's size.
- Develop the CMS in order to transfer all sensors' data to multiple wireless devices for further analysis. In other words, a pressure-mapping map can be shown on both caregiver and the patient simultaneously. We are only supporting one device at this time due to serial port limitation.
- Assign each individual motor for a specific area. If long lasting pressure is detected on that area, the corresponding motor will be triggered instead of triggering all of them at the same time.

9. Appendix



Meeting Minutes #1

Data: September 2, 2014

Time: 10:30-11:30

Location: Tim Horton at West Mall Center

Present: Wei Lu, Henson Truong, Di Luo

Absent: JabarJung Sandhu (Interviewing disabled and health care industry people for the group ideas)

Purpose of Meeting: To discuss the group ideas

Minutes:

A. Group idea

Discussion: There are two ideas for the project

- Di's idea: Design a sound controlled baby swing that consist of
 1. Timer: Swing the cradle for a certain amount of time and send a message to parents if the time is too long.
 2. Temperature sensor: monitor baby's body temperature
 3. Wet sensor: detect baby's poop
 4. Cradle song player
 5. Sound sensor: detect the baby's crying
 6. Pressure sensor: in case baby fall out of the bed
- Jung's idea: Design a cushion for disabled people, which can detect long lasting pressure and help them prevent developing bedsores (dig out all the information)

B. Invite more team members

Discussion: In order to meet the time frame of this course, more members may be needed for this project

Action: JabarJung will send an email to ENSC-305 list to recruit more helpers if possible

C. Funding sources for our project

Discussion: Henson and Wei believe that team needs funding sources to cover the cost of our project

Action: Di will dig out the funding detail on ESSEF and Wonton funding

D. Set up calendar link and exchange members' contact info

Discussion: Set up a calendar in order to manage team's future meeting time

Action: Wei, Henson and Di will send their course schedules to Jung and Jung will be responsible for making the schedule

E. Next Meeting Date

TBA (Once Jung finish his schedule, he will send out the next meeting time via email or text message)



Meeting Minutes #2

Data: September 5, 2014

Time: 9:30-11:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: To decide the final topic for our project

Minutes:

A. Decide the final topic

Discussion: All team members agree to choose cushion, which can help disabled people prevent from developing bedsores as our project topic. The reasons are

1. Benefit disabled people and society
2. Large market
3. Involves human factor (Great learning opportunities)

Action: Ask professor Andrew for his suggestions on the next meeting

B. Explain the cushion idea

Discussion: Jung explains his idea to the rest of the team

1. Target user: people at risk of bedsores are those with a medical condition that limits their ability to change position
2. Detect the long lasting pressure from the cushion and delivery pressure data from the cushion to a wireless device in order to inform the care giver or patient himself to change the position
3. Several key components of this product
 - A mat
 - FPGA board
 - Sensors
 - Wireless device (Smartphone)

C. Next Meeting date

September 10, 2014



Meeting Minutes #3

Data: September 10, 2014

Time: 9:30-10:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo

Absent: JabarJung Sandhu (Class)

Purpose of Meeting: To discuss the feedback from professor and problems we have so far

Minutes:

A. Feedback from professor

Discussion: Team's project topic has been approved by professor Andrew. He also provide some suggestions on picking components for the project.

B. Components that we will be using for this project

Discussion: List all possible components that team may use

- FPGA board - Arduino Mega 2560
- Blend Micro
- Vibration motor
- Pressure sensors (Two alternatives)
 1. Matrix analog pressure sensor + Matrix sensor shield
 2. Building our own sensor

Action: Look for the suitable pressure sensor and all other components

C. Problems that we can think of so far

Discussion:

- Arduino Mega board only has 16 analog pins, which is not enough for our need
- Power consumption of vibrating motors
- The cost of each pressure sensor is high

Action: Do more researches and make an appointment with TA Jamal

D. Next meeting date

September 12, 2014



Meeting Minutes #4

Data: September 12, 2014

Time: 9:30-10:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo

Absent: JabarJung Sandhu (Joined meeting on the phone)

Purpose of Meeting: To assign job duties for project's proposal

Minutes:

A. Getting key components for CMS

Discussion: Henson found some components that team might need. Here is the list and approximate cost of each component:

1. Mega 2560 R3 board - \$64.9
2. TPH Board - The Temperature Pressure Humidity Sensor Board - \$29
3. Matrix Analog Pressure Sensor - SWITCH - \$63.44
4. Vibration Motor - \$2.9
5. Matrix Sensor Shield - \$32.37
6. Bluetooth 4.0 Low Energy-BLE Shield - \$24.95
7. DMI Duro-Med Convuluted Foam Chair Pad, Blue - \$14.82

Action: Di will apply for ESSEF funding. Wei will find other components

B. Company logo and name / product name

Discussion: Di comes up with two product names: Comfort Mat System and Pressure sensor monitor. Henson name the company as CareTec for now

Action: JabarJung will think about some other names, and design the company logo

C. Assign job duties

Discussion: Team agrees with the assignments on proposal

1. Letter of transmittal - Henson

2. Executive summary - Di
3. Introduction - Wei
4. Key components of our design
 - Phone application - JabarJung
 - Pressure sensor - Henson
 - Vibration motor - Wei
 - Pressure relief mat - Di
 - Humidity & Temp sensor - Wei
5. Analysis of need and market - Di
6. Budget - Di
7. Time schedule - JabarJung
8. Description of each team member - Wei, Henson, Di and JabarJung
9. Conclusion - Henson
10. Documentation - JabarJung

Action: Each team member should finish his part by September 21

D. Next meeting date

September 17, 2014



Meeting Minutes #5

Data: September 17, 2014

Time: 10:30-11:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: To obtain the components of the project

Minutes:

A. Components

Discussion: Wei recommends an alternative pressure sensor called force sensitive resistor. The rest of the group agree to use it as our pressure sensors because of low cost, high force sensitivity and suitable force range. More components are needed for the Comfort Mat System.

1. Fabric cover
2. Plexiglass
3. Copper wire
4. Multiplexer and shift register
5. BLE mini Bluetooth transceiver

Action: JabarJung will borrow FSRs from Surrey campus. Di and Henson will get Arduino Mega board, motors and LCD screen from ESSS office. Until next meeting, team should obtain the key components and finish writing the proposal.

B. Next meeting date

September 29, 2014



Meeting Minutes #6

Data: September 29, 2014

Time: 10:30-11:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: To assign duties for functional specification

Minutes:

A. Duties on functional specification

Discussion: All of the team members agree the following assignments on functional specification

1. Letter of transmittal - Henson
2. Executive summary - Di
3. System overview - Di
 - General requirement
 - Physical requirement
 - Power requirement
 - Environmental requirement
 - Performance requirement
 - Reliability and Durability
4. Vibration motor - Di
 - General requirement
 - Power requirement
 - Safety requirement
 - Performance requirement
5. Sensing modules (Pressure, Humidity & Temperature sensor) - Henson
 - General requirement
 - Power requirement
 - Safety requirement
 - Performance requirement

6. GUI (Phone app) - JabarJung
 - General requirement
 - Performance requirement
7. Relief pressure cushion -Di
 - General requirement
 - Performance requirement
 - Environmental requirement
 - Physical requirement
8. FPGA - Wei
 - General requirement
 - Performance requirement
9. User manual requirement - JabarJung
 - General requirement
 - Documentation requirement
10. Conclusion - Henson

Action: Finish the first draft by Oct 03

C. Next meeting date

Oct 12, 2014



Meeting Minutes #7

Data: Oct 12, 2014

Time: 10:30-11:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo

Absent: JabarJung Sandhu (Class)

Purpose of Meeting: To design the simple version of Comfort Mat System

Minutes:

A. 2*2 Comfort Mat System

Discussion: Wei uses digital pin from Arduino to control each row of FSR matrix and use analog pin to read each FSR on different column.

Action: Wei builds the 2*2 FSR matrix on breadboard

B. Matlab code

Discussion: In order to make communication between Arduino board and Matlab, Di tries to first define the serial port on matlab and then use "fopen" to establish the connection. Then, use "fread" or "scanf" function to read the value from Arduino board. Henson downloads and use the Arduino support package from matlab.

Action: Di will focus on transferring data to a wireless device via bluetooth signal

C. Order more components from digikey

Discussion: Team agrees to start ordering 8*8 FSR matrix right now

Action: Di will order those FSRs and other key components tonight

D. Next meeting time

Oct 20, 2014



Meeting Minutes #8

Data: Oct 20, 2014

Time: 9:30-11:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo

Absent: JabarJung Sandhu (Burned his hand)

Purpose of Meeting: To assign the job duties for design specification

Minutes:

A. Job duties for design specification

Discussion: Here is the assignment list:

1. Introduction - JabarJung
2. Letter of Transmittal - Henson
3. Executive summary - Wei
4. Overall system design
 - Seat - Henson
 - i. Fabric cushion cover
 - ii. Pressure relief mat
 - Input signal unit
 - i. Temp & Humidity sensor - Henson
 - ii. FSR matrix array - Henson
 - iii. Sampling frequency - Di
 - iv. Battery connector - Di
 - Output signal unit
 - i. Vibration motor - Wei
 - ii. Bluetooth signal - Di
 - Data processing
 - i. Computer (Matlab) - Di
 - ii. Phone - JabarJung
 - Circuitry
 - i. Plexiglass - Henson
 - ii. Conductive wire - Henson

- iii. FSR - Henson
- User interface unit
 - i. Phone app programming- JabarJung
 - ii. Arduino board programming - Di
- 5. Test plan - individual
- 6. Conclusion - Henson

Action: Finish all writing assignment by NOV 1, and then Di will start editing the document. At meantime, Wei will start build the 4*4 FSR matrix with BLE mini and Temp & Humidity sensor. Henson will solder all 8*8 FSR on a Plexiglass. Di will figure out the motor control and timer problem. Jung will continue working on his phone application

D. Next meeting time

Oct 29, 2014



Meeting Minutes #9

Data: Oct 29, 2014

Time: 11:30-12:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Job duties for oral progress

Minutes:

A. Job duties for oral presentation

Discussion: Here are the job duties for each team member:

- A brief overview of your project - Henson
 - i. Introduction of Comfort Mat System (CMS)
 - ii. Target customers
- The status of the project with respect to the original timeline and scope and budget - Henson
- The overall progress since the 1st week of classes - Di
 - i. Researched on the causes of bedsores
 - ii. Programmed on the Arduino board to obtain sensors' data and transfer data to a wireless device
 - iii. Got all necessary parts
 - iv. Built the simple version of CMS, which only has 4*4 FSRs and temperature & humidity sensor
 - v. 8*8 final version of CMS is almost down
- Problem need to be solved and tasks remaining to be completed - Wei
 - i. Finish circuitry design of CMS
 - ii. Finish phone app
 - iii. Power supply problem (DC motor)
 - iv. How many motors should be enough
- Conclusion - JarbarJung

Action: Need to practice presentation at home

B. Solving problem for JabarJung

Discussion: Di explains the BLE Bluetooth setup. Wei introduces the ways of using RHT temperature/Humidity sensor. Henson fixes the circuit for JabarJung.

Action: After solving these problems, JabarJung will now focus on building the phone application.

D. Next meeting time

Oct 29, 2014



Meeting Minutes #10

Data: Nov 14, 2014

Time: 9:30-12:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Phone application features

Minutes:

A. Phone application

Discussion: The features of the phone application should include pressure mapping plot, current environmental condition (Temp & Humidity), motor controller options. Team has decided the layout of the CMS phone application.

Action: JabarJung will design the phone application based on others' suggestions

B. Next meeting time

Nov 21, 2014



Meeting Minutes #11

Data: Nov 21, 2014

Time: 9:30-4:30

Location: West Mall Center 3511

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Integrate Comfort Mat System with all components

Minutes:

A. New Matlab code for pressure mapping

Discussion: Wei shows the new pressure-mapping plot to other team members on Matlab. The new plot is very straightforward and clear (similar to heat map). A function called "surf" is used to plot the graph.

Action: Some tests are done on the mat in order to check whether if this new Matlab function shows a consistency and accurate result. Results are pretty good.

B. Integrate all key components together

Discussion: Team need to integrate all components together now for unit testing.

Action: Henson finishes integrating the code of motor and timer on Matlab. Di finishes combining the foam topper and the pressure relief mat. JabarJung is still working on the phone application.

C. Redo the wiring of Comfort Mat System (CMS)

Discussion: In order to make the CMS system simple and neat. Team decides to redo the wiring and place the main FPGA board inside a plastic box.

Action: Wei and Henson focusing on wiring and redesign the circuitry. Di focuses on integrating all the codes on Arduino.

D. Next Meeting date: TBA



Meeting Minutes #12

Data: Nov 26, 2014

Time: 9:30-1:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Backup plan for phone application and system test plan

Minutes:

A. Backup plan for phone application

Discussion: JabarJung is still developing his phone application, but team doesn't have much time left. Therefore, we need a backup plan in case phone application cannot be developed. Team decides to use Matlab as GUI.

Action: Wei will figure out Matlab Simulink part to create a GUI

B. System test plan

Discussion: System test plan is needed for our unit testing

Action: Di and Henson will update system test plans

C. Extend the presentation date

Discussion: Due to difficulty in developing phone application, all team agrees to extend presentation date to Dec 10.

Action: Make an appointment with Professor Steve to discuss team's current situation.

D. Next Meeting date

Dec 1, 2014



Meeting Minutes #13

Data: Dec 1, 2014

Time: 9:30 - 11:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Job duties for presentation

Minutes:

A. Assign the job duties for presentation

Discussion:

- Introduction:
 - Introduction to the team (JabarJung - 2mins)
 - Roles in project
 - Introduction to project (JabarJung - 2mins)
 - Motivation for project
 - Target users
 - System overview
- Project specifics (Henson - 3mins)
 - Timeline
 - Budget and cost
 - Teamwork
- High level system design
 - Hardware (5 mins)
 - Pressure relief cushion (Wei)
 - Material
 - Shape
 - FPGA board and BLE mini (Wei)

- Features
 - Why use Arduino
 - FSR sensors matrix (Wei)
 - Why FSR
 - How to build matrix
 - Temp & Humidity sensor (Wei)
 - LCD screen ((Wei)
 - How to integrate all components together (Wei)
 - Software
 - Matlab (Di)
 - Coding on Arduino (Henson)
 - Phone application (JabarJung - 4mins)
 - Business case (Di - 4mins)
 - Market
 - Cost breakdown
 - Financing sources
 - Competition on the market
 - Conclusion (JabarJung - 2mins)
 - What we learned
 - Future plan
 - Information sources
 - Acknowledgements of help
 - Question
- Action:** Practice at home and make any necessary changes on presentation slides

B. Next Meeting date

Dec 8, 2014



Meeting Minutes #14

Data: Dec 8, 2014

Time: 1:30 - 4:30

Location: Wei's home

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: JabarJung Sandhu (Working on application)

Purpose of Meeting: Perform the unit testing on Matlab

Minutes:

A. Perform the unit testing on Matlab

Discussion: Di has optimized the Matlab GUI code that Wei and Henson have created. Now our back plan is finished.

Action: Record the testing video.

B. Next Meeting date

Dec 9, 2014



Meeting Minutes #15

Data: Dec 9, 2014

Time: 1:30 - 4:30

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Perform the unit testing and try out the phone application

Minutes:

A. Perform the final unit testing

Discussion: Verify the overall performance of Comfort Mat System. The final unit testing will be performed on both Matlab and Phone application

Action: Test CMS based on our system test plan. Record the video for our final testing

B. Phone application

Discussion: Phone application is almost done at this point. The only issue left is alarm setting and updating real-time pressure mapping figure

Action: JabarJung already has ideas about how to fix it. Other group members will focus on the presentation

C. Next Meeting date

Dec 10, 2014



Meeting Minutes #16

Data: Dec 10, 2014

Time: 8:30 - 12:00

Location: Library 2nd level Group study room - Burnaby Campus

Present: Wei Lu, Henson Truong, Di Luo, JabarJung Sandhu

Absent: N/A

Purpose of Meeting: Practice presentation

Minutes:

A. Practice presentation

Discussion: Discuss any changes we have made on the slides

Action: Go through and practice the presentation together