POWER WALKER

Post Mortem Report

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SUBMITTED TO
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DATE ISSUED
April 13th, 2015

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2. Introduction & Background

Presently, millions people are living without electricity around the globe [1]. At POWER WAKER, our goal is provide an alternate, portable and eco friendly source of energy to the people most in need. POWER WALKER designed, implemented and developed a system that converts kinetic energy generated by walking to electrical energy. This system gave birth to our revolutionary product called SolexPRO.

SolexPRO harvests energy by converting kinetic energy generated by walking to electrical energy and then stores the energy in an AA battery energy reservoir. The AA battery will be charged gradually as the user walks/runs daily with the pair of shoes. The user can use the partially/fully charged AA battery with compatible electronic devices. Furthermore, SolexPRO has been engineered to perfection to ensure safety and comfort of our customers by designing a water resistant and non intrusive device in the sole of the shoe.

3. System Overview and Features

In today's world the need for energy is more than ever, and given the fact that the world's population is increasing exponentially means this demand will only keep on growing. Each day a significant amount of energy is spent by an average person due to walking. The idea of harvesting re-useable energy from average persons any daily activity is quite extraordinary in being able to harvest this kinetic energy and convert it into another re-useable form of electrical energy could be a potential solution to increasing demand for energy.

At POWER WALKER, our goal is to address the demand of portable energy whilst keeping sustainability in mind. Our two prototypes SolexPRO E and SolexPRO F convert energy produced from kinetic motion of walking into electricity. SolexPRO E uses magnets alongside a solenoid to harvest the kinetic energy from walking to electrical energy due to linear movements of the magnets inside the solenoid. SolexPRO F consists of micro-hydro-turbines, water tubes and a pump. The water is pumped through the tubes each time a person steps due to the pressure applied to the pump which then turns the micro-turbine and hence power is generated. After assessing our feasibility study and testing initial prototypes, our company concluded to design the product that is based on the principle of electromagnetic induction.

Energy Harvesting Unit (EHU)

The EHU is made up of three components which are the solenoid, the tube and the magnets. Specifically, in each successive step, the magnet moves inside the solenoid thus creates electric current, which charges a battery.

Energy Storing Unit (ESU)

The ESU is made up of two major components, mainly the rectifier and the battery. The rectifier consists of diodes, capacitor and printed circuit board. Also the battery that was used is two AAA rechargeable batteries per shoe. The AAA batteries are placed inside a waterproof housing and positioned on top of the shoe laces.

4. Budget

The table below gives us an outline of the expenditures that have been made until April 11, 2015.

Table 1: Finances

Item	Estimated Costs (in CDN)	Actual Costs(in CDN)
AC motor	50	0
Batteries	60	31.99
Battery Holder	0	7.22
Flashlight	40	63.05
Grill tape	0	2.99
insoles	50	0
LED	0	3.03
Logo	0	37.34
Magnetic Wire	50	67.1
Magnets	52.5	67.89
Micro-hydro water turbines	45	78.04
PEX tubes	50	5.51
Rectifier	10	0
Shipping	0	16
Shoe Glue	0	19.19
Shoes	100	167.99
Solenoid core	0	85
Springs	120	0
Usb associated parts	20	0
WaterSpray	0	22.98
Promotional Material	0	350
Refreshments	0	200
Taxes	0	11.6
Total	**647.5**	**1245.26**

We have spent in total $1245.26 till to date. As we can see from the above table, the total actual cost is way greater than the total estimated cost. This is because we didn't consider some of the aspects such as promotional material and refreshments.

Our only source of funding was from Engineering Student Society Endowment Fund, which is run by Engineering Science Student Society of SFU. We received a total of $500 from them for our project. As shown from the table above, we have clearly exceeded our budget limit by $745.26. Therefore, we will be applying for Wighton fund for further reimbursements.

5. Schedule

Managing a project with varying schedules was not an easy task.

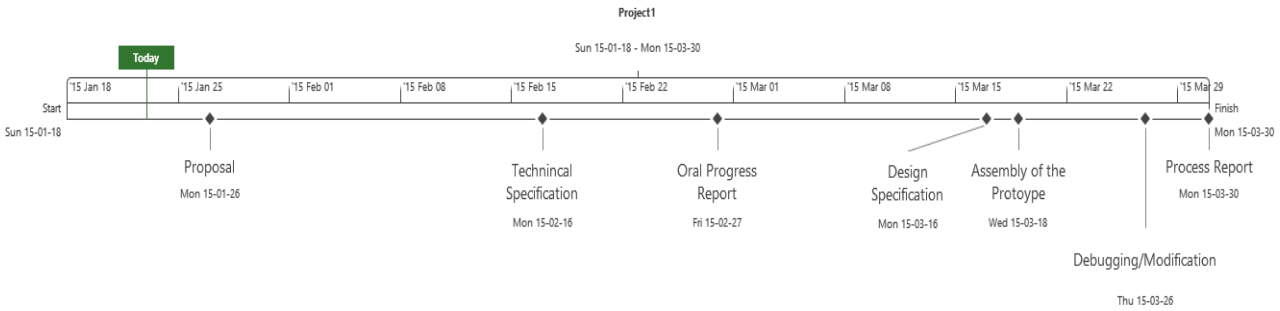

Figure 1: Anticipated Project Deadline

Figure 1 shows us the anticipated project deadline that was set during the initial stages of this project. We initially set out to test two different prototypes. However mid - assembling stage we realized that implementing the second variant was going to take longer than expected. Hence SolexPRO F was discontinued.

Secondly, our initial solenoid designs turned out to be too fragile to be used. This added extra working time to our already tight schedule because the solenoids were needed to be created again.

However due to us setting a soft deadline with an added leeway, we were able to finish our project right on time. Our actual project Gantt chart is shown below (figure 2):

	Task Mode	Task Name	Duration	Start	Finish
0	✓	**Power Walker**	**61 days**	**Sun 15-01-18**	**Sun 15-04-12**
1	✓	**Proposal**	7 days	Sun 15-01-18	Mon 15-01-26
2	✓	**Technincal Specification**	17 days	Fri 15-01-23	Mon 15-02-16
3	✓	**Oral Progress Report**	8 days	Wed 15-02-18	Fri 15-02-27
4	✓	**Design Specification**	**36 days**	**Mon 15-01-26**	**Mon 15-03-16**
5	✓	Documentation	36 days	Mon 15-01-26	Mon 15-03-16
6	✓	Testing	36 days	Mon 15-01-26	Mon 15-03-16
7	✓	**Assembly of the Protoype**	**40 days**	**Tue 15-02-17**	**Sun 15-04-12**
8	✓	SolexPRO	40 days	Tue 15-02-17	Sun 15-04-12
9		~~Prototype 2~~	~~16 days~~	~~Wed 15-02-25~~	~~Wed 15-03-18~~
10	✓	Integration/ Testing	21 days	Mon 15-03-16	Sun 15-04-12
11	✓	Debugging/Modification	17 days	Fri 15-03-20	Sun 15-04-12
12	✓	**Process Report**	4 days	Wed 15-03-25	Mon 15-03-30
13	✓	**Documentation**	62 days	Sun 15-01-18	Sun 15-04-12

Figure 2: Actual Gantt chart

6. Challenges

Like any other product, there are many challenges to be addressed and solved before the product is ready to be handed over to the client. At POWER WALKER, we were faced with numerous problems and challenges throughout the design, fabrication and debugging phase which were resolved by our engineers.

At the design stage, our first and foremost important challenge was the safety and comfort of our clients. We had to ensure that while the device does not harm the user by any means, it also provides comfort to the user. This was resolved by taking into consideration different safety measures such as heat dissipation, possible electrocution, and durability when designing our two first prototypes. In addition, due to geometry of soles in a pair of shoes, we had to ensure our device fits in an average size running shoe (size 10) heel that is about (5-7 cm). This was resolved by placing the solenoid horizontally in the sole of the shoe.

While fabricating our two prototypes of Solex PRO F and Solex PRO E, we faced a leakage problem in the tube lining of Solex PRO F. Due to reliability concerns, risk of possible water leakage and low efficiency we decided to make Solex PRO F prototype obsolete.

Furthermore, during the testing phase, we encountered a problem with charging of the Nokia Power Pack. This was caused due to inconsistent current generated by the solenoid and incompatibility of Nokia Power Pack to store this energy. We decided to simplify the circuitry and solve the issue by replacing the Power Pack with AA batteries.

7. Group Dynamics

Our POWER WALKER team is formed by three systems engineers, one electronics engineer and two computer engineers: Pouya Aein, Shelvin Chandra, Vani Choubey, Tommy Lu, Shervin Mirsaeidi and Arshit Singh. All of the team members have great technical proficiency in a variety of areas including hardware & software design and applications, microprocessor development, advanced circuitry, scripting and testing of enterprise applications, AutoCAD software, embedded software development and firmware engineering. Thus for the distribution of roles, each member took on both development and testing tasks. There were minor conflicts with level of member contributions for the hardware development and documentation work during the semester for this project. However, quick action by the team members to resolve the issue helped eliminate this. Meeting minutes and notes were taken regularly, and other communications such as face-to-face meetings, WhatsApp and Skype meetings, etc took place almost daily.

8. Workload Distribution & Reflections

It would be hard to delegate different responsibilities to different members because our group was well assimilated. We volunteered and helped each others with problems. The workload distribution chart is shown below:

Table 2: Workload Distribution; XX: Primary Contribution, X: Secondary Contribution

TASKS	POUYA	VANI	SHELVIN	ARSHIT	SHERVIN	TOMMY
Documentation	XX	XX	XX	X	XX	XX
Meeting Minutes			X	X		
Scheduling				XX		
Financing		XX				
Parts Procurement	XX	X	X	X	XX	XX
Hardware Fabrication	XX	X	X	X	XX	X
Prototype Testing	XX	XX	XX		XX	XX
Energy Harvesting Unit	XX			X	XX	X
Energy Storage Unit		XX	XX		X	X
Energy Dissipation Unit		X	X		X	XX
User Interface Unit	X	X	X		X	X
Website Design	XX					

Tommy Lu – Chief Executive Officer

Working with POWER WALKER on the SolexPRO has made a lifelong impression on me. I first have to thank my amazing group members: Pouya Aein, Vani Choubey, Shelvin Chandra, Shervin Mirsaeidi and Arshit Singh. By working as a team we became much more than the sum of our parts. I'll always remember the long nights spent in the lab, the meetings, the jokes, the crushing failures and the exhilarating successes. I would also like to thank our professors, Dr. Andrew Rawicz and Mr. Steve Whitmore. They gave us the mental tools necessary to complete our project. Next I would like to thank the lab technicians, Fred Heep, Gary Shum and Gary Houghton. They provided us with parts and shared with us their technical expertise whenever we found ourselves in a conundrum. Lastly I would like to thank the course TA's for marking the many many pages that made up our documentation.

My role in the course was to oversee workflow and make sure that we hit all of our deadlines. This means that I had a hand in all of the processes within the group. I worked with material ordering, prototyping, fabrication, testing and documentation. Thanks to my education in Systems Engineering I was able to use my broad range of knowledge to advance our ideas and make sure that our concept was physically sound. I learned much about solenoids; how they work, their most efficient design, and how to harness the power produced by them. I also learned about rectifier circuits and their various configurations. Lastly I learned about good old fashioned mechanical design and tear down. We used several different techniques to break down a shoe and rebuild it with a power harvester installed. So in the end I learned physics, micro-electronics, and mechanical design. The courses that correlated the most to these subjects are: PHYS 221, ENSC 325, and ENSC 230 in that order.

I found that my interpersonal skills grew tremendously throughout the course of this capstone project. I worked much harder on this group project than any other group project I've worked on since I started at SFU. This is due to how much I cared about the project. I could tell that my teammates felt the same was so I was determined not to let them down. I learned how important open communication is in a large team. I learned how to talk about conflicts and to work through them. I learned that everyone has a specialty, an area where they excel at. By identifying these qualities, and assigning appropriate tasks that make the most out of them, I was able maximize the output of the group. Four months is a long time to work with the same people day in and day out. I consider myself the glue that held everyone together. By promoting a light sense of humor, our team was able to maintain a high level of productivity even under a constant workload.

In the end, I feel extremely proud of what POWER WALKER has accomplished. We were able to create an entirely unique and innovative product that has the potential to change the status quo. We took an idea the drawing board to a tangible product that functions remarkably well. This is just the beginning. Who knows? Maybe you'll find a SolexPRO on the shelf in the not too distant future.

Shelvin Chandra – Chief Technology Officer

Over the last sixteen weeks, I have learnt quite a number of things and have acquired numerous skills that I believe would aid me in the future ranging from technical to interpersonal skills. By completion of our energy harvesting shoe prototype, I have learnt and improved my communication skills as well as mechanical and electrical design skills.

As one of the Chief Technical Officers in POWER WALKER, I was responsible for designing the electrical circuit for our energy harvesting shoes: the SolexPRO. Along with Shervin Mirsaedi, I was the technical consult for our team. Based on my previous knowledge on electromagnetism, I supported Tommy Lu with his idea when he first came up with using solenoids and magnets as our power generators. Since there was also the option of using a tiny hydro-turbine generator and we were not sure of the possible outputs of either of the two options, I advised the team to do trials with both. During the testing phase, we noted that the output from the hydro-turbine was too little when compared to the magnet and solenoid option. There was also the issue of weight when the water in the tubes was taken into account. Based on these, we decided to drop the hydro-turbine option and focus entirely on the electromagnetism option. Once this was finalized, I worked with the team to fine tune the design of the solenoids as well the circuit and circuit boards. Following this and with the help of Vani Choubey, I acquired the components needed for the circuit boards. Since the lead time for obtaining printed circuit boards was more than what we had remaining, I used a perforated circuit board that Vani had obtained from Dr. Parameswaran. After a number of trials, I was able to solder all the components, including diodes and capacitors, on the perforated boards using minimal board area and obtained successful results. Though its value was dependent on how fast the magnet moved inside the solenoid, the output from the board was a stable direct current (DC). If we were able to continue with the project, we would definitely try to increase the charging current and might even implement more functionality besides charging the AA and AAA batteries.

Besides the above mentioned technical skills, I was also able to advance my communication skills. Even though I do have a few years of experience in a professional work environment, I did find it a little challenging communicating to my team members at times. This was mainly due to a lack of hierarchical team structure. However, this also proved to be helpful as I was able to influence the team through reasoning and persuasive arguments.

Despite all the challenges, I had a wonderful time working with the POWER WALKER team. We were able to resolve all our issues through either meeting or direct communication. In addition, we received a large amount of direction from Dr. Rawicz, Dr. Whitmore, Dr. Parameswaran, Fred Heep and Gary Shum. For all these I would like to say a big thank you to all the above mentioned individuals as well as the Power Team for their hard work in helping convert an idea to a touchable prototype.

Shervin Mirsaeidi – Chief Technology Officer

During the past four months, I had an amazing experience working on the Solex PRO project. ENSC 440 was by far the most challenging and pleasurable course I have ever taken during my studies. It gave me a chance to apply what I have learned in the past few years. I was able to apply the knowledge I gained in the Engineering Reliability course during this project in order to meet reliability and safety requirements of our product. ENSC 305 has taught me the importance of proper documentation and the detailed procedures that are required to design and create an actual product from scratch. Having finished these two courses, I feel much more confident in facing new challenges and my future career goals. In addition, I learned that when a task is broken down into smaller tasks, it becomes substantially easier to successfully complete a complex project.

My main responsibility during the project was to do most of the fabrications on the shoe with Pouya. I was able to get a good understanding of what it takes to actually create a prototype from scratch. I was able to review and further extend my experience with SolidWorks when I spent time creating drawings of some of the components of our prototype. I also was able to make some great connections while working on this project; some of these connections were introduced to me by Gary Shum, Gary Houghton and Fred Heep. Pouya and I were able to research and purchase the electronic parts required for our project. I would like to express my sincere gratitude for the great advice we received from Fred Heep. Another one of the main tasks that Pouya and I spent considerable amount of time on was manually and automatically winding up different sizes of solenoids. Furthermore, I was able to refresh and enhance my knowledge of using electronic apparatus during the time we spent on testing the outputs of our prototype. I was also able to significantly increase my technical writing skills while working on my assigned parts of the documentation required for ENSC 305.

Interpersonally, I learned to collaborate within a group of teammates with different majors, backgrounds and work experience. In addition, I learned to respect others' opinions and take into consideration suggestions made by peers. During the project, each of us learned to communicate with one another without any problems in case of disagreements.

Last but not least, I would like to take this opportunity and thank everyone who contributed to our project including Dr. Andrew Rawicz, Steve Whitmore, Fred Heep, Gary Shum, Gary Houghton, Pouya Aein, Tommy Lu, Shelvin Chandra, Vani Choubey, Arshit Singh and many others with whom we interacted.

Pouya Aein– Chief Innovation Officer

Capstone project was one of the only group projects at SFU that gave me a real insight of how to design and develop a product from scratch. In the past four month I used my knowledge gained throughout my academic studies and co-op experience on the SolexPRO design and development.

My knowledge in mechanical design, fabrication and CAD design helped me to take apart the initial and foremost crucial stage of this project by designing and fabricating the component in Solidworks. My main role in the design stage was to design couple of prototypes and perform a feasibility study on them. In addition, I was able to analyze all the components and subcomponents in Solidworks to ensure precision, safety and efficiency.

As project progressed, Shervin and I were in charge of fabrication and testing of the product mainly hardware implementation. This included 3D printing of the parts, making modification to the shoes, using different tools in machine shop and proof sealing the final product. Furthermore, this also gave me an ability to work on the energy harvesting unit and gain more knowledge on electrical and magnetic fields generated by this methodology. In addition, Shervin and I were mainly in charge of procurement of parts from different retailers.

Interpersonally, I learned to tackle challenges, work in a team and/or individually, enhance my communication skills and advance my project management skills. Furthermore, I took this as an opportunity to allow myself to be open to different suggestions and accept other methodologies to achieve a better end result. There were ups and downs, misunderstandings and lack of commitments in the team throughout this journey. However, as a team we managed to resolve these issues and fulfill our purpose to complete our project on time.

This project consumed huge amount of work, research and dedication. Still, implementation would not have been possible if I did not have the support of many individuals and organizations. Therefore I would like to extend my sincere gratitude to all of them.

First of all I am thankful to all the members in our group for their support and for providing necessary guidance concerning projects implementation, design and documentation. I'm also grateful to Dr. Andrew Rawicz and all the teaching assistants, Steve Whitmore, Fred Heep and Gary Shum for their provision of expertise and technical support in this matter. Without their superior knowledge and experience, the project would not likely have had the same quality of outcome, and thus their support has been essential.

Vani Choubey – Chief Financial Officer

Looking back at the semester now, I realized why capstone project plays a very important role during your career as an engineer. This course gives us a real outlook on how engineers act in real life scenarios. It allows you to have an experience with hardware development process, from defining the requirements all the way through testing and verification of the product. I got to learn not only at technical level but also at interpersonal level.

As the president of SFU's Women in Engineering Group, I have been exposed to world of finances before. By acting as a Chief Financial Officer for my company, I have enhanced my financial management skills. I was responsible for reimbursements, contacting possible sponsors and keeping track of expenditures and amount of funds left.

I, along with Shelvin, was also responsible for designing, implementation and verification of the Energy Storage Unit. Through this whole process, I not only got exposed to new technology but also enhanced some of my concepts of electric circuits. I learned different PCB design software such as Eagle 7.2 and Fretzing. Now, I am capable of designing circuits not only on at schematic and breadboard level but also at PCB level. I also enhanced my researching skills by going through different research papers and consulting with Engineering Science and Physics professors.

Furthermore, ENSC 305W helped me strengthen my writing skills. Prof. Whitmore and his teaching assistants guided me and my team members through all the documentation required for this project. Their invaluable teaching showed us how to make our reports precise, detailed and at the same time to the point.

In terms of inter personal skills; I familiarized myself with different aspects of team dynamics. I faced different challenges related to maintaining the communication between the team members and management of time. I learned to communicate my ideas and views without disrespecting anyone. I also provided support to any of the team member whenever they were in need of help.

It was amazing to go through all the stages of making the SolexPRO. I would like to acknowledge Dr. Rawicz, Dr. Parameswaran, Fred Heep and Gary Shum and all the teaching assistants who helped us turn our idea into reality. Without their support, this product would not have been the same as it is today.

Arshit Singh – Chief Operating Officer

Looking back, I can say Capstone has been one of the more useful courses I have taken at SFU. Even though there were no weekly assignment or semester-end exams, Capstone still taught me multiple skills. The best part, I either learnt these skills on my own or my group members taught me these skills. We may have been overwhelmed by the amount of work this course requires, or got frustrated at thought of spending multiple hours in the lab at a stretch, but thanks to Capstone, I have matured out as an engineer.

My primary responsibilities as a Chief Operating Officer was to schedule tasks and to ensure our project does not go off track. Due to my past experience with using Microsoft Project, I immediately started scheduling. I inculcated all the milestone tasks as well as number of hours everyone can work per week. This made it easier to schedule our project to a tentative finish date and have a working Gantt chart ready.

Secondly, I also helped with fabricating the shoe to house the PCB and the solenoid. I was succesfully able to carve out the sole of the shoe with various equipment as needed. Some of my other secondary responsibilities included Testing and Prototyping the Solenoids, Testing the rectifier circuit using Digital Multimeters, Function generators and Oscilloscopes.

Another important aspect of Capstone that I have to mention was Documentation. No matter how redundant our Progress Reports got or how overwhelmed we got finishing up documents for our product, this experience has taught me the importance of maintaining a track record of our progress. Not only previous documents provide a reference to develop our design, these documents came in handy to inform us about the limits of our product.

Personally, this course has taught me the importance of scheduling and prioritising tasks. I have also learnt the importance of team values and how to properly implement them to come forth as trusted, dependable and a self - motivating team member. Dealing with people from varied backgrounds and technical aspects has enhanced my listening skills as well as made me a more welcoming person.

First and foremost, I would like to thank my team members Pouya Aein, Shelvin Chandra, Vani Choubey, Tommy Lu and Shervin Mirsaeidi, without whose help this project couldn't have been built from the ground up. I would also like to thank our professors Dr. Andrew Rawicz and Mr. Steve Whitmore for the consistent support. A special to thanks to Dr. Ash Parameswaram, Freed Heep, Gary Houghton for their unmatched technical knowledge that played a crucial part in completing our project.

Given the opportunity, I would be ecstatic to work with the same group again!

9. Conclusion and Future Work

Through the hard work of our members, POWER WALKER has successfully created a shoe that harvests kinetic energy. We have met our design specifications and passed our System Test Plans. Currently the SolexPRO is capable of charging AAA and AA batteries. We have collaborated well as a group and have become close friends through the trials and tribulations that occurred during development. Our goal was to tap into a new source of sustainable energy. The world is so used to seeing energy as something to be consumed, our aim is reverse this thought. We want the world to start considering energy as something to be generated.

The next step for POWER WALKER is to officially incorporate. We believe that the SolexPRO has promise. Although we are not quite there in terms of design, our concept is proven and sound. More has to be done in research and development to improve the reliability, durability and aesthetics of our product. We will also look into licensing the SolexPRO system to shoe manufacturers for a set royalty. The future holds a great deal of promise for our company.

10. Meeting Minutes

Meeting Number 001

Date and Time: December 27, 2014 @ 4.00pm
Location: SFU ASB Atrium

Attendees: Pouya Aein, Tommy Lu, Shervin, Vani Choubey, Shelvin Chandra
Absent: Arshit Singh

Follow-up Items from Previous Meeting:

1. None

Agenda(s) for Current Meeting:

1. Present at least 2 possible project ideas to group for consideration
2. Choose 3 project ideas from the possible project list for presentation to Dr. A. Rawicz

Agenda Item #1: Present at least 2 possible project ideas to group for consideration

Minutes:

Pouya:
- i. Using image processing at a poker table to determine value of poker chips on the table
- ii. Shaver with camera to allow neck shaving with ease

Shervin:
- i. Using image processing to keep track of vehicles with unpaid parking. This will reduce the man hours spent to do parking lot patrolling
- ii. Build an app to control all appliances in a house remotely

Shelvin:
- i. Car sensor system to warn driver of distance between his vehicle and the one in front at his particular travelling speed
- ii. Swimming pool alarm system to call for help automatically when patron fails to check-in at a set interval

Tommy:
- i. First responders notification system – will search for qualified first aid responders nearby and notify them of the emergency situation
- ii. On-star system alternative

Vani:
- i. Foldable crutch – can be folded to a possible pocket size for easy carry around
- ii. Crutch with pressure sensors to allow it to be more comfortable for user
- iii. Bike turning signal
- iv. Automatic low tire pressure/ bad brake notification system for bikes

Conclusion(s):

None

Action Item(s):	Assigned to:	Deadline:
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Agenda Item #2: Choose 3 project ideas from the possible project list for presentation to Dr. A. Rawicz

Minutes:

i. Using image processing at a poker table to determine value of poker chips on the table
Not certain on how complicated this will be to implement and/or if the group has quite the expertise to carry this one out

ii. Shaver with camera to allow neck shaving with ease
Maybe too simple for 6 people group

iii. Using image processing to keep track of vehicles with unpaid parking. This will reduce the man hours spent to do parking lot patrolling
This seems a doable idea as it is applicable, practical and group has the ability to implement it

iv. Build an app to control all appliances in a house remotely
Apps already exist for this

v. Car sensor system to warn driver of distance between his vehicle and the one in front at his particular travelling speed
This is already in the market

vi. Swimming pool alarm system to call for help automatically when patron fails to check-in at a set interval
Alarm system may not be an effective solution to the problem

vii. First responders notification system – will search for qualified first aid responders nearby and notify them of the emergency situation
This seems like a possible project idea as well

viii. On-star system alternative
This seems like a possible project idea as well

ix. Foldable crutch – can be folded to a possible pocket size for easy carry around

x. *Maybe too simple for 6 people group and possibly too expensive to be a marketable solution*

xi. Crutch with pressure sensors to allow it to be more comfortable for user
Possibly too expensive to be a marketable solution

xii. Bike turning signal
Done as ENSC440 project in the previous years

xiii. Automatic low tire pressure/ bad brake notification system for bikes
Possibly too expensive to be a marketable solution

Conclusion(s):

The three possible project ideas so far are:

1. Using image processing to keep track of vehicles with unpaid parking

2. First responders notification system
3. On-star system alternative

Action Item(s):	**Assigned to:**	**Deadline:**
1. Explore on “Using image processing to keep track of vehicles with unpaid parking“ idea and list pros and cons to determine project viability	Pouya and Shervin	Sunday, January 04, 2015 @12.00pm
2. Explore on “First responders notification system “ idea and list pros and cons to determine project viability	Arshit and Tommy	Sunday, January 04, 2015 @12.00pm
3. Explore on “On-star system alternative “ idea and list pros and cons to determine project viability	Vani and Shelvin	Sunday, January 04, 2015 @12.00pm

Meeting Number 002

Date and Time: January 9, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent:

Follow-up Items from Previous Meeting:

- Previously discussed topic proposal

Agenda(s) for Current Meeting:

- Choose a more reasonable topic for 440

Minutes:

- The current ideas were discussed and assessed
- Many different ideas were laid out
- Among them were advanced walking cane, GPS drone, Smart credit card and shoes that can harvest energy from walking
- We chose the latter

Conclusion(s):

- Energy harvesting shoes was chosen as the topic as a consensus was reached.

Meeting Number 003

Date and Time: January 12, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent:

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Brain storm ideas for the chosen project

Minutes:

- We decided that our project can be implemented in two ways:
    - Hydro-electrical principle
    - EMF principle
- Shelvin also talked about the possibility of using mechanical gears
- We decided to create two prototypes; one based on the hydro-electrical principle and the other based on EMF principle

Conclusion(s):

We chose to create two prototypes.

Meeting Number 004

Date and Time: January 16, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent:

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Materials required for the project

Minutes:

- For fluid mechanics, following parts were needed
    - PVC pipes
- For EMF model, we would require
    - Magnets
    - Pipes
    - Copper Wires
- We will also require Shoes and Soles which are common to both the system

Conclusion(s):

- We decided on the necessary parts for our project

Meeting Number 005

Date and Time: January 20, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey
Absent: Pouya Aein

Follow-up Items from Previous Meeting:

- ESS funding proposal

Agenda(s) for Current Meeting:

- Go over the presentation

Minutes:

- Arshit was presenting the idea to ESS
- Everyone pitched in for any errors in the presentations

Conclusion(s):

- None

Meeting Number 006

Date and Time: January 21, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: N/A

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Task Distribution for the Proposal

Minutes:

- Following task distribution was decided for the Proposal.
    - Shelvin & Tommy – Market competition
    - Arshit – Gantt Chart and Scheduling
    - Vani – Finances & budget
    - Pouya– details of each prototype
    - Shervin – Introduction

Conclusion(s):

- Tasks have been distributed as a consensus was reached.

Meeting Number 007

Date and Time: February 10, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: Arshit Singh

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Task Distribution for the Functional Specs

Minutes:

- Following task distribution was decided for the Proposal.
    - Shelvin & Vani – All the requirements
    - Arshit – User documentation requirements, Executive Summary and Conclusion
    - Pouya & Shervin – Introduction and Proof Reading
- Also it was decided to ask for an extension for Function specifications.

Conclusion(s):

- Tasks have been distributed as a consensus was reached.

Meeting Number 008

Date and Time: February 26, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Vani Choubey, Shelvin Chandra, Pouya Aein
Absent: None

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Task Distribution for the upcoming oral presentation
- Test out recently acquired parts
- Address concerns regarding Arshit's participation and commitment towards the project

Minutes:

- Arshit is tasked with the introduction and the scheduling portion of the presentation
    - 1.5 min for Introduction and 1 min. for the Scheduling
- Vani is tasked with the Finances, Funding and Logistics
    - 1 min.
- Pouya and Shervin are collectively presenting the progress of our project.
    - 3 min. in totality
- Tommy will be presenting the Remediation for our project
    - 2.5 min.
- Shelvin will be presenting the conclusion
    - 1 min.
- Solenoids ordered/constructed were found to be working as expected, however we are still trying to fix some issues regarding micro hydro generator
- Arshit's motivation towards the project was addressed and agreement was reached where tasks will be clearly defined well ahead of time. Also, Arshit needs to show motivation towards this projects and he needs to prioritize his school and work
    - Arshit and the rest of the team have agreed to the solutions mentioned above.

Conclusion(s):

- Tasks have been distributed and have been agreed upon
- Parts are in the process of being tested before moving on to the 'Assembly' stage
- Arshit and the group came to a conclusion on how to go about in the future.

Meeting Number 009

Date and Time: February 27, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: N/A

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Practice for Progress Report Presentation

Minutes:

We all met to practice for our presentation

Conclusion(s):

- None

Meeting Number 010

Date and Time: March 01, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Pouya Aein
Absent: Vani Choubey

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Task Distribution for the upcoming Design Specs

Minutes:

- Pouya, Arshit and Shervin decided to split the Solidworks fabrication process and EHU
- Tommy, Vani and Shelvin will work on EDU, ESU and UIU
- Pouya and Shervin will be working on finding the output parameters of the solenoids
- Decision on deciding the demo date is still pending.

Conclusion(s):

- Tasks have been distributed and have been agreed upon

Meeting Number 011

Date and Time: March 16, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: N/A

Follow-up Items from Previous Meeting:

- Design Specs Documentation

Agenda(s) for Current Meeting:

- Proof Read and Edit the Design Specs

Minutes:

- Pouya and Shervin proof read the document
- Shelvin edited everyones error
- Arshit and Vani were implementing diagrams in the document
- Tommy helped with the ToC, ToF, and List of Figures

Conclusion(s):

- None

Meeting Number 012

Date and Time: March 22, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey
Absent: Pouya Aein

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Task Distribution for the Progress Report

Minutes:

- The current progress of the project was discussed
- The type of the battery needed was decided
- Arshit will be providing some rechargeable AA and AAA batteries
- Following task distribution was decided for the progress report.
    - Shelvin – Introduction & Conclusion
    - Arshit – Gantt Chart and Scheduling
    - Vani – Finances
    - Pouya and Shervin – Progress of the Project
    - Tommy – Remediation

Conclusion(s):

- Tasks have been distributed as a consensus was reached.

Meeting Number 013

Date and Time: April 04, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: N/A

Follow-up Items from Previous Meeting:

- N/A

Agenda(s) for Current Meeting:

- To shoot for the promo video

Minutes:

- We hired two professional videographers to shoot for our video.
- The shoot in its entirety took 4 hours
- We managed to get great shots of us working in the lab

Conclusion(s):

- None

Meeting Number 014

Date and Time: April 10, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Tommy Lu, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: N/A

Follow-up Items from Previous Meeting:

- N/A

Agenda(s) for Current Meeting:

- To fabricate our prototype

Minutes:

- Arshit, Pouya and Shervin helped in carving out shoes so as to house the circuitry and the Solenoid
- Tommy, Shelvin and Vani were busy making extra PCB's as a backup

Conclusion(s):

- None

Meeting Number 015

Date and Time: April 11, 2015 @ 12.30pm
Location: SFU ASB Atrium

Attendees: Arshit Singh, Shervin, Shelvin Chandra, Vani Choubey, Pouya Aein
Absent: Tommy Lu

Follow-up Items from Previous Meeting:

- None

Agenda(s) for Current Meeting:

- Task Distribution and working on the Post Mortem Report

Minutes:

- Following task distribution was decided for the Proposal.
    - Shelvin – Group Dynamics
    - Arshit – Gantt Chart and Scheduling and Workload distribution
    - Vani – Finances & budget
    - Pouya– Challenges faced
    - Shervin – Introduction and System Overview
    - Tommy - Absent

Conclusion(s):

- Tasks have been distributed as a consensus was reached.