

# Post Mortem for the Wearable Pointing Device

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## 1. Introduction

Over the past four months, four dedicated engineering students, Alex Chen, Albert Xu, Current Zeng, Scott Zhu from AimBot technology, have successfully developed a proof of concept of the WizardHand system. This document summarizes and shows the results and challenges the team has gone through.

The WizardHand system is a wearable pointing device, it can be wirelessly connected to PCs and smartphones in order to achieve cursor control. It is wearable as it is a glove, and it will not be limited by the existence of a table since it maps the location of a single hand directly to the screen. It uses the combination of finger positions to launch hotkeys which are intuitive and fast. By using this device, the user will have a more elegant and efficient way to control the screen while doing a presentation, and a more involving and attractive experience during gaming.

The system is physically implemented via the use of a glove, containing one potentiometer for each finger in order to catch the motion of fingers for users. The control unit attached to wrist is connecting with the glove. The control module is consists of CPU, Bluetooth module, IMU, battery and most of the important components. All the digital data can be sent via the control unit, we can also capture gestures of users through it.



Figure 2- SolidWorks Design of Our Device



Figure 1 - Final Result of Our Design

## 2. System Overview

Figure 1 below shows the high-level overview of WizardHand. The system takes the data from measurement units, and output 2-D coordinate of cursor position and hand gestures code in five digit binary code. The measurement units include five soft potentiometers and one IMU. The five Soft Potentiometers are used to detect the status of user's fingers. For example, if the user only bends his/her ring finger, then the measurement is 00010b. We implemented MPU9150 as IMU in our design. MPU9150 has three smaller measurement units, which are Accelerometer, Gyroscope, and Magnetometer, embedded on board [2]. Each of this smaller components has 3-DOF. In conclusion, we have nine measurements from IMU and five measurements from Soft Potentiometers. These fourteen measurements will be collected by Arduino Pro mini and sent to PC's end by Bluetooth module. In PC's end, Visual Studio is used to write the driver for our device. In this device driver, nine raw data of IMU will be processed and filtered by Kalman Filter then be output as the 2-D coordinate of cursor position, and five digits binary measurements from Soft Potentiometers will be output directly.

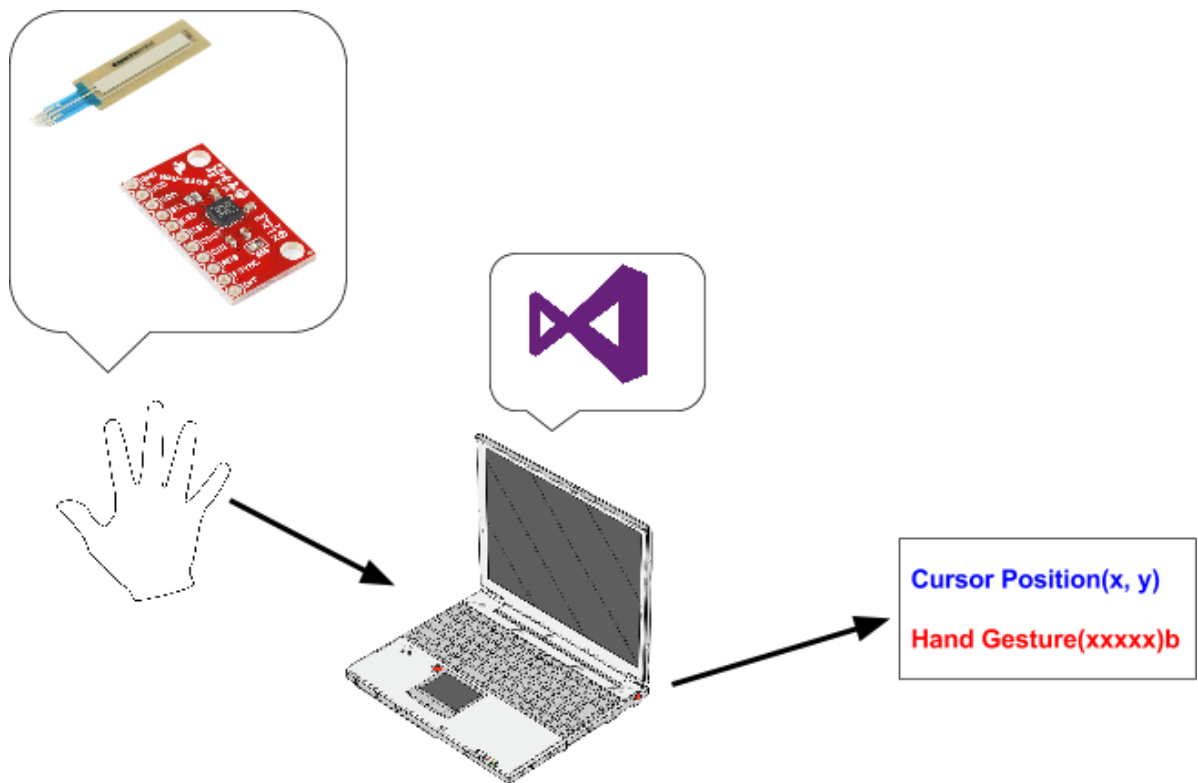


Figure 3 - System Specification

### 3. Business Case

To sell our product, the first targeting people are teachers. Because during the lecture time, the teacher always moves around the class, especially when they are far away from the computer but still trying to click the PowerPoint slides, our product will be very helpful and convenient.

Second targeting people are disabled people who are not able to move around easily. Using our product, even if you are sitting on the sofa or lying on the bed, your computer will be still under your control.

Another advantage of our product is that it does not require Wi-Fi environment, which means you can use our product to control computer almost everywhere.

Actual Cost	\$691.5
Expect Cost for Mass Production	\$100
Selling Price	\$200
Profit	\$100
Expected Time for Reproducing	12 Hours

Table 1 - Future Cost of Project

As we mentioned in cost part, we can purchase most materials from China, the cost will be way much cheaper than buy them in Canada. Because it is a brand new idea for a computer mouse and based on the feature of our product, we think the selling price is reasonable.

After doing the market research, we find some big company like Razer are doing similar product as we do, but it is still on testing phase and the price might be a little bit higher compare to the normal mouse. So we think our product is very competitive in the market if we reduce our materials cost.

#### 4. Materials and Cost

The actual cost of our project is \$691.5, which exceed our expected cost of \$501.99 by \$190. During our design process, some unforeseen things happened, so there were some unnecessary expenses. For example, we do not have professional soldering skill, the first time we tried to solder the hardware components failed, so we had to buy more new components.

Secondly, in order to save time, we bought some electronic and mechanical components in Canada instead of ordering them from China which results in more cost of this project. In addition, the shipping costs and taxes applied when we ordered stuff from U.S. and Canada.

The next reason was that we did not pay attention to the second microprocessor we purchased, the Arduino Lily-pad does not have Bluetooth module pins, so we had to change our microprocessor to Arduino Pro-mini which is the one we are using now.

Components	Budgeted	Actual	Breakdown
Arduino Microprocessor	58.74	99	23*3+30
Bluetooth module	32.42	162.5	32.42+35+50+46
IMU	25.83	130	
Flexible potential meters	130	60	
Gloves	50	23	13+10
PCB boards and wrings	20	30	
LEDs	5	5	
Vibrate modules	10	10	
Li-on battery	20	27	
Electrical tools	50	50	
Office materials	50	45	
Others	50	50	
<b>Total</b>	<b>501.99</b>	<b>691.5</b>	

Table 2 - Detail of Project Cost

## 5. Schedule

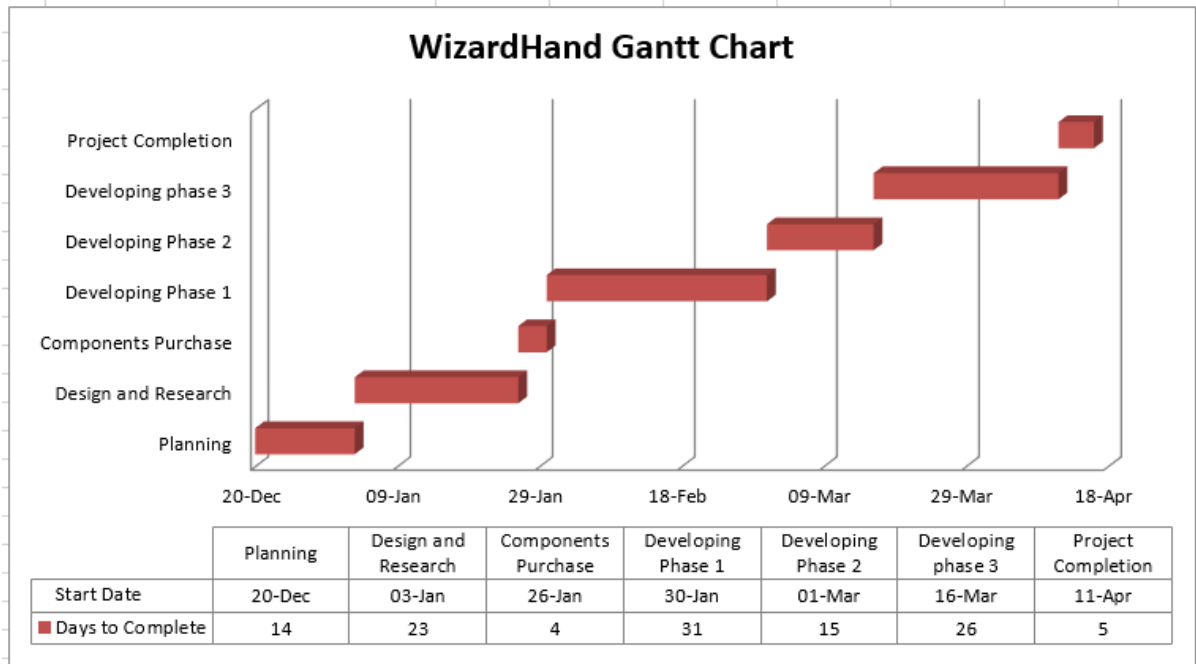


Figure 4 - Proposed project schedule

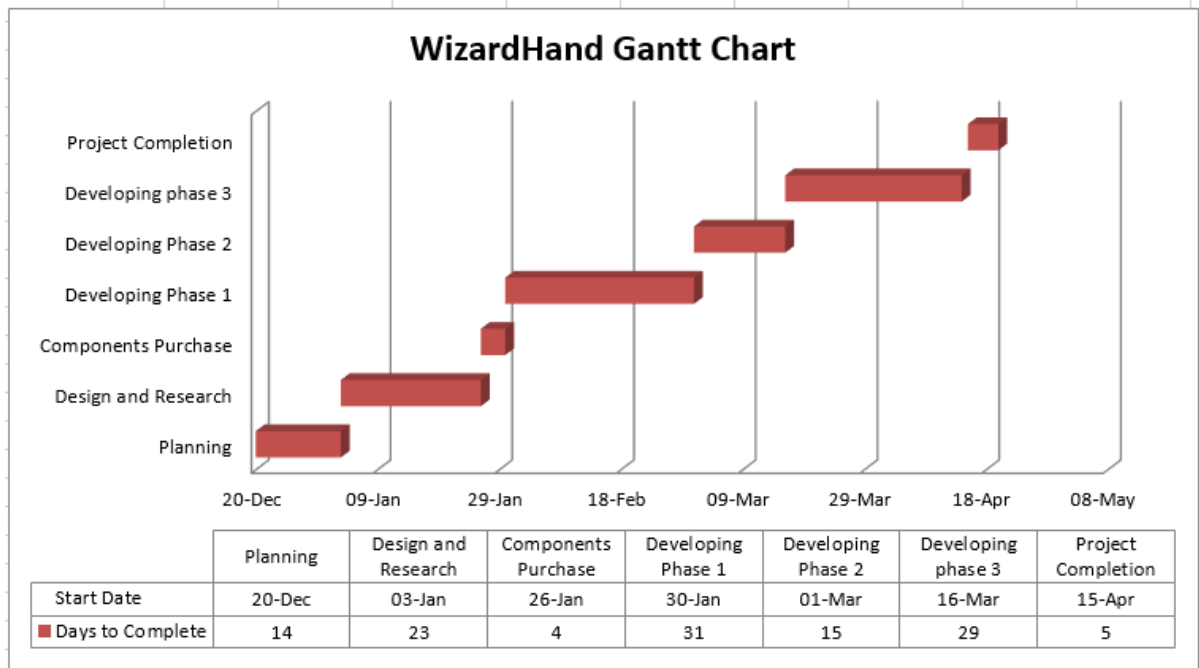


Figure 5 - Actual project schedule

Figure 4 shows the proposed schedule as designed phase. This schedule is the original one we followed. But as we continued doing the project, we faced some technical problems and we had to change our original schedule. Figure 5 shows the actual project schedule.



We followed the original schedule until developing phase 1, all the individual component parts were tested by checking that they were functionally sound, and they were all soldered on solderable breadboard before 01-Mar. During the developing phase 2, we have some software error problems, fortunately, we have some friends from computing science major is willing to help us debug the C++ code, so we still finished developing phase 2 on time. However, during the developing phase 3, we encountered Bluetooth module communication problem, which caused us have to delay our demo date about 3 days. As we originally planned, by the end of 11-Apr, the project should be completed and ready for demo. But we actually finished the project on 15-Apr, so we changed the demo date to 18-Apr.

## 6. Major Technical Challenges

### 6.1. Software Challenges

#### 6.1.1. PC freezes while performing read\_data function

When we ran our PC UI at the first development phase, we faced the problem that each time we launch our UI, the computer freezes. We have to force the program to end in order to take back control of the computer. The solution we found is the multi-thread programming, it allow the read\_data function to run on an independent thread, and at the same time, we are able to perform other actions and operations.

#### 6.1.2. Data reading malposition

We have 13 groups of data, sending from Arduino Pro-mini to PC byte by byte. On the PC side, UI should be able to accurately capture the data. However, during the phase one development, we found our UI data reading is obviously wrong and meaningless. Through problem shooting, we found out that it is because the UI could not recognize where to start reading, which means it might read data from byte that is not representing the first data. The solution we use is to add both sides a signifier. This handshaking protocol ensures that each time the UI will read the beginning of a data transfer.

### 6.2. Hardware Challenge

#### 6.2.1. Soldering fails / components broken

When we started to assemble all the essential components together, we found it really challenging to accurately and flawlessly solder those tiny pins and leads. We were impatient and careless. We deal with the soldering as regular lab's soldering. The high temperature and longtime contact between the soldering gun and the components finally burned several of our expensive parts. We have no choice to replace them and

start again. The next time we started the assembly, we designed more logical and easy-to-operate circuit and components' positions. With more attention and time inputs, we finished the circuit soldering.

### **6.2.2. Bluetooth random disconnection issue**

We established wireless serial communication using Bluetooth under the baud rate of 115200 which is really ideal for transferring our sensor data. However, the Bluetooth data transfer will randomly stop after several seconds of successful transfer. We consider multiple possibilities that might cause this problem, and we excluded each one of them. In the end, the attempt to use Bluetooth under 115200 baud rate still resulted in a fail. We had no choice considering the time constraint and then we lowered the baud rate to 9600 in exchange for some data loss. We will continue researching on the Bluetooth module and hopefully solve the issue in the future.

## **7. Group Dynamics**

AimBot Technology Inc. team is a group of engineering students organized to work together cooperatively and interdependently in order to success finish WizardHand: wearable pointing devices. Our team will work together for one semester. Therefore, the positive relationships are necessary. Everybody showed respecting to others, when a disagreement occurred, we would solve it later. In this way, everybody has time to think about what to do.

We split the tasks equally according to our specialization in different fields. Each module will be assigned to at least two members in order to have an easier team communication and understanding. Furthermore, we decided to schedule our weekly meeting and used a group chat for daily communication. We also provide feedback and discuss the progress as well as the major problems of the project in order to keep track of the project progress and to solve issues quickly. In addition, we assigned roles at the beginning of this project in order to have the most efficiency and efficacy of the project: Chief Executive Officer who keeps the team focused and solve the conflicts and problems among the members, Chief Financial Officer is responsible for financial planning and budget management, Chief Technology Officer who is in charge of development of the project and technical support and Chief Marketing Officer who is in charge of research and some related paperwork. However, every member should participate in brainstorming, problem-solving and voting when the issues arise.

Overall, Aimbot Technologies Inc. team has trust and gives a full respect among us.

## 8. Workload Distribution

Due to the different technical and proficient fields, each member is assigned equally to the tasks they are expertise and interested in which allow us to focus and work in a specific part of the project efficiently. The following table summarizes the work distribution of this project.

High Level Tasks	Current Zeng	Albert Xu	Scott Zhu	Alex Chen
Component Determination		xx		x
Circuit Design	x	xx		x
Circuit Build	x	xx	x	x
Packaging		x		xx
Data Transfer	xx		x	
Windows Form Design	xx		x	
Virtual Events	xx	x	x	x
IMU Research	xx		x	
IMU Data Processing	xx			
Quaternion Research	x	x	xx	x
Market Research		x	xx	
Administrative Tasks	x	x		xx

Table 3 - Workload Distribution

## 9. Learning Reflection

### 9.1. Current Zeng

In this amazing semester, I learned a lot of useful hardware and software skills that we may not learn from a normal ENSC class.

In hardware aspect. First, I learned that the working voltages of the most electronic components are 5V and 3V. If the voltage does not meet the requirement, voltage divider or amplifier might be introduced. Secondly, I realize that it will be much better to have a circuit design and a soldering plan before soldering the board. For example, we have to decide where to put what component and what component should be soldered first, and arrange the soldering sequence. In addition, we even have to do research before performing the soldering because some components will be broken if the soldering temperature is not low enough. At last, I found out that it is best to do enough research before purchasing a component since we made couple mistakes in component determination and this mistake gave us unnecessary money wastage.

In the software aspect. It turns out that the best free IDE for developing windows application is Visual Studio Community because it support enough programming language and plenty of project types. In addition, it is more supported because it is published by Microsoft. In programming area, I found that these two websites are very useful when I don't know the syntax of some specific function or what library should I include: <http://www.cplusplus.com/> and <https://msdn.microsoft.com/en-us/default.aspx>. At last, after programming the whole project, I realize that it is very important to keep the code sorted in a good way, to comment the code in an easy understanding way and to divide a large file into smaller files. These three tips help the programmers build projects more efficiently, friendly and clearly.

At last, I really appreciate that all of the team members are still good friends after this large workload project. It turns out that it very important to communicate with teammates and to exchange information during the research and development stages. And the quality of willing to sacrifice is respectable.

### 9.2. Scott Zhu

First of all, I would like to thank you to three of my hardworking teammates, you guys are really dedicated, determined, and considerate. Because we are friends since a long time ago, and we have done so many projects together, I already know we will be an awesome team before we start doing on our project. We formed the group during the semester break

and got a lot of exciting ideas before the new semester started. At that time, I know 305/440 will be a great learning experience for me.

As a group project, the organization is a very important factor that determines if we will do this project successfully. First, we both know who has a passion for which part, so it is easy for us to distribute the tasks. The second thing is good communication. Sometimes, if one group member encountered a problem he cannot solve, we would like to work together to find out the solution. For me, when I cannot solve the code error, Current Zeng always help me to do some research and debug the code with me. So this makes me feel helping each other is really necessarily, not only making group more efficiency but also learning some new knowledge from teammates.

Another reason why we can make our project succeed is that everyone does sacrifice. For example, during the midterm week, the people do not have exams will do more work than the others, this is especially for doing the paperwork. After this semester, I know how to write a professional engineering paper, and my online researching skill is really improved.

After this project, I found I became more interested in engineering science, especially in software part. In conclusion, I think I need to practice more on different programming language and learn more about the popular software and hardware which we can use in the real world.

### **9.3. Albert Xu**

From the second I enrolled in these two joint courses, I feel that I will face some unforgettable challenges. It turns out to be true. The project idea is fully generated by ourselves, and the team members are selected by ourselves. It gives me the feel of unlimited possibility and at the same time, thrill to the unknowns.

Fortunately, I have found this great team. It's a team that is established basing on friendship and understanding. From the day, we confirmed the intention to group-up, every one of our team members is doing everything they can to achieve the final goal. It is an experience that I had not acquired before. These four months of fully involving a team with the same goal of completing a final project teaches me the thinking of corporation, sacrifice, as well as critical thinking and comparison of multiple solutions. I learned not only the technical knowledge but more importantly, the attitude, the spirit, to highly focus and working on a target.

On the technical side, I practiced much more soldering and circuit design than the sum of my previous courses. And with no requirement and guidelines, I put more thoughts on the design and build process than before. On programming area, CTO Current Zeng has tons of experience, as an Engineering student with relatively low knowledge on programming

with pure software, I benefited a lot working with Current on our project software design. The skills I acquired are not only one or two coding lines but also the method to debug and use online resources to generate a solution.

Alex Chen and Scott Zhu are really helpful on my paper works. Their good attitudes toward writing and formatting have influenced me a lot. They turned our paper works from a low mark to later the real engineering paperwork.

Regarding the team dynamics, I feel that our team has no doubt one of the best team dynamics and atmosphere. Through the four months of working together, there was not even one argument or criticism appears inside our team. Whenever there is a challenge or disagreement, we can always stay calm and work peacefully towards a solution.

Good team, good work, unforgettable experience.

#### **9.4. Alex Chen**

This semester is a very meaningful semester. Although we faced a lot of challenge and pay a lot of effort, we learned a lot from the project.

First, we learned is on hardware. We learned how to design and build electrical circuits by ourselves. We also learned how to arrange the components properly and how to use Arduino microcontroller. What is more, through the process of assembling, our hands-on skills had been improved a lot. Secondly, we are now much more familiar with Visual Studio, we know how to make virtual mouse and keyboard in C++ and we can now achieve a serial communication through our coding. Thirdly, apart from the technologies we learned, we also know how to work with a team, how to face disagreement and solve it well, we know how to better arrange our schedule as well.

I feel like I am lucky to have such good teammates. Current is the most knowledgeable guy and he carried the whole team in the aspect of technology, both on hardware and software, he could always finish tasks on time and he always brought us a surprise. Albert is a good helper for me on purchasing components and negotiations, what is more, his hands on skill is amazing, he was the most active guy in our group. Scott is another tough guy, he found out a lot of algorithms and did a lot of contribution on paperwork.

Nice teammates, nice working environment, and enough knowledge. These are three key factors for us to be successful this time. After this unforgettable experience, we are now considering continuing our project and try our best to make it a well-developed product.

Once again, this is a great experience. I am appreciated to have such a chance. I am now falling in love deeply with my major.

## 10. Conclusion

Our final product already met most of the requirement we designed. However, the potentiometer can be smaller and softer, the present potentiometer is not soft enough and make people feeling not very comfortable. The Bluetooth needed to be faster as well, we now have a little difficulty on making Bluetooth out rate at 115,200 Bit per second (right now is 9600 bit per second). If possible, we will redesign the closure and packaging as well. The cost is another part that needed to be improved. We will buy all of our components in China next time. The components in China are at least 10 times cheaper than those in Canada. We also need to design and manufacture our own board in the future.

## 11.Meeting Minutes

### AimBot Technology

#### AGENDA 1

2015/12/10

16:30-17:30

#### The WizardHand

**Purpose of Meeting:** To confirm the intention to form a group in the coming ENSC305 and ENSC440.

#### Items for Discussion:

- All four members confirmed to enroll ENSC440 and ENSC305w the coming term?
- All have the intention to work together as a team?
- Group of 4, or add more members?



**AimBot Technology****MINUTES 1****2015/12/10****16:30-17:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** To confirm the intention to form a group in the coming ENSC305 and ENSC440.**Minutes:**

Current Zeng called the meeting to order at 16:30

**A. All four members confirmed to enroll ENSC440 and ENSC305w the coming term?**

Current Zeng and Alex Chen is still waiting for approval to enroll these two courses, but it is likely they both get positive results.

**B. All have the intention to work together as a team?**

Yes. We will form a team once everyone enrolled in.

Discussion: What if one or two members fail to enroll?

Action: Everyone drop this course and enroll together the next offering semester.

**C. Group of 4, or add more members?**

According ENSC440 rules, more members requires a final project with more difficulty. Group of 4 should be a good balance with respect to difficulty and workload. So, no more members.

**AimBot Technology**

**AGENDA 2**

**2015/12/15**

**13:30-14:30**

**The WizardHand**

**Purpose of Meeting:** To collect ideas of what should be the project

**Items for Discussion:**

- Skills and expertise
- Idea brainstorm and collection
- Confirm the enrollment and group

**AimBot Technology****MINUTES 2****2015/12/20****13:30-14:30****The WizardHand**

**Present:** Alex Chen, Albert Xu, Scott Zhu

**Absent:** **Current Zeng** (this member went back to China, he gives inputs via social media)

**Purpose of Meeting:** To collect ideas of what should be the project

**Minutes:**

Albert Xu called the meeting to order at 13:30

**A. Skills and expertise**

Current Zeng has the strongest programming background and knowledge on sensors, Albert Xu has a good skill on circuit assembly and some experience on Microcontrollers, Alex Chen has good knowledge on electronics market and Scott Zhu skilled on signal process and calculation.

**B. Idea brainstorm and collection**

Albert Xu provides idea to refine his ENSC100w project, the alarm clock-weight scale, Scott Zhu wants to build a Mineral Oil Cooling system for desktop PC, Current Zeng offers the idea to build a new generation pointing device as replacement of mice, Alex Chen's idea is to build a lock that can be unlocked by smartphones.

**C. Confirm the enrollment and group**

Since Current Zeng and Alex Chen are both confirmed to successfully enroll in ENSC440 and ENSC305, we are officially announcing the team-up.

**AimBot Technology**

**AGENDA 3**

**2015/12/20**

**14:30-15:30**

**The WizardHand**

**Purpose of Meeting:** To confirm the project idea

**Items for Discussion:**

- Mineral oil cooling system for desktop PC
- Alarm clock-Weight scale
- Wearable, glove-mouse
- Smart unlock system

**AimBot Technology****MINUTES 3****2015/12/20****14:30-15:30****The WizardHand****Present:** Alex Chen, Albert Xu, Scott Zhu**Absent:** Current Zeng (this member went back to China, gives inputs via social media)**Purpose of Meeting:** To confirm the project idea**Minutes:**

Albert Xu called the meeting to order at 14:30

**A. Mineral oil cooling system for desktop PC**

This system uses mineral oil to cover and cool the whole computer system, it is efficient to conduct and remove heat. However, this makes desktop extremely heavy and difficult to remove and replace parts. And it has been done similarly by a guy on YouTube.

**B. Alarm clock-Weight scale**

Idea is good, however, the technical difficult are not likely to be approved.

**C. Wearable, glove-mouse**

Includes multiple sensors, complex signal process, massive code writing, fit the market trend, the best idea so far.

**D. Smart unlock system**

Use smartphone Bluetooth connection and password to verify the authority and use microcontroller to unlock the door. Potential security issue and not applicable to all the door shapes and locks.

**Final decision and action**

The wearable glove-mouse. Current Zeng starts to purchase some necessary tools in China.

**AimBot Technology**

**AGENDA 4**

**2016/01/15**

**16:30-17:30**

**The WizardHand**

**Purpose of Meeting:** If we apply for funding, what are the components we need?

**Items for Discussion:**

- If we apply for funding?
- What are the components we need?

**AimBot Technology****MINUTES 4****2016/01/15****16:30-17:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** If we apply for funding, what are the components we need?**Minutes:**

Current Zeng called the meeting to order at 16:30

**A. If we apply for funding?**

3 of us agree to apply the ESSEF funding. However, Scott disagrees, he thinks that it would be better we fully control our own project and save the trouble of extra paper work and presentation. Thus, 3 votes vs. 1 vote, we are applying the ESSEF funding.

**B. What are the components we need?**

5 x SoftPot potentiometer for hotkey

IMU

Bluetooth module

Arduino Pro-mini

Headers

Conductive thread

Wires from lab1

**Action**

Albert Xu is responsible to search online and complete the purchase of components.

**AimBot Technology**

**AGENDA 5**

**2016/02/15**

**16:30-17:30**

**The WizardHand**

**Purpose of Meeting:** Problem regarding team dynamics and paper works

**Items for Discussion:**

- Why we got low mark on Proposal?
- Why missed teamwork inventory 1?
- Why missed team meeting with Andrew and Steve?



**AimBot Technology****MINUTES 5****2016/02/15****16:30-17:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** Problem regarding team dynamics and paper works**Minutes:** Alex Chen called the meeting to order at 16:30**A. Why we got low mark on Proposal?**

The marking is more detailed and serious than any other marked reports or papers we have received in our university career. None of us expected that. The main mark lost from the grammar and vocabulary used, some came from misunderstanding of the rubric and requirement. We will certainly pay more attention on the paper work. (However, since the Function Specification has already been submitted, the similar mark lose could happen to the Function Specification paper)

**B. Why missed teamwork inventory 1?**

None of us paid close attention to the due date of teamwork inventory, and we did not have a good habit to carefully read the e-mail. Probably because we are used to check websites such as Canvas for assignment information instead of e-mail.

**C. Why missed team meeting with Andrew and Steve?**

After our CEO Alex Chen received the e-mail which calls a meeting with professors. He misunderstood that we should select one team member to represent us to meet with professors and explain our idea. Thus, we select the idea owner, our CTO Current Zeng to join in meeting. And the rest of us waiting outside for the results. (None of the other members are intentionally avoid the meeting)

**Conclusion and action**

We are working closely on the project, there is no team dynamics issue. However, we lack of good altitude to the paper work and we should pay more attention to e-mails. Thus, we select CEO Alex Chen to be the person responsible for checking e-mails and keeping track with the paper works.

**AimBot Technology**

**AGENDA 6**

**2015/2/24**

**14:30-15:30**

**The WizardHand**

**Purpose of Meeting:** Discuss the Arduino pro-mini to PC data transfer method, and more needed components.

**Items for Discussion:**

- How does the data from sensors collected and sent to PC?
- What are the other components we need?

**AimBot Technology****MINUTES 6****2015/2/24****14:30-15:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** Discuss the Arduino pro-mini to PC data transfer method, and more needed components.**Minutes:**

Current Zeng called the meeting to order at 14:30

**A. How does the data from sensors collected and sent to PC?**

9 data from IMU + 5 from SoftPot, 14 groups of data will be collected by Arduino Pro mini. And Arduino writes those data byte by byte to the serial communication established by Bluetooth module. On the PC side, we will write a software which reads these bytes and show them on screen (for debugging).

**B. What are the other components we need?**

Right now, we have or ordered all the essential components we need. However, we might need a vibration module for feedback and LED's for visual notification.

**Final decision and action**

Every team member should research on serial data transfer. Albert Xu is responsible for receiving all the ordered components.

**AimBot Technology**

**AGENDA 7**

**2016/03/12**

**16:30-17:30**

**The WizardHand**

**Purpose of Meeting:** User Interface build

**Items for Discussion:**

- Software install and introduction
- UI basic function

**AimBot Technology****MINUTES 7****2016/03/12****16:30-17:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** Software install and introduction**Minutes:**

Current Zeng called the meeting to order at 16:30

**A. Software install and introduction**

Each member should install latest version of Microsoft Visual Studio. We will use Visual Studio Form application to build the User Interface. CTO gave us tutorial on create new Form application.

**B. UI basic function**

The UI will read data coming from system Bluetooth and using algorithm to transfer the data in to location on the screen and using the SoftPot data to decide if a hotkey function launching is needed. The UI should also provide user the possibility to change sensitivity and do the calibration and hotkey pre-load. We should also show our company brand on UI.

**Conclusion and action**

Each member continue to research on Form application.

**AimBot Technology**

**AGENDA 8**

**2016/03/25**

**19:30-20:30**

**The WizardHand**

**Purpose of Meeting:** Circuit design and build

**Items for Discussion:**

Discuss and design the final circuit for control unit

**AimBot Technology****MINUTES 8****2016/03/25****19:30-20:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** Circuit design and build**Minutes:**

Current Zeng called the meeting to order at 19:30

**A. Design the final circuit of the control unit**

Previous fail on soldering the components indicates we need design the circuit more carefully. This time, circuit diagram was made and discussed. We abandoned 2 inferior design. Finally, we are able to build all 5 components on a single 10cm x 7cm breadboard that is small enough to fit on the wrist. The discussion and design took about 1 hours. The build requires more time, and thus, details are not included in this meeting description.

**Conclusion and action**

All member continue working on the building the circuit. The resulted circuit will be functional on signal receiving and sending test.

**AimBot Technology**

**AGENDA 9**

**2016/04/10**

**12:30-13:30**

**The WizardHand**

**Purpose of Meeting:** Bluetooth trouble shooting, problem analysis and solution generation

**Items for Discussion:**

- Discuss what could be the reason resulting the Bluetooth random disconnected issue
- Generation of test plan to for the corresponding potential cause



**AimBot Technology****MINUTES 9****2016/04/10****12:30-13:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** Bluetooth trouble shooting, problem analysis and solution generation**Minutes:**

Albert called the meeting to order at 12:30

**A. Discuss what could be the reason resulting the Bluetooth random disconnected issue**

Design test plans to find out what is causing the randomly stop issue.

1. The problem could come from
2. Hardware connection issue.
3. Thread building issue
4. Data receiving signifier issue
5. Baud rate consistency issue
- 6.

**B. Generation of test plan to for the corresponding potential cause**

1. Excluded by replacing the Bluetooth and getting the same result.
2. Excluded by using wired connection and resulted in no sign of random disconnection
3. Excluded by using wired connection and resulted in no sign of random disconnection
4. Excluded by carefully check and set all the baud rate.

**Conclusion and action**

The Bluetooth random disconnection issue is still not solved. Each team member should do more research on the Bluetooth module.

**AimBot Technology**

**AGENDA 10**

**2016/04/14**

**16:30-17:30**

**The WizardHand**

**Purpose of Meeting:** Bluetooth issue solution explain, final test run.

**Items for Discussion:**

- Discuss the final solution for Bluetooth random disconnection issue
- Final test run with wire and wireless connection

**AimBot Technology****MINUTES 10****2016/04/14****16:30-17:30****The WizardHand****Present:** Alex Chen, Albert Xu, Current Zeng, Scott Zhu**Absent:** None**Purpose of Meeting:** Bluetooth issue solution explain, final test run.**Minutes:**

Current Zeng called the meeting to order at 12:30

**A. Discuss the final solution for Bluetooth random disconnection issue**

Since last time we excluded all the possibility that might cause to Bluetooth connection issue, Current Zeng and Albert Xu have worked on the back-up solution. They found the Bluetooth will work fine under 9600 baud rate. Thus, we will use this rate for the final demo, with the trade-off of some data lose during the serial communication.

**B. Final test run with wire and wireless connection**

Using the new solution, we performed the last test run of the whole system including cursor moving and hotkey functions. All return positive results. This project is good to demo.

**Conclusion and action**

With the completion of the project. Team should now focus on the preparation on the final presentation and post mortems paper writing.