

December 16th, 2015

Dr. Andrew Rawicz
School of Engineering Science
Simon Fraser University
Burnaby, BC V5A 1S6

Re: ENSC 440 Post Mortem for the Dot Light Canvas

Dear Dr. Rawicz

The attached document is the Post Mortem for Art Tech's project, the Dot Light Canvas. The Dot Light Canvas is a new and innovative art canvas that uses LED light in the place of paint. It will be used by new and seasoned artists alike to create unique artistic expressions that are bright, creative and engaging.

This post mortem discusses the current state of the Dot Light Canvas Prototype model, as well as future plans for the device. It will also include project material, cost and scheduling outlines, as well as the workload distribution of team members and their individual thoughts on the project.

The Art Tech team is made up of four Simon Fraser University engineering students; Zachary Cochrane, Dana Sy, Aman Shoker and Bhavit Sharma. If you have any questions or comments about this document or our project, please contact me at zwc@sfu.ca or through phone at (778) 378-6019.

Sincerely,



Zachary Cochrane
Co-Founder and Primary Contact
Art Tech

Enclosure: *Post Mortem: The Dot Light Canvas*



Post Mortem The Dot Light Canvas

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Submitted To: Dr. Andrew Rawicz
Professor Steve Whitmore
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1.0 Introduction

The Dot Light Canvas is an electronic painting canvas that uses Light Emitting Diodes (LEDs) for illumination. The canvas will consist of an infrared touchscreen (IR) mounted over a cloth painting canvas that will overlay an LED array. Users will be able to 'paint with light' by applying a smart stylus to the IR touchscreen, activating the LEDs behind it to illuminate the canvas in a variety of user specified colors. This document describes the current state of the Dot Light Canvas Prototype model, as well as future plans for the device. It also includes project material, cost and scheduling outlines, as well as the workload distribution of team members and their individual thoughts on the project.

2.0 Current State of Dot Light Canvas

Art Tech considers the current state of the Dot Light Canvas to be a resounding success, in that nearly all planned deliverables have been met, as well as a number of our stretch goals.

As described in the Art Tech documents for the project proposal [1] and functional requirements [2], the Dot Light Canvas is to illuminate the LEDs in its array when a smart stylus, connected to the canvas via Bluetooth, is applied to the infrared touch screen. Users are able to change the color being applied through color selection mode, made available by one of the buttons on the stylus itself. Users can also remove color from the screen with erase mode, also made available through the stylus.

The current Dot Light Canvas prototype has successfully implemented all of these features, although major issues were encountered with Bluetooth integration. For this reason, the canvas has been given the ability to work with or without the stylus, depending on user preference. Based on these issues, as well as user feedback, changes in scope have been made for both prototype and future revisions of the Dot Light Canvas. These will be detailed in section 3 and 4, respectively.

The dot light canvas is also currently capable of color mixing as well as saving images to the raspberry pi's removable storage. These were the stretch goals which we were very keen on implementing, and found that they were important enough to ensure they were delivered by the deadline Art Tech set for itself of the 18th.

To both receive feedback and to properly test the capabilities of the Dot Light Canvas, professional artists were asked to draw on the canvas and provide their thoughts. Figure 1 is an unedited photo of one of their creations, drawn in under 15 minutes. Their feedback was very helpful, and will be discussed in more detail in section 4.



Figure 1: Artist's rendering using the Dot Light Canvas

3.0 Changes in Scope

The Dot Light Canvas was initially to use a force sensitive resistor in the tip of the stylus to light up LED lights according to the force being applied to the user. However, early on in the implementation of the canvas, the decision was made to instead use an additive color mixing algorithm in place of the force sensitive resistor. When a user touches the screen, the pixel they touched will become illuminated by 20 percent of the selected color's maximum value. In the same way, when a user applies a color to a location already containing a different color, the pixel will trend towards the currently selected color by 20 percent.

The algorithm described above accomplishes two things. Firstly, it simplifies the delicate behavior of balancing the force sensitive resistor versus light distribution on the canvas by removing it from the equation. Secondly, when drawing, multiple strokes are often used as a means of applying more color to an area. As such, the color mixing algorithm is an intuitive and highly effective way of controlling color applied to the display.

Another issue encountered with the Stylus was proper Bluetooth connectivity to the Canvas. The problems mainly stemmed from the decision to use Bluetooth Low Energy (LE); a simplified version of Bluetooth that consumes considerably less power. Issues with Bluetooth LE stemmed from the fact that it is a relatively new technology, and as such, there are few developer resources currently available to support it. Creating our own libraries for Bluetooth LE was beyond the scope of this project, and not within our time constraints, so libraries with less than ideal functionality were used.

The result of the above problems were that while the stylus can connect to the canvas wirelessly, it often loses connection, which forces the user to perform a reboot on the system to reestablish a connection. This functionality is less than ideal, and so the canvas was made to be capable of being controlled without the use of the pen as well as with it. Users can now switch between erase, paint and color select mode using controls on the canvas as well as controls in the pen.

4.0 Future of Dot Light Canvas

Art Tech fully expects to continue work on the Dot Light Canvas system. Further iterations will be discussed, and hopefully, a marketable product will eventually be created.

Future iterations of the Dot Light Canvas will include a number of changes from the prototype. Firstly, the Smart Stylus will not be included in the final package. Based on user feedback from professional artists who used the Dot Light, drawing on the canvas using hands alone is both more intuitive and easier. Controls will be included to ensure that all features of the canvas are accessible via the Canvas chassis. Not only does this make the product easier to use, but it also drives down production and development costs by a significant amount.

The Smart Stylus, then, will be created and marketed as a separate item that can be used with the canvas after acquisition. The main draw of the stylus is that it will enable force sensitive drawing, as well as additive drawing, creating a system that simulates painting more closely than additive drawing can do alone.

Feedback from users also indicated the need for the ability to upload and download creations as well as more colors, the ability to fully illuminate an LED immediately, and a higher resolution by 150 to 200 percent. Such features will be taken into serious consideration for all future Dot Light Canvas models.

5.0 Project Budget

Table 1 contains the estimated costs and actual costs of the Dot Light Canvas project.

Table 1: Estimated Cost vs Actual Cost of Dot Light Canvas Prototype

Equipment List	Estimated Cost	Actual Cost
IR touch Screen	\$220.00	\$178.97
LED Strips	\$400.00	\$343.13
Raspberry Pi 2 microcontroller for Canvas	\$70.00	\$100.74
Canvas Chassis and Electrical Components	\$150.00	\$410.73
Smart Stylus Chassis and Electrical components	\$100.00	\$59.93
20% Overhead	\$190.00	N/A
Microcontrollers for LEDs and Stylus	N/A	\$127.57
Canvas Power Supply	N/A	\$106.40
Total Cost:	\$1130.00	\$1327.47

For funding, ArtTech has received \$400.00 from the ESSEF Grant, so while the team has stayed reasonably close to the estimated budget, we are currently \$927.47 out of pocket. The project has also gone over budget by \$197.47

The increase in cost largely comes from two purchases which were not foreseen in the Dot Light Canvas proposal document. These are the required microcontrollers for the stylus and LED lights, and the canvas power supply, as well as much higher than expected costs for the canvas chassis, which required two panes of plexiglass, numerous nails, screws, fasteners, and clamps, as well as a large amount of lumber.

The project required three FadeCandy [3] microcontrollers, which control the LED lights, as well as a BlueFruit Micro LE [4] controller for the stylus. The FadeCandy microcontrollers were not initially discussed because it was thought the Raspberry Pi could control all 1032 LED lights, which we now know was not feasible within the scope of this project. Additionally, it was thought that a team member already had a microcontroller for the stylus, however this microcontroller turned out to be too large and consumed too much power for our purposes. The power supply was not included in the estimated cost because it was simply overlooked.

6.0 Project Timeline

Figures 2 and 3 show Gantt charts that describe the estimated and actual timelines of the Canvas and Stylus respectively, detailing their design, construction and implementation. The estimated timelines are taken from the Dot Light Canvas proposal document. Darker fields represent estimations, while lighter fields represent the actual timeline.

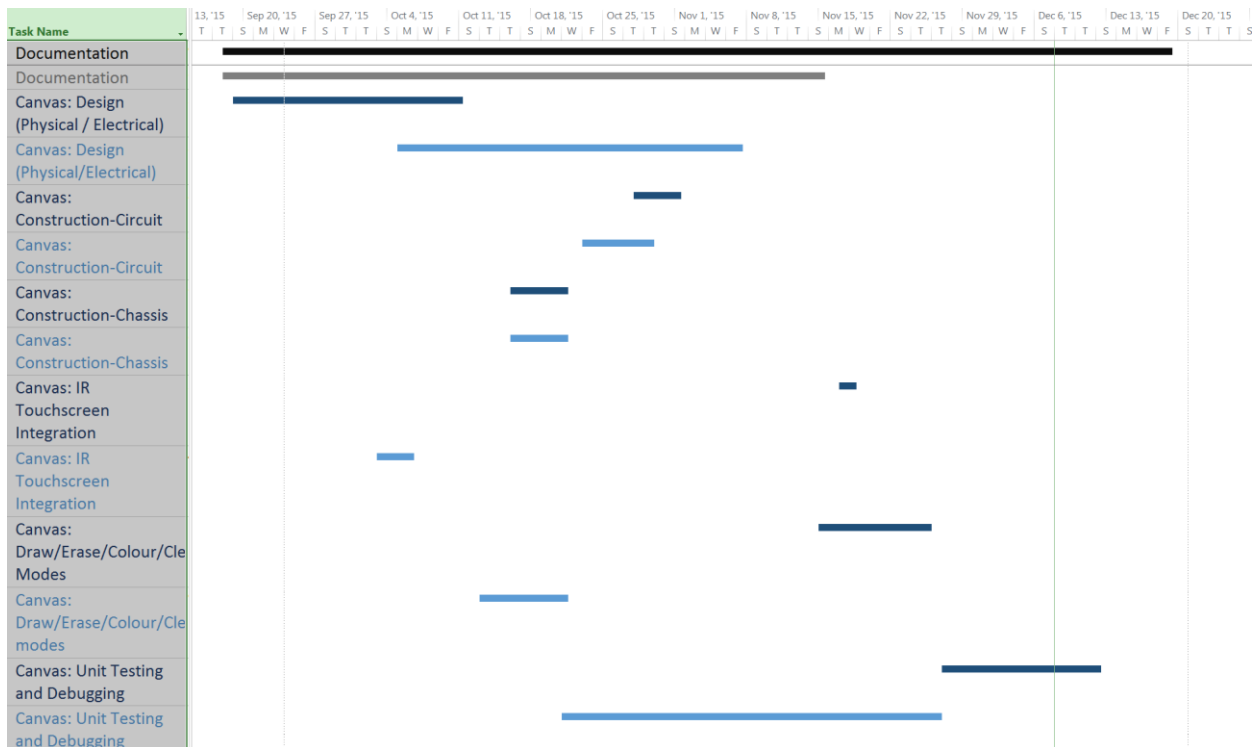


Figure 2: Gantt chart of Canvas timeline

The project, for the most part, stayed close to the estimated timeline. Art Tech initially estimated that the project would be completed by December 18th 2015. As the project is being demoed December 21st, this turned out to be a good estimate and the prototype was completed successfully on December 20th.

It is interesting to note that many tasks we thought would be quite trivial ended up taking much longer than expected, such as the Bluetooth integration of the stylus and canvas. Other tasks which we thought would take a lot of time were actually quite fast, such as the construction of the canvas circuit. Research and design also took a lot of time and effort.

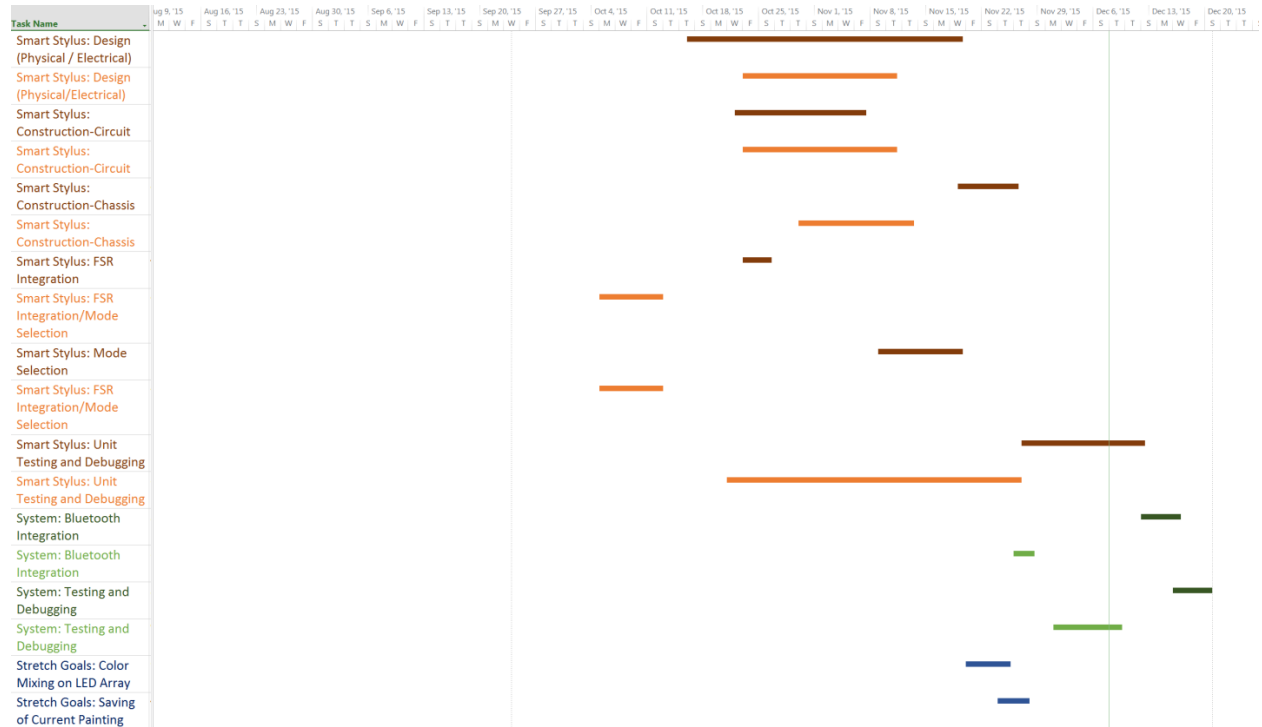


Figure 3: Gantt chart of Stylus System, and Stretch Goal timeline

7.0 Work Distribution

Table 2 indicates how work was distributed throughout the team.

Table 2: Work Distribution throughout the Art Tech Team

Task	Zachary	Dana	Bhavith	Aman
Documentation	XXX	X	XX	X
Canvas: Design (Physical / Electrical)	XX	XX		XX
Canvas: Construction - Circuit	XX	XXX		
Canvas: Construction - Chassis	XX			X
Canvas: IR Touchscreen Integration	X	XXX		
Canvas: Draw / Erase / Color / Clear Modes	XXX			
Canvas: Unit Testing and Debugging	XXX	XXX		
Smart Stylus: Design (Physical / Electrical)			XXX	XXX
Smart Stylus: Construction - Circuit		XX	XXX	
Smart Stylus: Construction - Chassis				XXX
Smart Stylus: FSR Integration			XXX	
Smart Stylus: Mode Selection Functionality			XXX	
Smart Stylus: Unit Testing and Debugging			XXX	XX
System: Bluetooth Integration	X	XXX	XXX	
System: Testing and Debugging	XX	XX	XX	XX
Stretch Goals: Color Mixing on LED Array	XXX			
Stretch Goals: Saving of Current Painting	XXX	X		

A team member's level of participation is indicated by the number of X's:

XXX – Team member was primarily responsible for this action

XX – Team Member was heavily involved in this action

X – Team Member was involved in this action

Blank – Team member was not involved in this action

Work was divided up according to a project member's strengths and interest.

8.0 Personal Reflections

8.1 Zachary Cochrane – CEO and ArtTech Co-Founder

When we first started planning our capstone project, I was incredibly nervous. The first week of classes came and went and I still had no idea what our project was going to be. The only other person in my group I knew was Dana, and our fourth member dropped the course just as groups were beginning to finalize. We had to be quick to replace him. It was a stressful period of the term.

During the first couple weeks we mostly brainstormed ideas, eventually settling on one of my own; the Dot Light Canvas. We then began our first document, the project proposal, of which I was made the editor. Because our project was my idea, and I was largely in charge of the documentation, I quickly found myself playing a managerial roll in the group. While the group collaborated well when coming up with ideas, many major design decisions were left to me. Delegating work as well as overseeing task completion were things I was responsible for.

Being in a leadership position has taught me many things, as it's not a position I readily assume. I am not an argumentative person, and I dislike conflict. This made it difficult for me to constructively criticize the work of my other group members, a necessary step in ensuring project milestones are up to par. Additionally, for the first two documents I found that my preparation was inadequate. I did not thoroughly review the documentation's requirements beforehand, and as a result tasks were not delegated evenly or correctly. Things that were needed were missed or left out. I would scramble to finish the document myself, and I would stress out when help was not made available. I feel I handled the design specification much better, which resulted in a mark of 95%, and a lot less stress on my part. These experiences have truly helped me grow as a leader and team player.

Technically, capstone has been very challenging as well. I've always considered my software skills to far surpass my hardware skills, which is why I did a large portion of the software for the project. But I was involved with hardware too, and designing and building the canvas' circuit was truly a learning experience. While I still have a lot to learn, I feel much more confident with hardware and electronics now than I did before.

This past term has easily been the most challenging, demanding and rewarding period of my academic career. Capstone truly is just that; the very capstone of an engineer's undergraduate experience. While this term has had its ups and downs, it was an eye

opening experience that has kindled my interest in entrepreneurship, strengthened my interpersonal and technical skills, and given me something I will always remember.

8.2 Dana Sy - ArtTech CoFounder

Capstone is the most important course for an Engineering student. It shows the accumulation of everything an engineering student has learned throughout the student's undergraduate career. Thus, we needed a project that will push us to utilize the accumulation of the education we have received thus far. It is amazing to see how our project started and slowly start to come together. It gave us the sense of achievement and motivated us to further perfect our ideas for the project.

The documentation gave us a strict guideline on how the project should turn out and the deadlines of the project. We found out that we never followed the guidelines we set upon ourselves for the project and implemented the features as we saw fit. We realized that some of our stretch goals were actually easier to implement than we expected. However, we always felt confident that we will finish on time even though we did not follow our schedule.

I feel like this project has improved me as a future engineer. On the hardware side, I have improved upon my circuitry design knowledge and soldering skills. Software wise, I have improved my knowledge of Linux, Java and shell scripting knowledge tremendously. If we had more time, I would love to learn more about Bluetooth LE technology and try to get the pen working flawlessly.

For our future pursuit of this project, we will need to get the LED array to be fabricated into a single board instead of using LED strips. Instead of Java, I would prefer if we wrote the program in a low level language such as C. Instead of using multiple Fadcandy to control the LEDs, we should try to develop a single microcontroller that can control over 5000 LEDs for when we scale up the size of our canvas. We will also try to improve the resolution by at least fifty percent.

In conclusion, I am very pleased with how our project turned out and we will pursue a commercial version of our project. We will probably get back together and work on it after we all graduate. We will probably still meet up from time to time while we're finishing our undergraduate career and talk about features we can implement or things we need to improve upon our project.

8.3 Bhavit Sharma- ArtTech CoFounder

The capstone was one of the most fun project I have undertaken. It included all the elements of learning, fun and discipline. Learning in classes has already taught me how to research but during this project I learnt how to implement the research into real world. Before starting the project, I was a bit worried and skeptical on how we would complete the project and if it would be completed on time. But after 4 months today, I have been surprised by how much we have done and how we have managed our time to do it. This project has taught me not only how to manage your time but also how to manage it smartly. Everyone has high expectations from the ideas they have and the project they have been working on, but working on this project I learnt sometimes you have to give up some expectations in order achieve the bigger picture.

We divided responsibilities equally to each member. Even though we had 4 members, dividing the responsibilities and having good communication made us work more efficiently and with less conflicts. I learnt through this course that even though technical abilities of a group are important for the project, the most important as per me is good communication and respect for others work.

I was focused on hardware and software aspect of the smart stylus that included setting up the hardware for the stylus and then programing the microcontroller with Bluetooth Low Energy module, force sensitive resistor, buttons and a LED. I was also responsible for implementing proper Bluetooth communication between Canvas and the Smart Stylus. In the start, nothing seemed to work as I would have wanted. I found out that google is a really helpful tool available for ay Engineer, in fact, for anyone. Arduino itself provides lots of libraries and helpful videos to work with. I learnt while working on the Smart Stylus that getting help from available resources like google, YouTube, TA's is the only way you could complete this project on time.

Sometimes things don't go as planned, like with us the Bluetooth Low Energy implementation turned out to be really difficult to implement as it is fairly a new concept. After a lot of researching I tried to implement a program which was based off of an experimental API. Even though we ended up making it work it still had a lot of bugs. I did end up learning a lot about how Bluetooth Low Energy works, and where it can be used. This would be one example of how I learned about decision making as a group to make a marketable product launch on deadline, since we had to make a decision to change the scope of our product to a Canvas without the Stylus and provide stylus as an accessory later when we try to market the product.

An important thing I learned about how to make a product marketable is documentation. This project has given me an overview of what it takes to build your own

product/company. In the end I would like to say that it was an honor to work with such a talented group of engineers and I would really like to thank Andrew, Steve and all the TA's for providing help when needed and giving us the direction to build our dreams.

8.4 Aman Shoker – ArtTech Co-Founder

During the past 4 months I had the pleasure of being a member of Art Tech, where we collaborated to design a unique artistic product which has seldom been seen out in the market before. While designing the Dot Light Canvas I learned a tremendous amount about real product design cycle, which made me realize that no step in the process of engineering a product can be taken lightly. I was initially reluctant in enrolling in Ensc 440/305W, because of my inability to join a group ahead of the fall 2015 semester. However my desire to graduate as soon as possible made me join a group initially consisting of Dana and Zach. After a few short days the group grew in size to 5, but in the end shrank to 4 members, Zach, Dana, Bhavit and I.

What I can say about designing a product from scratch is it takes a tremendous amount of research to determine how to integrate and construct the initial vision from paper to a concrete product. The group and I faced some early challenges while researching individual components that would be integrated to create the Dot Light Canvas. The most significant one was finding a NeoPixel led strip that allowed us to control individual NeoPixel, after a few unsuccessful days we were able to find WS2812b NeoPixel led strips where we could control a single NeoPixel.

After going through tons and tons of links and webpages I've learned that somewhere out there someone has already attempted to make something, or shared information about electrical techniques which can be found on the World Wide Web. This improved my researching skills, which led to the significant improvement of my technical writing skills; because of the research I had done I could thoroughly explain the products functional and design specifications.

I was initially responsible for the electrical and hardware design of the Dot Light Canvas as well as the hardware design of the Smart Stylus. This included soldering and wiring the canvas components, designing the exterior of the Stylus as well as helping with the interior design. However due to transportation issues in the midst the electrical wiring and soldering of the canvas it was more practical for Dana to continue the wiring and soldering at his house instead of bringing the wired canvas components to school. Unfortunately this changed my role to communicating suggestions and offering verbal help whenever Dana had questions.

I learned a lot about CAD design while creating the exterior of the Smart Stylus. Features such as revolved extrusions and mid view design are all new techniques which I can now add to my intermediate CAD design skills. I learned how crucial initial design sketches and measurements are in order to begin constructing a product. Forethought about interior component placement and usability were two of the challenges I face while designing the Smart Stylus. This led me to re-design the Smart Stylus twice before I was satisfied with the final product.

In conclusion, this course is a great opportunity to apply what you have learned in the past 4/5 years of engineering into the design of a product. I've learned a lot of new technical skills and improved upon most of my existing skills such as time management, communication and teamwork skills. I feel as though I should have been more helpful with the electrical design aspect, but regardless I am proud of the work my team members and I have done and proud of the Dot Light Canvas we designed.

9.0 Conclusion

The past four months have undoubtedly been the most exciting and trying of times for all members of the Art Tech team. Through it all, we have learnt a lot, both about engineering and ourselves. The result is the Dot Light Canvas; a product that we are very proud of, and have hope to one day see on store shelves.

The Dot Light Canvas has met our expectations exceedingly well. It is fun to use, responsive, and intuitive. While the stylus and canvas Bluetooth connectivity remains an issue, we have still accomplished our goal of creating a system that allows users to paint with light.

Art Tech like to thank everyone who has helped us throughout the term, including our professors Andrew Rawicz and Steve Whitmore, the ENSC 440 TA's, Bill Cochrane for his contributions to the Canvas Chassis, Natalie Lau, Saar Bodman and Joyce Ngu for their artwork and creative input, as well as any and all others who have contributed in some way.

References

- [1] *Project Proposal: The Dot Light Canvas*. Vancouver: ArtTech, 2015.
- [2] *Functional Specification: The Dot Light Canvas*. Vancouver: ArtTech, 2015.
- [3] Adafruit.com, 'FadeCandy - Dithering USB-Controlled Driver for NeoPixels', 2015. [Online]. Available: <https://www.adafruit.com/products/1689>. [Accessed: 08- Nov- 2015].
- [4] Adafruit.com, 'Adafruit Bluefruit LE Micro - Bluetooth Low Energy', 2015. [Online]. Available: <https://www.adafruit.com/products/2661>. [Accessed: 08- Nov- 2015].

Appendix – Meeting Minutes

TBD.

AGENDA

September 14, 2015

17:00

Purpose of Meeting: To discuss what our capstone project is going to be

Items for Discussion:

- Each person in the group is to give out their ideas for the project and we will decide on which project to proceed on.

Frist is Aman's ideas:

A belt/walking stick for visual impaired that has sensors. It vibrates when you get too close to obstacles.

Smart home features, control lights and stuff. House reminder system. For example if you forgot to leave the stove on.

Zach's ideas:

Led painting canvas, an array of leds that has pressure sensitivity and it will control led intensity. Brush will have buttons for color.

For the demo we can have demo for cool light shows. Nothing in market so far.

Barbell clips it will check your form as a phone app. If you have the barbell not straight it will tell you what was wrong with the form. It will suggest which weights you might want. Can have different modes for different weight training

Guitar note writer. It will monitor guitar input to the computer and will make the notes from the guitar. Notes will be shown in real time

Barva's ideas:

Automatic cruise controls. RV's are too hard. It will have separate engine that will just copy what the main engine does (IE your own car). It will be a separate trailer that will follow your car.

Basically a smart trailer. You wont need to have a car with large torque since it will have an engine of it's own.

Pants with back support. It will help you lift heavy object properly.

NFC bracelet that will the password is your heart signature. Heart rate can also be a security feature and safety feature. If heart rate goes up, some functions will not be available. If you get a heart issue it can alert medics

Dana's ideas:

Smart mirror. It can have news and weather. It can also have a closet integrated that you can choose outfits. It can be used in home and at stores.

Heated jacket. Temperature regulated jacket that can have a solar panel at the back.

Automated lawn mower. Lawn mower plus Roomba
NFC with info. It will have all your personal info.

~~—Taser with GPS.~~

After discussing our ideas we try to discuss what we think we like the best out of each person.
Best one for Aman is the smart home, but unless we have the complete suite it will be pointless.
Zach Idea: LED canvas. We can kickstart it if we get enough interest.
Barva's idea: Automatic cruise control. We probably need to discuss further
Dana's idea: smart mirror

We decided to work on the LED canvas. We discussed the logistical problems with it and we decided to do more research on it. We came out with a plan on how we will implement this project
We will first research the parts we need for the project. Our plan for this project is to first implement the led arrays and the digitizer first. After we get the array and digitizer to work we will then do led intensity. After the intensity we will then implement the pen with pressure sensitivity and saving work to an sd card. After everything is implemented, we will then add more colours.

Next meeting date:

Depending on when we meet Andrew. We will reconvene on our earliest convenience.

TBD.

Minutes

September 18, 2015

10:30 – 11:20

Purpose of Meeting: To figure out the budget, company and product name.

Budget discussion:

Touch screen:

We decided that instead of using resistive touch sensors, we would just use infrared sensors for our touch screen instead. Infrared touch screens are available online with various sizes, and we have decided upon a 42" on from AliExpress. On average the screen cost around \$180-250 USD.

LEDs:

Initially we wanted to buy 1mm single LEDs, but to have decent resolution we would have to solder thousands of them individually. We went with two other options, either we buy led strips and figure out how to control them or buy a LED panel from the LED sign shops. We set the task of checking prices for LED signs to Dana, since he claims to know a place that makes them. As for the LED strips, we have found 2 different ones. One strip has 120 LEDs per meter. Another strip has 60 LEDs per meter. The price is around \$400 CAD for the higher resolution LED and around \$300 CAD for the 60 LEDs.

Controller:

We decided that it would be easier to control everything with a Raspberry PI and we will just buy a Raspberry PI 2 over the weekend.

Pen:

We did not have enough time to discuss this since we have class, we made a very rough estimate that it will cost around \$200 to make the pen.

Note about the budget:

Depending on how much funding we get, we will scale down our project accordingly. Ideally, we want to have a canvas the size of around 42" TV and have a 3D printed pen with pressure sensitivity.

Meeting had to be cut short since we have classes. We will meet again in the afternoon after classes to decide on how we will split the proposal so we can start on it over the weekend. We will also brainstorm names for the company and the product.

Next meeting date:

We will meet the next Wednesday at September 23, 2015. The location is to be decided then.

ArtTech

Minutes

September 28, 2015

16:30 – 18:00

Little Dot

Purpose of Meeting: Gather information about parts and where to buy parts.

Parts discussion:

Touch screen:

We are still deciding whether to buy the infrared touch screen from AliExpress. For now we decided to ask friends from China to ask around for us. However, we have decided to buy a 32" to scale down.

LEDs:

We have found various reputable website to buy are LEDs from. We have decided to go with the model WS2812 LED strips. Zach and Dana are going to an LED hobbyist shop at 1st and Boundary road tomorrow to check out prices and selection. If we do not end up getting a decent price we are going to buy the strips Ebay.

Controller:

We just purchased a Raspberry PI 2 from amazon and we expect to receive the controller by Thursday.

Pen:

We have a rough sketch of the pen in Dana's journal. We are going to 3D print the pen and have a piezoelectric sensor for our pressure sensitivity. It will most likely have a button on the top for the eraser.

Miscellaneous Parts:

Zach and Dana are going to drop by Lee's Electronics tomorrow to pick up miscellaneous parts. We are also going to see if they can help us order our touch screen from China.

Note about the budget:

We still have not heard back from ESSF, however we found out that we are able to use the Whigton fund as long as we save our receipts.

Next meeting date:

We will meet the next Wednesday at September 30, 2015. The location is to be decided then.

ArtTech

Minutes

October 19, 2015

16:30 – 18:00

Purpose of Meeting: Finish up Functional Specifications document and start working on parts that have arrived.

Everyone went over the functional specifications just to make sure everyone is on the same page. We noticed that everyone had different ideas on how each component is being implemented. Final editing took place as a group and the document is to be handed in by Zach later.

Aman will take a look on how to power the canvas and start working on the autocad to design the pen.

Bhavit will start working on the nano microcontroller for the pen.

Dana will start working on capturing the input of the infrared touch screen.

Zach will look into getting the LEDs for the canvas to work.

Since the LEDs still haven't arrived yet. We are working with a 1-meter cable we have sourced locally.

We have decided to work on the Design specification by the end of this week. We are going to have it done by Monday November 9, 2015.

Next meeting date:

We will meet the next day at October 26, 2015. The location is to be decided then.

ArtTech

Minutes

November 2, 2015

16:30 – 17:30

Purpose of Meeting: Talk about our progress for the LED array and the Smart Stylus and updates on the documentation.

Canvas: Zach and Dana laid out all the LEDs on the MDF board and have tested all the LEDs with the Arduino. Zach will be working on the documentation and Dana will finish up the power delivery system for the array and the PCB of the individual strands of LED.

Smart Stylus: Bhavit has made tremendous progress on the smart stylus and made a few schematics as per the TA instructed. Seems like Bhavit has a good idea on how to interface the bluefruit micro with the raspberry pi and he will post us with updates as he makes any progress.

Aman has figured out how to start making the chasis for the canvas. Dana will need to give any restrictions on the canvas if there are any.

Zach made a schematic using LTSpice of the LED array. Since the array is just split into 3 block, he made a block only since the schematic will be too messy with all 24 individual strips.

Next meeting date:

Next meeting will be after we get all the documentation done. Which will hopefully be by Wednesday.

ArtTech

Minutes

November 16, 2015

16:30 – 17:40

Purpose of Meeting: Talk about our progress for the Canvas and the Smart Stylus

Canvas: The initial construction of the canvas is done. Zach and Dana constructed the circuits and the power delivery system of the Canvas. The wiring is a bit messy but everything is confirmed to be working. Dana managed to get a test code working and Zach succeeded with programming the LED array in Java. Dana has some complaints about using Java and is worried about the performance of the PI running the JVM instead of using a more hardware oriented language like C. However, Zach insisted that if we use Java he can work on the canvas faster rather than using C. Since Dana is fine with working with both, Zach and Dana decided to work on the canvas using Java.

Smart Stylus: Bhavit started to work on the stylus. He's using his phone as a device to receive data input while Zach and Dana is working on the PI. He found a tutorial online on how to use the Bluefruit LE so he's going to figure out how to use the Bluefruit first.

Aman started to finalize the CAD designs for the pen so we can start 3D printing the pen.

Next meeting date:

Next meeting date is when the group makes a substantial progress on the project.

ArtTech

Minutes

November 20, 2015

13:30 – 14:00

Purpose of Meeting: Talk about our progress for the Canvas and the Smart Stylus

Canvas: Zach and Dana made a substantial progress on the canvas. They managed to make it draw and the group seems impressed and happy with the outcome and the progress. They are now going to work on the GPIO for the canvas buttons and color mixing and selecting right after the meeting.

Smart Stylus: Bhavit got the pen to send data to his phone and control the peripherals attached to the pen. It seems like everything is working and it just needs to be fine tuned to the canvas now. Zach and Bhavit discussed how they want the data structure to be so there's going to be a standard on how the pen and the canvas communicates. They decided on sending a single byte and each bit corresponds to color and pen status.

Aman is finalizing the stylus CAD design. He showed us what he has and we agreed that we needed some parts moved to make the pen feel more like a pen and part to be less obstructive to the user. After he makes the changes he will ask Gray or Fred (ENSC lab technicians) to 3D print the pen chassis.

Next meeting date:

Next meeting date is when we need to build the pen chassis.

ArtTech

Minutes

November 27, 2015

13:30 – 14:00

Purpose of Meeting: Talk about our progress for the Canvas and the Smart Stylus

Canvas: Zach finished the color mixing and is going to work on the saving feature after the meeting. Dana will try to optimize the C code for the touchscreen data and integrate the GPIO to the Java code.

Smart Stylus: Bhavit will try to get the smart stylus to talk to the PI today with Zach and Dana. Aman got the 3D printed chassis and he's trying to sand the chassis down so it will be smooth and made sure that all the parts is going to fit the 3D printed chassis.

Next meeting date:

Next meeting date is when we need to build the pen chassis.

ArtTech

Minutes

December 2, 2015

14:10 – 14:50

Purpose of Meeting: Talk about our progress for the Canvas and the Smart Stylus and start on our post mortem.

Canvas: Saving feature is now finished and the C code is now a bit more optimized. We still need to test if the canvas will speed up with the C optimization. Zach's dad who is a luthier is going to help us construct the chassis for the canvas while we are studying for exams.

Smart Stylus: The group decided that Dana was the best one out of all the member to solder the pen together. Bhavit and Aman are not confident that they can solder on a very tight enclosure. Zach is just bad at soldering as proven when we tried to solder the LED array.

Documentation: Zach and Aman will try to start on the post mortem while Dana and Bhavit put the pen together. After Dana and Bhavit finish the pen construction they are to meet up with Aman and Zach to discuss what's left to be done on the post mortem.

Next meeting date:

Next meeting date is going to be after everyone's exams are over and hopefully the construction of the canvas chassis is done by then.

ArtTech

Minutes

December 18, 2015

8:30 – 18:30

Purpose of Meeting: Finish the Dot Light Canvas

Today was our proposed deadline for the Dot Light Canvas. We met and worked until we were happy with the results. The canvas is basically fully functional. The stylus is too, but it doesn't connect to the canvas wirelessly as well as we like. We decided to demo both with and without the pen.

We started planning for the demo as well. We will be practicing over the next couple days for the final presentation on the 21st.

Next meeting date:

Next meeting date is on Sunday. We will go over the demo until everyone is comfortable with their parts.