



NavEYegation Technologies

Post Mortem for the
Gaze-controlled Mouse

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1. Introduction

A gaze-controlled mouse is a system that uses the movement and state of the user's eyes to interact with a personal computer. The system is made up of software as well as hardware components to ease the integration and enhance the user experience. It will use the position of the pupils relative to the rest of the eye to correctly map the cursor on a computer. Additionally, it will use a combination of blinks, dwell time, or other methods to interact with the user's computer.

The system is primarily designed for individuals with musculoskeletal, inflammation, or motor degeneration issues such as Parkinson's disease, arthritis, and carpal tunnel syndrome where the use of hands is painful or impossible. The design specifications for this gaze-controlled mouse will be detailed in this document, as proposed by NavEYegation Technologies.

2. System Overview

A camera is mounted next to the output screen which is intended to be controlled through gaze-tracking as shown in Figure 1.

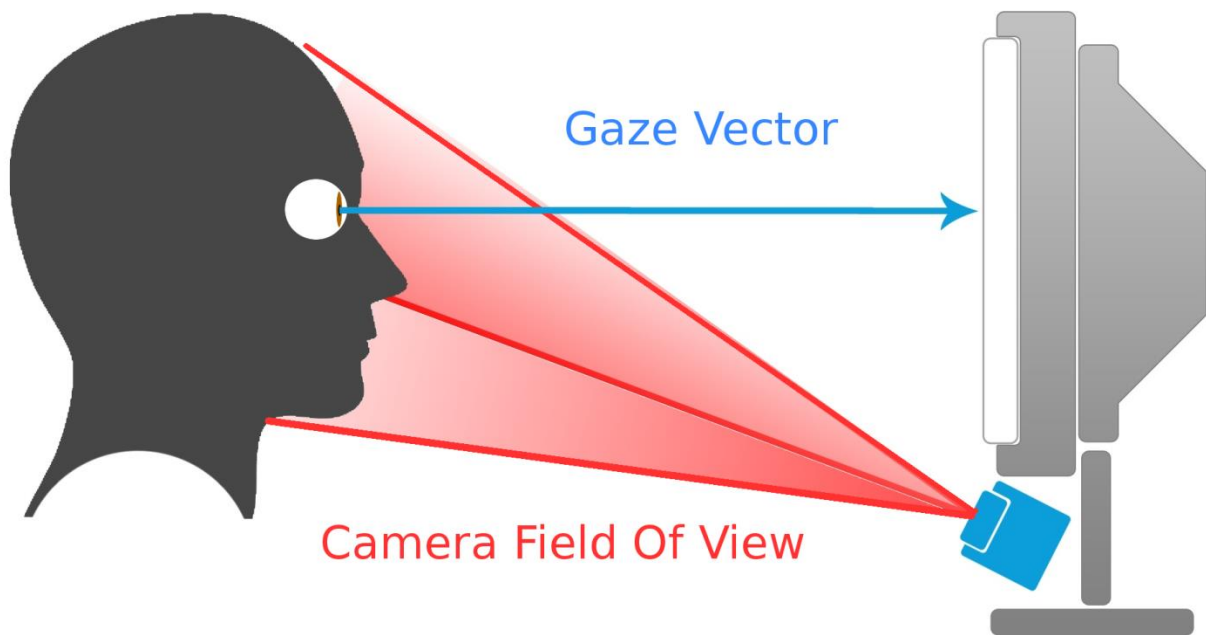


Figure 1: Gaze-Controlled Mouse System

The user's full face will be visible within the mounted camera's field of view and the input from this camera will be fed through a software image processing algorithm on a Single Board Computer (SBC) to determine the user's point of gaze.



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Upon using the gaze-tracking solution for the first time, a one-time calibration step must be performed. This calibration step would consist of looking at several sequentially displayed points on the screen the user is intending to use. The gaze of the user during this step would be recorded and used to establish the screen's position relative to the camera.

The screen coordinates provided as output by the image processing algorithm would be sent to an application running on the user's PC would then project the mouse cursor on the screen accordingly and allow them to click and drag, as they would with a regular mouse. The whole system is shown in Figure

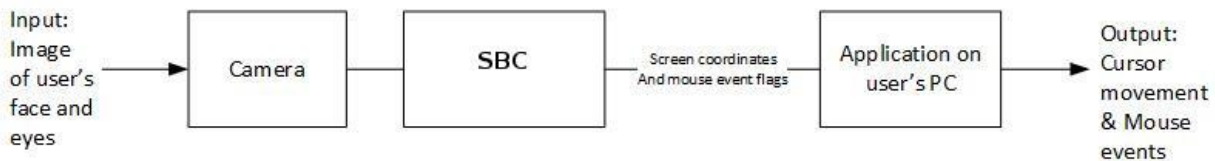


Figure 2: Gaze-controlled Mouse High Level Diagram

3. Materials and Costs

The estimated and actual costs are outlined in Tables 1 and 2, respectively. The actual cost of cameras is intentionally less than estimated as we were aiming to reduce overall costs to remain so as to not exhaust the funding we received from the ESSEF fund too quickly. The aim to reduced costs was superseded by the need for a more powerful processing unit which resulted in the increased cost of the processing unit.

Table 1: Estimated Cost of Gaze-controlled Mouse

Item	Estimated Cost
Cameras	\$240
Sensors	\$130
Processing Unit	\$130
Miscellaneous Materials	\$130
Structural Components	\$70
TOTAL	\$700



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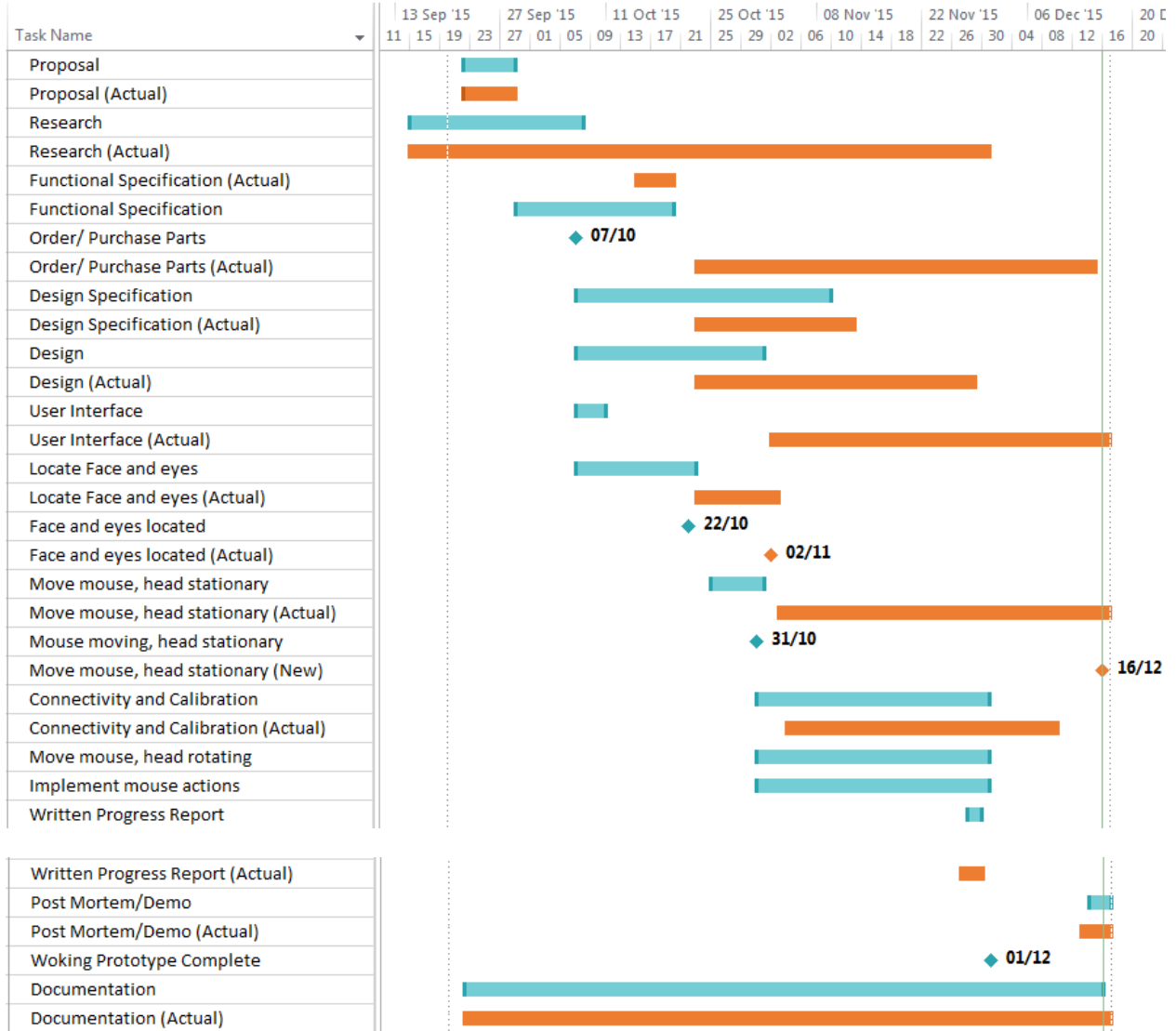
Table 2: Actual Cost of Gaze-Controlled Mouse

Item	Actual Cost
Odroid C1+	\$55.30
Odroid XU4 with Enclosure	\$132.44
Logitech C615 Web Cam	\$84
Logitech C170 Web Cam	\$37.38
Micro SD Card x2	\$47
Cables (HDMI/Ethernet)	\$12.60
3D Printed Case	\$35
Teensy	\$62.24
Parcel pickup	\$10
TOTAL	\$476.96

Although, we came in significantly under budget, the total amount spent was still more than what we received from the ESSEF, which was our only source of funding. We will be claiming the maximum amount allowable to be covered by the Wighton Fund.



4. Schedules





5. Challenges

1. Installing libraries: This was a challenging part as the existing library files from SDL website didn't work with our installed IDE. We had to look for a separate version of the library to work with our IDE.
2. Linking libraries: Linking library was also an issue but we were able to solve it using windows subsystem method on the IDE.
3. Displaying multiple windows: This was a big issue due to lack of experience with SDL library. However throughout the project we were able to manage it by debugging.
4. Detecting eye corners stably: Due to the fact we were using a 1080p webcam with a fairly wide FoV, many methods outlined in research papers that we read were unusable. That combined with the level accuracy, and more importantly robustness, needed to accurately determine eye motion made this the most difficult and most time-consuming part of implementing the gaze-vector estimation algorithm. In particular, the method was changed from the one in the design document to one that took advantage of radial symmetry.
5. Maintaining code consistency: With multiple contributors to a project, some method of keeping the code consistent across everyone's development environments is really important. Source control, like git, makes this much easier, but there are still times when it breaks down and manual merging/copying of files is necessary, which takes time.

6. Group Dynamics

Monica, the CEO, was the main leader of the group, and was responsible for setting meeting times, taking minutes, and keeping everyone organized. Nathan and Ramin worked together pair-programming style on the gaze-estimation algorithm, building off of each other's work and bouncing ideas back and forth. Sunny and Mani mostly worked alone on their parts, getting together with everyone else to work on documentation and integrate their parts into the final product.

Throughout the project we realized more face-to-face meetings would have been beneficial. Although we did keep up with our communication through means of text messages and emails, more face-to-face communication would have helped keep everyone up to date on more specifics, and would have made splitting tasks easier.

The group was fairly easy-going, with people working on their respective parts without really pushing the others too much. This did mean that some people, and as a result the group as a whole, fell behind in certain areas. A stronger leadership would have helped push everyone to finish by the target dates, which would have resulted in a better, more complete product.



7. Reflections

Monica Santiago:

With regards to the technical I learned a lot: how to use sockets in windows and Linux. I also learned how to write bash scripts in Linux and generally became far more familiar navigating Linux in general, particularly via command prompt. This was mostly due in part to the fact that half of the part of the part I was working on (the connectivity between the Odroid and the windows). Thus, it was almost a necessity to set up my laptop to be a dual-boot (Windows/Linux). As such, I learned (thanks to my colleagues) to set up my laptop to be this way. Throughout the project I learned how to search for, read, modify and utilize useful snippets of code to solve problems along the way, in addition to learning how to use the aforementioned aspects of programming. This also helped me become more fearless about trying different things to solve problems/bugs.

In terms of project execution, I learned that I should research parts more thoroughly before purchasing them. If I had done this, we might have been able to get our project to work on the Odroid XU4. I also learned to carefully consider the requirements of supporting features, not just the core features of the project. One example of this was the fact that the library that Sunny used to create the calibration animation had a windows subsystem instead of a console one, making it impossible to run both of our code in the same file. This experience allowed me exercise some creativity in coming up with a solution (albeit a somewhat inelegant one) in which our code was run as two separate processes which was synchronized by writing to a file. However, this could have been avoided had I/we considered the subsystems as a requirement.

With regard to interpersonal experiences, as CEO/Project Manager (or at least the person taking on the most administrative duties) I learned it would have been better if I was more assertive about enforcing deadlines and keeping track of when things should get done in general. Additionally, I learned that meeting at least once a week is absolutely critical. Emails and text messages are insufficient for keeping everyone up to date, especially if people have different Ideas to contribute. This was emphasized by the fact that we had vastly different schedules. We thought we could compensate by sending emails with meeting notes. But I found that when we actually met up people had a lot more to contribute. In general, I didn't butt heads with anyone, per se, but I believe that I have proved to myself I am able to compromise and/or take peoples perspective into account. In general I also proved to myself that I prefer to work independently.



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Sunny Chowdhury:

Throughout this project I have improved my C++ skills. Object oriented programming is an area I had spent a lot of time on. Initially my code was in one main file. However due to the demand of the project I had to take the object oriented approach. Object oriented approach made me split the project into a class with a header file along with implementation file. This has help me to create multiple windows to have calibration points on them. Later in the project, I switch to a separated dot Pixel method, which was possible due to object oriented programming. This idea definitely made way to run my code well not only by itself but also run smoothly when we integrated code with others.

Besides OOP, I spent an enormous amount of time researching about C++ libraries such as C++ QT, OpenGL, and SDL. After some consideration I settled with SDL (Simple DirectMedia Layer). This was an amazing opportunity to work with library and see how graphics work. So far, my programming courses and projects involved codes that either run on a console or write results in a file. However, during the project I learnt how to use the library and manipulates it's built in classes to work for me. This was great opportunity as this experienced opened doors for future learning. I am thinking of using this library and work on making graphics and even games in my free time. During calibration part of the project I had to change the output of calibration several times. I went from multi window calibration points to single window calibration points with a timer in between each calibration point. "Windows.h" is another library, which works with SDL, has helped me achieve that.

Another initial struggle was to setup a library within Visual C++ IDE. I believe this is an essential troubleshooting skill to have as industry software requires multiple open source libraries to work simultaneously with their project. The existing file didn't work with my IDE and had to look for the current library for 2015 Community Visual C++. After some research and intense troubleshooting I was finally able to install it, link it, and finally use it's built in classes.

Overall working with a team in an actual hardware/software engineering project has given me a lot of experience to take on future projects. I am confident that I can approach ever bigger projects with a clear goal in mind. I had an excellent team where everyone knew their role so we can work according to that. I also understood early that my work needed to work properly for us to work with communication protocol and also data needed to be sent to odroid for our gaze detection algorithm to work.

My work with other team members have improved my interpersonal skills. From setting up a proper budget to ordering parts to work with feedbacks has worked well for me as I got constant feedback to make my code better. I would definitely consider working with groups in the future to take on a similar engineering project and overall I am satisfied with my team members.



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Ramin Nazarali:

Throughout the course of the project, I gained a broad amount of experience in the use of the OpenCV image processing library, and learned many basic tools and techniques used for typical image processing scenarios. For example I helped write a routine that would isolate regions of interest within an image – such as the eyes – and pass these regions to another set of routines that would further process them. Another useful concept I gained familiarity in is with splitting images into different color spaces to perform different combinations of operations such as thresholding, gradient mapping, and averaging in order to highlight or extract certain sought-after features.

In addition to the previously mentioned operations, I gained knowledge in the use of morphological operators such as erosion and dilation of an image in order to further process an image to expose different features, and using haar cascade searches to find certain existing features such as the face, eyes, and nose of a user. Furthermore I learned of simple ways to optimize image processing algorithms, such as making use of image pyramids to search for feature locations in a down-sampled version of the original image, then using the found locations to sample areas on the original image.

Another experience I found extremely valuable involved the use of source control. This was one of the first projects where I dealt with multiple different branches of code being worked on by different people at the same time, with merges between branches occurring often. Learning how to manage conflicts within the same source file and making sure that merged code would build correctly has allowed me to develop skills to more effectively manage team based coding projects in the future.

On an organizational front, I experienced the importance of having consistent schedules and meeting times in order to work effectively with other group members. The importance of keep ourselves in the loop with regards to what other team members were doing and what they had/hadn't accomplished showed itself during the later stages of our integration plan: certain features of the hardware that were assumed to work by one or another group member did not, and much time was spent attempting to fix new problems that may have been caught by other group members in earlier stages should we have had more regular meetings.

In addition I gained experience with the particular difficulties of working with hardware. Doing extensive research before purchasing parts and trying to batch orders such that we were not missing required components would have saved us time and money, and likely would have allowed us to arrive at a more complete final state for our project.



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Nathan Samchek:

I learned a lot in this project. The biggest area was image processing. Morphological operations (erode, dilate, open, close, etc.), radial symmetry detection, adaptive thresholding methods, edge detection, and circle detection were all new to me, and I learned not just how to use them, but also what they are useful for and the details of how they work. In particular, I learned how to use the OpenCV implementations of the above.

I also gained a much greater appreciation for the human face, in particular the symmetries and geometry of and around the eye. Most notably, what aspects of the geometry apply near universally and what varies greatly from person to person. The sheer variety of types of eyebrows, eyes, noses, etc. is pretty mind-blowing, and it amazes me that facial feature detection is as good as it is.

This was also my first time working on a project of this breadth in Linux. So dealing with not just programming in a Linux environment, but also installing/updating software, using the command line, and creating/editing multimedia documents. All of which isn't very difficult, but different enough from Windows (which is what I'm familiar with) to cause some headaches getting used to it. I also learned how to use vim, which is a very useful, and notoriously difficult to learn, text editor/development environment.

In terms of interpersonal relationships, I learned much about communication, in particular keeping everyone in the loop. Towards the end of the project, I knew very little about what Mani or Sunny was working on, and they probably didn't know much about what I was working on either. And when it came to writing documentation, distributing the workload, and integrating the different parts, there were more headaches than there could have been if we had kept in touch more.

Additionally, I learned the importance of strong leadership. Having someone that knew what everyone was doing, could distribute the work evenly, push those that were behind, and enforce target dates more strictly would have been helpful. We did have some leadership, and without it we would have really been in trouble, but there could have been more.

Finally, I learned about budgeting/sourcing parts, more specifically in prototyping. At first, we were kind of wishy-washy in hammering down just what exactly we needed. Some parts were ordered later than they should have been, and some extra parts we didn't end up using at all were purchased. We probably should have spent a bit more money, especially early on. This would have reduced some of the deadline headaches towards the end.



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Mani Ahuja:

It's tough to even think about where to begin. There were many things that I've learned over the course of these past 4 months. I was primarily responsible for the user interface. In addition to my primary responsibility, I was also responsible for ensuring that the system our code runs on (Linux Ubuntu) is also up to date and functioning properly. This includes installing and maintaining the system, its libraries and troubleshooting any issues that may arise. Overall, I learned a great deal from this project. And that doesn't include just the engineering aspect of it. It also includes team dynamics, interpersonal skills and communication skills.

If we strictly look at what I learned from a technical point of view, it would be the user interface of the project. Usually, UI consists of hardware and software, but we had to scrap the idea from software. This was due to the GUI incompatibility issues with the Linux OS on the Odroid single board computer (SBC). I learned how to solder the components to the PCB board that indicated the status of Odroid SBC. Along with Monica, I also learned about bash and shell scripting while we were troubleshooting the hardware implementation. I also learned how to implement the GUI (even though we scrapped it) using Qt creator (which is a framework to create GUI using C++). This included the object oriented programming (OOP) aspect of C++ using classes. I also had plans to create a case for the Odroid C1+ SBC in AutoCAD/SolidWorks, but time did not permit me this. I did however spend a few days learning different things about AutoCAD and SolidWorks since it has been a very long time since I used these two programs (>5 years). I consider myself an intermediate Linux user however there are things that I also learned regarding the Linux OS during this project. More commands and how the SBC works with the Linux OS opened a new world of possibilities in terms of customization which added to my existing knowledge of Linux.

Many people underestimate the importance of team dynamics and communication in a project. I believe they are extremely important and vital to the success of any project, no matter how large or small. I did strengthen my interpersonal skills however I expected more. While my relationship with my team members was great, I wish I had developed a stronger connection with Nathan. This could be due to the fact that we did not see much of each other because of scheduling conflicts, so I was unaware what he was working on exactly. Monica is a great CEO; however, I felt that if she was more assertive with the deadlines and the overall project, we would have had better results and fewer headaches. Consistent meetings are critical to ensure the ongoing status of any project; ours included.

Budget is a huge aspect of any project. I learned that we need to have a strict budget and stick to it. Furthermore, I also learned that we should know what we want before we ordered the parts so as to not go over budget.



8. Work Distribution

Table 3: Work Distribution for the Gaze-Controlled Mouse

High Level Task	Nathan	Ramin	Monica	Sunny	Mani
Gaze-Tracking	XX	XX			
Connectivity			XX		
Calibration Animation			X	XX	
User Interface			X		XX
Documentation	X	X	X	X	X
Packaging		XX			

X = some responsibility

XX = Primary responsibility

9. Conclusion

Although the final result was not as complete as we originally hoped for, due to delays and unforeseen challenges, it still succeeds at tracking a user's gaze in a way that is not expensive, and with minimal processing on the user's computer. Given more time, we are confident that a fully functional product that meets our target specifications is achievable. However, it is unlikely we will continue working on the product in the near future, to give time for other studies and to reflect on what we have learned so far. In the future, some, or all of us, may pick up the project again to bring it to completion. Ultimately, it was a great learning experience, both in terms of technical areas, and group dynamics on a large, multi-part project, and the lessons we've learned will be carried forward into the future.



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AGENDA

October 9, 2015

2:30pm– 3:30pm

TASC I 9000 Level Study Area

Purpose of Meeting: To distribute work for functional specification and decide on what parts we need.

Items for Discussion:

- **Work distribution for functional spec**
- **Parts**
- **Other next steps**



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MINUTES

October 9, 2015

2:30pm– 3:30pm

TASC I 9000 Level Study Area

Present: Monica, Nathan, Ramin

Absent: Sunny, Mani (with regrets)

Purpose of Meeting: To distribute work for functional specification and decide on what parts we need.

Minutes:

Monica called the meeting to order at 2:40

A. Work distribution for functional spec

Discussion/Action:

- everyone flesh out some requirements, make it more formal
- Place initials next to the section you're working on

B. Parts

Discussion/Action:

- IR
- ramin will figure out what we need
- 3rd party board for LED (ameridroid) email mani about getting it from the US
- IR camera

C. Next Meeting Date

The next meeting was arrange for October 16 to work on functional spec

D. Other Business

Start playing with OpenCV by next week

Meeting was adjourned at 3:20pm



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AGENDA

September 15, 2015

4:30 pm – 5:30 pm

The Sunny Room

Purpose of Meeting: To decide on a project and discuss next steps

Items for Discussion:

- Findings on each project idea
 - yarn length gauge
 - eye-cursor
 - self-dimming headlights
 - self-sorting garbage
- ESSEF Application
- Proposal work distribution



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MINUTES

September 15, 2015

4:30 – 5:30

The Sunny Room

Present: Monica, Nathan, Sunny, Mani, Ramin

Absent: (with regrets)

Purpose of Meeting: To decide on a project and discuss next steps

Minutes:

Monica called the meeting to order at 4:30pm.

E. Project Decision

Discussion:

- Yarn counter – too simple?
- Self-dimming headlights – being worked on by Mazda, Hyundai (not luxury car manufacturers)
- Self-sorting garbage – popular project topic. Can sort btwn garbage, plastic and aluminum. – We could add compost recognition capabilities
- Gaze-controlled mouse – probably viable option with available eye tracking software
 - Will need high resolution cameras
- Split between garbage and eye-tracker
- Will do more research to determine if eye tracker might be too difficult

Action:

- Research eye-tracker project
- Come up with company and product name

F. Next meeting date

The next meeting was arrange for Friday September 20, 2015 – Lab 1

G. Other Business

Meeting was adjourned at 5:25pm



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AGENDA

September 18, 2015

10:30am – 11:30am

Lab 1

Purpose of Meeting: To *really* decide on a project, create a budget and choose a company name

Items for Discussion:

- Findings from research
- Budget
- Company Name



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MINUTES

September 18, 2015

10:30am – 11:30am

Lab 1

Present: Monica, Nathan , Mani, Ramin

Absent: Sunny (with regrets)

Purpose of Meeting: To *really* decide on a project, form a budget and choose a team name

Minutes:

Monica called the meeting to order at 10:30

H. Project Decision

Discussion:

- * Feasibility still uncertain
- * Group of 6 not allowed to pursue eye-mouse. Prof deemed it too easy for 6 people, therefore doable by 5 people.
- * Decision unanimous gaze-controlled mouse

Action: Pursue gaze-controlled mouse project

I. Budget

Discussion:

- *Cameras: \$240
- * Unsure of other viable pupil tracking methods
- Sensors: \$130
- Processing unit \$130
- Miscellaneous Materials \$130
- Structural Components \$70

Action: Add discussed items to budget for ESSEF proposal

J. Next Meeting Date

The next meeting was arrange for Tuesday September 22, 2015 4:30 pm

Meeting was adjourned at 12:00pm



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AGENDA

September 22, 2015

4:30 pm– 5:30 pm

Lab 1

Purpose of Meeting: To distribute work for the proposal and go over talking points for the ESSEF presentation

Items for Discussion:

- Talking points for ESSEF presentation
- Proposal section assignments
- Titles
- Company Name
- Logo



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MINUTES

September 22, 2015

4:30pm– 5:30pm

The Sunny Room

Present: Monica, Nathan, Sunny, Ramin

Absent: Mani (with regrets)

Purpose of Meeting: To distribute work for the proposal and go over talking points for the ESSEF presentation

Minutes:

Monica called the meeting to order at 4:44.

K. ESSEF Presentation Talking Points

Discussion:

- * Miscellaneous – cables, connectors, contingency costs, unforeseen parts
- * Structural – For mounting if we choose to do multi-camera or sensors

Action:

- * Discuss the above point, should they be addressed

L. Proposal Section Assignments

Discussion:

- * Better to meet all together – Any time

Action:

Section	Person
Letter of Transmittal (<10%)	Monica
Executive Summary (<10%)	Mani



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Introduction (5%)	Sunny
Scope/Risks/Benefits (15%)	Sunny
Market/Competition/Research Rationale (10%)	Mani
Project Planning (10%)	Monica
Proposed solution	Ramin
Cost Considerations (5%)	Monica/All
Conclusions/References (10%)	Nathan
Editing	Nathan

*Above chart subject to change

*Meet up Thursday 1:30

M. Titles

Discussion:

* Low priority

* Assign at random

Action:

Person	Title
Monica	CEO
Nathan	CFO
Ramin	COO
Sunny	CIO
Mani	CTO

N. Company Name

Discussion:

*Onpoint Technologies Taken



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Action:

- *Continue to brainstorm
- *Should choose something on Friday

O. Next Meeting Date

The next meeting was arranged for Thursday 1:30 Front of the library

P. Other Business

Meeting was adjourned at 6:30



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AGENDA

September 29, 2015

4:30– 5:30

Lab 1

Purpose of Meeting: To discuss steps required to start the building/ designing and to go over the Functional Specification Rubric

Items for Discussion:

- Functional Specification
- Meeting Frequency



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MINUTES

September 29, 2015

4:30– 5:30

Lab 1

Present: Monica, Nathan, Sunny, Ramin

Absent: Mani (with regrets)

Purpose of Meeting: To discuss steps required to start the building/ designing and to go over the Functional Specification Rubric

Minutes:

Monica called the meeting to order at 4:20

Q. Business Arising (Things people would like to discuss that weren't in the agenda)

Thing 1

Discussion:

Action:

R. Functional Specification

Discussion:

- * Go over examples and fill in relevant specs
- * Continue research as needed
- * Better to do as a group: one person typing, the others feeding them content

Action:

S. Meeting Frequency

Discussion:

- * Every day after 1:30 or as needed?
- * Play it by ear.



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T. Action:

U. Next steps in terms of actual work

Discussion:

Action:

V. Work Schedules

Discussion:

Action:

W. Next Meeting Date

The next meeting was arrange for < Insert date time and location here>>

X. Other Business

Meeting was adjourned at 4:45



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AGENDA

October 2, 2015

10:00 – 11:00

The Sunny Room

Purpose of Meeting: Confirm schedule changes. Work on functional spec.

Items for Discussion:

- Weekly meeting date, time and location
- Functional Spec



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MINUTES

October 2, 2015

10:00 – 11:00

The Sunny Room

Present: Monica, Nathan, Sunny, Mani, Ramin

Absent: None

Purpose of Meeting: Confirm schedule changes. Work on functional spec.

Minutes:

Monica called the meeting to order at 10:00am.

Y. Meetings

Discussion/Action:

*Wed/Thurs 1:30

*Rendez-vous at TASC and wander around for a spot

* Book library meeting rooms ASAP

Z. Work Schedules

Discussion:

Action:

AA. Next Meeting Date

The next meeting was arrange for Monday October 5, 2015 1:30pm TASC1

BB. Other Business

*Meet Mon/Wed or Tues/Wed? – Start earlier in the week?

*Ideas

-video tutorial

-tutorial/wizard mode which walks through user every time

-multiple options for customizing actions

-snapping function like tab function

- know what's on the screen and snap to major fields/buttons-autoscoll

Meeting was adjourned at 2:15



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AGENDA

October 9, 2015

10:30 – 11:30

CSIL

Purpose of Meeting: Discuss Functional Spec

Items for Discussion:

- Functional Spec
- Parts
- Actual work



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MINUTES

October 9, 2015

10:30 – 11:30

CSIL

Present: Monica, Nathan, Sunny, Ramin

Absent: (with regrets)

Purpose of Meeting: Discuss Functional Spec

Minutes:

Monica called the meeting to order at 10:30.

CC. Functional Spec

- everyone flesh out some requirements, make it more formal
- Show the TA if possible

DD. Parts

- Probably need IR camera
- Ramin will figure out what we need
- 3rd party board from ameridroid
- email mani about getting it from the US

EE. Actual work

- Start playing with OpenCV by next week

FF. Next Meeting Date

The next meeting was arrange for Thursday October, 15 2015 11am

Meeting was adjourned at 1:30pm



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AGENDA

October 23, 2015

1:30– 2:00

TASC 8000

Purpose of Meeting: Delegate work. Share ideas.

Items for Discussion:

- ⑩ Work delegation idea
- ⑩ Plan B2



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MINUTES

October 23, 2015

1:30– 2:00

TASC 8000

Present: Monica, Nathan, Ramin

Absent: Sunny, Mani (with regrets)

Purpose of Meeting: Delegate work. Share ideas.

Minutes:

Monica called the meeting to order at 11:30.

A. Work Division

Discussion/Action:

Image Processing	Mouse Driver
Ramin Nathan Mani	Monica Sunny

B. Plan B2

- Discrete movements only
- i.e. pupil moves up = cursor moves up, pupil moves right = cursor moves right

C. Next Meeting Date

The next meeting was arrange for October 30 2:30;m

Meeting was adjourned at 1:30



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AGENDA

October 30, 2015

3:00pm – 4:00pm

TASC

Purpose of Meeting: GUI and Connectivity update

Items for Discussion: GUI and Connectivity update



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MINUTES

October 30, 2015

3:00pm – 4:00pm

TASC

Present: Monica, Sunny, Mani, Ramin

Absent: Nathan (with regrets)

Purpose of Meeting: GUI and Connectivity update

Minutes:

Monica called the meeting to order at 3:30.

GG. GUI

Will be building the GUI in windows

HH. Connectivity

- USB driver cannot be done in 2 weeks
- Ethernet or serial are the 2 best options

Meeting was adjourned at 5:30



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AGENDA

November 10, 2015

12:00pm – 1:00pm

TASC

Purpose of Meeting: Design Spec

Items for Discussion:

- Section order
- Test Plan
- Other ideas



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MINUTES

November 10, 2015

1:30pm – 3:30pm

The Sunny Room

Present: Monica, Nathan, Sunny, Mani, Ramin

Absent: (with regrets)

Purpose of Meeting: Design Spec

Minutes:

Monica called the meeting to order at 2:00

II. Section order

- General System operation/System overview
- Gaze tracking + Camera
- Odroid +Buttons + LED + Seperate camera & Odroid
- Connectivity + Ethernet + System operation
- UI
- System Operation/Test Plan

JJ. Test Plan

Normal Use
Connection established

Calibration completed



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- Find gaze vector
- Find face
- Find eye center
- Find face points
- Mouse moves
- Mouse moves smoothly
- Mouse clicks things

KK. Ideas

User looks away and looks back

LEDs should be located near the camera so that you'll know the status of the system without looking away from the camera.

The button(s) would be located away from the camera, likely near the odroid. This way when the user pushes the button the camera turns around.

Meeting was adjourned at 3:30

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AGENDA

November 6, 2015



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3:00pm – 4:00pm

TASC

Purpose of Meeting: Parts

Items for Discussion:

- Parts
- UI
- Design spec



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MINUTES

November 6, 2015

3:00pm – 4:00pm

TASC

Present: Monica, Nathan, Sunny, Ramin

Absent: Mani (with regrets)

Purpose of Meeting: Parts

Minutes:

Monica called the meeting to order at 3:00pm.

LL.Parts

- May need IR LED for IR camera
- Picture in picture for demo to show what the odroid is seeing

MM. UI

- need buttons for reset esp software reset
- need and indicator leds
- nice to have gui
 - not essential
 - calibration dots
 - status indicator LEDs
- Give to Mani

NN. Design Spec

- Gaze-tracking - Ramin&Nathan
- Odroid-PC interfacing - Monica
- Monica will clean up my notes for sunny
- Other stuff: Mani



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AGENDA

November 20, 2015

10:30am– 11:30am

TASC 8000

Purpose of Meeting: Report updates on respective sections. Clear up priority of UI/LEDs

Items for Discussion:

- Task status updates
- Software and hardware UI features
- Priority of LEDs/Buttons
- Control framework
- Goals for next 3 weeks
- Next meeting
- Written progress report



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MINUTES

November 20, 2015

10:30am– 11:30am

TASC 8000

Present: Monica, Nathan, Sunny, Mani, Ramin

Absent: (with regrets)

Purpose of Meeting: Report updates on respective sections. Clear up priority of UI/LEDs

Minutes:

Monica called the meeting to order at 12:00.

OO. Business Arising (Things people would like to discuss that weren't in the agenda)

<p>Discussion:</p> <p><u>Presentation</u></p> <ul style="list-style-type: none"> • Would be nice to show what the Odroid is doing • One way, have a video feed going to Host-PC and displayed there • Another way: run gaze-tracking on a linux laptop • Should have a video of our thing working in case it suddenly breaks before the demo
<p>Action:</p> <ul style="list-style-type: none"> • Try to get have a video feed going to Host-PC and displayed there

PP. Status updates

	Gaze Tracking	Mouse event/ Cursor movement	Calibration	UI
Discussion	<ul style="list-style-type: none"> • Can get corners of the eyes 	<ul style="list-style-type: none"> • Mostly done • Still need to get the size of 	<ul style="list-style-type: none"> • Just started 	<ul style="list-style-type: none"> • Having a hard time with Qt



		<p>the screen in inches or mm</p> <ul style="list-style-type: none"> • clickable areas of the screen, <ul style="list-style-type: none"> ○ will help adjust the mouse to clickable areas ○ low priority 		
Action	Keep working till screen coordinates & event flags are produced	<ul style="list-style-type: none"> • Get screen dimensions in inches or mm • Implement mode control • Figure out how to do the software reset in a shell script in ubuntu 	Figure out how to get dots on the screen	<ul style="list-style-type: none"> • 1st will get 4 LEDs: red, green, yellow, blue? • Then will get a push button for s/w reset • Then will order 2 enclosures to modify for the LEDs and push button • will try Visual Studio

QQ. Control Framework

Discussion:

- Will have a calibration button on GUI and a physical software reset button
- Don't care how it works as long as it works

RR. Software and hardware UI features

Discussion:

- h/w reset easier to implement, but more overhead
- s/w reset, opposite of h/w reset
- s/w UI mostly to show that application is running and allow user to customize gaze-tracking algorithm and to calibrate whenever
- Calibration could be an animated circle to show that the calibration is in progress
- GUI would have a calibrate button
- LEDs/Buttons > GUI
 - 1 Push button for s/w reset
 - Detected in shell script
 - Should 1) create a new process running the program 2) Kill the current



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process
<ul style="list-style-type: none">○ 4 LEDS<ul style="list-style-type: none">▪ Working: Green▪ Calibrating: Yellow▪ Error: Red▪ Connected: Blue
Action: <ul style="list-style-type: none">• Monica will deal with code for s/w reset button• Mani will implement hardware

SS. Written Progress Report

Discussion <ul style="list-style-type: none">• Due on the Nov 29th – can be put off

TT. Other Business

Discussion: <ul style="list-style-type: none">• Would be nice good to have the Host-PC App let the Odroid know that the <u>Host-PC has fallen asleep</u>• Or be able to handle when this happens
Action: <ul style="list-style-type: none">• Monica will do this

Meeting was adjourned at 1:30