

Post-Mortem for Search and Rescue Quadcopter

Project Team: Lekabari Nghana Hesam Fatahi Avi Gill Gurjeet Matharu Mehrdad Ahmari

Contact Person: Gurjeet Matharu gsm9@sfu.ca

Submitted To: Dr. Andrew Rawicz – ENSC 440W Dr. Steve Whitmore – ENSC 305W School of Engineering Science Simon Fraser University

Issue Date: December 16th, 2014



Table of Contents

Introduction	2
Technological Challenges	2
Budget	3
Group Dynamics	4
Workload Distribution	5
Reflections	5
Future work	10
Conclusion	10
Appendix	11



1. Introduction

The main purpose of the project is to assist in search and rescue operations. In BC where there are lots of mountainous areas with different terrains, rescue operations can be delayed. There areas that pose dangerous for humans and may lead to ineffective searches. In order to reduce human limitations, we came up with the idea of a search and rescue system that uses a UAV with a camera mounted on it for both manual and autonomous flight. The camera is used to capture images using digital image processing. The operator can specify a particular area to search flight mode and can also switch to manual mode, where the UAV can be controlled to fly down for a better view of the situation. Using this information the search and rescue team can respond to different terrains with the necessary equipment needed for the rescue. As a proof- of-concept model, we would design the system to find an object in a field using digital image processing and send the Global Positioning System (GPS) location to the operator

2. Technological Challenges

There were numerous issues that we had encountered. One of the connections from the Arduino to the motors was not behaving properly. This was fixed by remapping a troubled pin to one that worked. Furthermore, one of the sensors was not working due to improper voltage supply. Utilizing the oscilloscope and multi-meter we were able to troubleshoot the sensor, by ensuring correct voltage had been applied to it.

The way we streamed the video from the raspberry pi to the client was troublesome to connect. Having to try and test numerous encoders and methods to finally find one to use in our method. Additionally, one of the receivers overheated due to a power distribution issue. The receiver had to be replaced.



3. Budget

Component	Predicted Cost(\$)	Actual Cost(\$)	Difference(\$)
Turnigy 9ch Transmitter and 8ch Receiver	75	90	15
GPS Shield Kit	75	75	0
Raspberry Pi, WIFI dongle and Pi camera	65	100	35
4x DJI 920KV Brushless Motors	50	50	0
4x Electronic Speed Controllers	50	80	30
9DOF Sensor Stick	50	50	0
Cable Connectors, spacers and wires	50	50	0
Zippy 4000mAh Battery	30	30	0
Carbon Fiber Frame	30	30	0
AeroQuad Shield	30	30	0
Power supply / distribution board	30	30	0
Carbon Fiber Propellers	20	20	0



SEARCU	E
--------	---

Barometer BMP180	15	15	0
Battery Charger	0	70	70
Subtotal	570	720	150
Shipping and Duty	60	100	40
Total	630	820	190

4. Group Dynamics

The team was organized into hardware and software aspects.

For the hardware aspects Mehrdad was in charge of the transmitter and receiver as well as the AeroQuad configurator software. Grace worked on the electrical components of the quadcopter. She calibrated the motors with the electric speed controllers (ESCs) and further worked with the power distribution board and implementing all the components onto the quadcopter.

For the software components of our project Hesam worked on our website including a server using nginx. Avi and Gurjeet worked together closely on the software aspects of the project including implementing the raspberry pi and pi camera into our quadcopter. Gstreamer was installed onto the raspberry pi to allow for easy streaming of our pi camera video. The image processing was done with openCV and one problem that arose was collaborating code. In order to solve this we shared the code over GitHub for easy manipulation and access. Portable Components (POCO) was used to send an email when the object of interest was found once the image was processed.



5. Workload Distribution

High-Level	Gurjeet	Grace	Avi	Mehrdad	Hesam
Task					
Parts sourcing			•		
Documentation	٢	<u>:</u>			
Administrator tasks					
Image Processing					
Website	<u>:</u>		<u>:</u>		
Arduino	<u>:</u>	<u>:</u> :::::::::::::::::::::::::::::::::::			
Quadcopter Assembly		•		•	\bigcirc
Quadcopter Debugging			<u>.</u>	\odot	٢

6. Reflections

Gurjeet

Arduino and the various sensors were used for the microcontroller. This forced us to work with and understand the many different commands, variables, and operations on the Arduino. Furthermore, this introduced us to different communication mediums such as PWM, and I2C protocols. Due to the fact that we ran into issues with some of the equipment we had to modify PWM timers which were complicated to learn. My understanding of Arduino, and its



communication mediums have been greatly improved after this project. Alongside the communication modules, we learned how to effectively solder and distribute various power supplies.

The raspberry pi was utilized for the video capture and streaming. This required a lot of research and eventually implementing various techniques and testing them. Many different methods failed such as ffmpeg as it was not practical to install such a package on something like the raspberry pi. Other methods did not have a real time feed, or introduced to high of latency. Ultimately we settled on gstreamer, and learning the different commands and understanding the pipelines we were able to properly play the raspberry pi stream. Aside from the encoding and media packages a linux machine was new to most of the group, forcing us to learn how to efficiently use a linux distribution.

Once we were able to capture the video and encode it, we had to find a way to send it to the host computer for server side image processing. This required us to understand a new set of applications and tools, namely nginx, which creates an RTMP server. To utilize this server we had to learn HTML and RTMP protocols and setup a webpage to listen for live RTMP streams. We eventually got a web player streaming live video from the raspberry pi over the local area network.

However, when retrieving this stream we weren't able to retrieve a lag free stream. This prevented us from establishing real time image processing server. Nevertheless, we continued with the image processing and learned and implemented various functions in openCV. This open source image-processing library is used in C++ and allowed us to successfully identify colors.

Overall the experience was a good one and it was great working with a creative and talantd group of engineers.

Avi

The project has been a wonderful learning experience and it has been a pleasure to work with a group of talented engineers. I came into the course expecting to take on a crucial and difficult course in my engineering career and having the group I did made the course exciting and enjoyable. The group had interest in our project right from the start whether it was the electrical, mechanical or software aspect of the project. At the start we had problems communicating and keeping up with deadlines for reports, this was quickly resolved by meeting up and organizing ourselves. We encountered challenges and overcome them together as a group to develop the Searcue system.



I have learned that working in a group has many benefits as if you don't know something you are able to ask and if they don't know as well you can go outside the group to obtain that knowledge. I realized that no matter how much planning or scheduling you do there is no perfect development cycle. There is always that unexpected delay such as a part not arriving on time or a malfunction with a part. Furthermore, I learned to push myself and be pushed by my group to work hard to meet the deadlines set.

I have learned from the project to work with the terminal and the Linux operating system as the raspberry pi runs as a Linux OS. I learned to use openCV libraries with C++ and the different image processing techniques available through these libraries. The number of algorithms available on openCV for image processing is remarkable and I plan on using openCV on future projects. Video encoding and streaming using gstreamer was also a valuable lesson learned from the project.

As the CFO of the company I monitored and managed the financials for the group. I was required to keep track of all components and their respective costs, so having good documentation to keep track was crucial. I gained the invaluable experience of improving my documentation skills.

Seyed M Ahmari

During the course of this project I learned a lot about myself and my capabilities as an engineer. Searcue system was the most exciting project I've ever done so far and it helped me gain a better understanding of different electronic components such as electronic speed controllers, sensors, and microcontrollers. I learned how to troubleshoot and tackle problems, which, in my opinion, is one of the most important skills you can gain as an engineer. This project helped me understand the meaning of the term "Top down design". In a top down design one would break down a system to gain insight into its sub-systems. We exactly did that for our project I had to learn the required software, hardware, and physics of quadcopter. I also needed to understand how the code and the microcontroller communicate in order to figure out how changing one would affect the other one.

The Searcue project provided some business ideas for the future. I believe that with more time and budget, I can improve our device and add new functionalities such as autonomous flight to it. This project also thought how important it is to keep track of my spending and also presented me with few ways to save money on parts. Being the Chief Operational Officer (COO) of the team gave me a good understanding of the pressure of such position and the importance of proper communication between the CEO and the rest of the members. In terms of technical aspect I learned how to put together many sub-systems to create a device that meets the requirements. I know how to calibrate sensors and ESCs and the purpose behind doing it. I learned how to solve



library errors that may arise while coding. I now know a big deal about Arduinos, their capabilities and limitations.

Working in a group helped me see not only advantages, but also difficulties that come with working with others. It is very reassuring when you have the support of your teammates. It helped me gain confidence and take on responsibilities. I also learned to be more patient, less judgmental, and more understanding towards my teammates. I learned that I should respect other member's opinion and always speak my mind respectfully. I put a lot of time on this project, but I cherish every second of it. I was always enjoying myself while learning. As a team, we had many setbacks and also many breakthroughs together and it made us closer over the course of the project. Another important lesson I learned was that no amount of research is sufficient. There is always more information out there waiting to be discovered. Even sometimes you may already have a solution, but then during your research you find a better alternative. This project thought me to not take impulsive actions out of exhaustion, impatience, or ignorance because it only results into failure and frustration.

Hesam Fatahi

Capstone project was my first real engineering group work experience during my interpersonally and technically study period. As a team, we had many obstacles and also many developments together and it made us closer over the course of the project. Working as a group would give you the opportunity to receive different suggestions and accept other methodologies to achieve a better end result. I had four exceptional teammates with great personalities and skills that allowed us to always move forward without major roadblocks.

My motivation to finish this project increased as the time flew. By learning a lot of technically and interpersonally skills during the semester my desire to learn accelerated. I had to design the system and test every part of the quadcopter and it helped me gain a better understanding of different electronic components.

It was important to understand the concept of combining sub-systems in order to make an advanced system. Understanding the functional aspects of each part, system requirements, the fundamental components and their relation improved my ability to troubleshoot and tackle problems. It also gave me a good understanding of the system overview of such devices. Besides, I feel that my overall mechanical and soldering skills were greatly increased while working on the project, as almost all components needed modifications to interconnect successfully.

The second part of my learning experience is related to the communication system of the software. I focused on the system server and the website which received the video directly from the quadcopter. I learned about different communication applications such as standalone application and web-based application. I had to do a lot of research about the client side and



server side to make myself more familiar to the programming codes such as Java Script, C++, PHP and CSS. I am now motivated to develop more web page designs or work on personal projects related to the developing and designing web pages.

I also improved my teamwork and learned how to communicate with my team members more efficiently. There were misunderstandings and lack of communication during some phases, but we managed to fulfill our purpose and completed the project before the deadline. Taking responsibilities, maintaining my composure in difficult times, and practicing leadership were other useful learning experience for me. I also learned that time management would lead to a better professional reputation. During this semester, there were a lot of times when I had to understand the level of difficulty of a problem and choose the best possible way to detect and solve the problem. I have more confidents in myself now and will use it to achieve important life and career goals. I spent a great deal of time towards planning and researching about different parts as well as executing preliminary tests. Finally, I learned what I had to apply for this course was so much more than just the technical skills that I have learned in the previous fourth years in my engineering studies.

Lekabari Nghana

Throughout the course of the project, I was exposed to new concepts and gained both technical and interpersonal skills. I worked in a group setting effectively and understood how to work with each of my team members. By getting to know my team, I learnt about different cultures and traditions. I was able to understand the different personalities and learnt to relate with each other in different ways. I made sure to respect and listen to suggestions form my team. I was able to take on responsibilities and contribute to the project by keeping myself informed on the different modules and gained some research skills.

Furthermore, I learnt how to troubleshoot problems on the hardware aspect of the project and also improved my testing skills. Most problems were as a result of weak connections which can cause problem during flight. I was involved in ensuring that the connections were proper. As a result, I increased my electrical knowledge and I also knew how to look up datasheets of parts.

I understood the importance of having the different sensors and their contributions to the stability of the quadcopter and the orientation of the motors for pitch, throttle, yaw and roll. Calibration is also an important aspect of the flight controller. Used serial commands to calibrate motors. If the sensors are not calibrated properly, the flight won't be stable during flight.

We had so many problems with connection which affected our calibration. The wire connections disconnect. We had to unsolder the pins on the Aeroquad shield couple of times which would have damaged the board. We needed to have been sure of the connections and check that they



work before soldering. From this, I learnt proper soldering techniques and was able to practice on one of our parts.

On software, I acquired knowledge on image processing i.e. transmitting and receiving RTMP streams. I also got to know open source software that are available for free like OpenCv, Poco, gstreamer. I worked on trying to remapping pins on Aeroqaud shield and had to understand and modify Aeroqaud software and the different timer values.

Although I knew nothing about quadcopters at the beginning of the semester, I have come to understand almost completely the physics and workings of the system. I improved on my communication skills and technical knowledge.

7. Future Work

Searcue has great potential for improvement of our current work. Our future works include developing better algorithms for search and rescue; instead of finding red possibly detect general human shapes. Also implementing better cameras, such as thermal cameras to better detect search and rescue victims would greatly improve the Searcue system. Our image processing had latency issues when retrieving video from the live stream, in future work we would like to process in real time. This would greatly improve the recognition of victims and help improve response time. Furthermore, after image detection of object of interest is achieved we would like to implement an autonomous flight mode where the quadcopter autonomously moves to the object of interest.

8. Conclusion

The Searcue system can benefit search and rescue missions, however, it currently lacks in a fundamental way. There needs to be a real time system implemented for search and rescue operations. There are currently methods or techniques that may be used, such as utilizing web socket pairing. Nevertheless, the Searcue system has potential, as it can work with proper implantation of communication modules. The system with a more robust controller and identification algorithms has the potential to become a viable option for search and rescue missions helping save the cost and finding peoples quicker.



9. Appendix

Searcue

AGENDA

September 7, 2014 1:00 – 2:00pm Sunny room, LAB1

Items for discussion:

- 1. Meet team
- 2. Introduce Project ideas



MINUTES

September 7, 2014 1:00 – 2:00pm Sunny room, LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Pouya

Regrets: Mehrdad Ahmari (Out of town)

- 1. Introduced team and a little background
- 2. Brainstorm and share project ideas with team
 - a. Hardware and software components



AGENDA

September 9, 2014 11:30am – 12:30pm Sunny room, LAB1

Items for discussion:

1. Discuss Project ideas



MINUTES

September 9, 2014 11:30 – 12:30pm Sunny room, LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Pouya

Regrets: Mehrdad Ahmari (Out of town)

- 1. Discussed project ideas
 - a. Search and rescue quadcopter
 - i. Different modes
 - ii. Involves image processing
 - b. Weather system at home
 - c. Airport baggage sensor
 - i. Sensing issues
 - ii. Not enough hardware component for demo
 - iii. Uses RFID

Note: Already made by Trakdot Luggage Tracker

d. Casino table



AGENDA

September 10, 2014 11:30 – 12:00pm TASC1

Items for discussion:

1. Decide on a project



MINUTES

September 10, 2014 11:30 – 12:00pm TASC1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi

Regrets: Mehrdad Ahmari (Out of town), Pouya (left for co-op)

1. Casino table

- i. Features include:
 - 1. Texas Hold'Em
 - 2. Casino mode with actual dealer (not automated)
 - 3. Image processing
- ii. Hardware Wooden table, Cameras (at least 3), LCD's
- iii. Software Image processing to scan codes and determine winner
- For demo purposes, need to design table for 3 players and actual dealer



AGENDA

September 11, 2014 2:30 – 4:30pm TASC1

Items for discussion:

- **1.** Pick top two project ideas
- 2. Talk to Andrew about both ideas and pick one



MINUTES

September 11, 2014 2:30 – 4:30pm TASC1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Reflection on the casino table
 - a. Too simple
 - b. Some members won't learn new concepts
 - c. Not challenging
 - d. Doesn't fit a capstone project
- 2. New Focus: Search and rescue quadcopter
 - a. Aim: For search and rescue
 - b. Tasks:
 - i. Make it fly which requires motors (automatic and manual)
 - ii. Communication System- sending information about an object to a laptop for example
 - iii. Image processing (using thermal generation)
 - c. More challenging, need to research and learn, there's an open source available
- 3. Talk to Andrew about the two ideas to finally decide
 - a. Decided to go with quadcopter!
- 4. TODO: Gurjeet to send out links to open source software and everyone needs to research more about the project



AGENDA

September 15, 2014 11:30 – 12:30pm Sunny room, LAB1

Items for discussion:

1. Research on parts and order them



MINUTES

September 15, 2014 11:30 – 12:30pm Sunny room, LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

1. Required parts

Arduino, IMU, GPS,

Frame: X vs H based on motors

- a. Buy one
- b. Fall back design: design a light and durable frame
- Motor: Hyper efficient DJI 2212
 - a. Reason for choice weight, cost, flight time, efficiency in terms of battery, current, power distribution

Propellers: 14" to 16" depending on distance between motors

Camera: Thermal imaging vs night vision with GoPro – cheaper alternative Arduino mega vs Nano – More inputs and outputs – can add extra functionalities



AGENDA

September 16, 2014 11:30 – 12:30pm Sunny room, LAB1

Items for discussion:

1. Work on proposal



MINUTES

September 16, 2014 11:30 – 12:30pm Sunny room, LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Delegate parts for proposal document
 - a. Introduction and company details- Avi
 - b. Scope Lekabari
 - c. Market/Competition/Research Rationale and cost consideration Mehrdad
 - d. Project Planning Gurjeet
 - e. Conclusion Hesam

Have your parts ready by the weekend and meet to put them together



AGENDA

September 20, 2014 4:00 – 7:00pm Sunny room, LAB1

Items for discussion:

1. Work on proposal



MINUTES

September 20, 2014 4:00 – 7:00pm Sunny room, LAB1

Present: Lekabari Nghana, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

Regret: Avneet Gill (work)

1. Work on proposal and make sure document flows then discuss more about the project



AGENDA

September 21, 2014 1:00 – 7:00pm LAB1

Items for discussion:

- 1. Prepare for ESSEF funding application
- 2. Discuss Proposal structure



MINUTES

September 21, 2014 1:00 – 7:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Discuss ESSS funding application
- 2. Continue working on proposal
 - a. Created dropbox to organize the document



AGENDA

September 22, 2014 5:00 – 12:00am LAB1

Items for discussion:

1. Complete proposal and submit



MINUTES

September 22, 2014 1:00 – 7:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

1. Format proposal document and submit



AGENDA

September 23, 2014 4:00 – 8:30pm LAB1

Items for discussion:

- 1. Update on ordered parts
- 2. Prepare for ESSEF funding presentation



MINUTES

September 23, 2014 4:00 – 8:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Update –Parts came in
- 2. Prepare for ESSEF funding presentation at 8:45pm
 - a. Make power point and split sections
 - i. Overview-Gurjeet
 - ii. Why is this a good project Lekabari
 - iii. Funding Mehrdad
 - iv. Cost breakdown Avi
 - v. Conclusion Hesam



AGENDA

September 24, 2014 1:00 – 3:00pm LAB1

Items for discussion:

1. Start working on project



MINUTES

September 24, 2014 1:00 – 3:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Start working on the project
 - a. Assemble frames
 - i. ST360 quadcopter frame with motors and propellers frames are too weak
 - b. Test motors
 - i. Using oscilloscope doesn't work, motors don't make a complete revolution
- 2. ESSS Funding No reply yet
- 3. Need to grab parts from the states to save us money



AGENDA

September 26, 2014 1:00 – 3:00pm LAB1

Items for discussion:

1. Motor test



MINUTES

September 26, 2014 1:00 – 3:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi

Regret: Mehrdad Ahmari

1. Continue with test on motors

Motor is comparable with turnigyL2210C-1200 Brushless motor

- a. Try with a higher voltage and current from oscilloscope
 - i. Need more current to run motor
 - ii. Can create small circuit using breadboard to divide current and keep voltage same, step up transformer
- b. TODO: research more on quadcopters Basic quadcopter tutorial



AGENDA

September 29, 2014 1:00 – 2:00pm LAB1

Items for discussion:

1. Updates on parts


MINUTES

September 29, 2014 1:00 – 2:00pm LAB1

- 1. Updates on parts- parts are not compatible, ordered more parts
 - a. 9DOF sensor stick -\$49.95
 - b. Barometric pressure sensor breakout BMP180 \$9.95
 - c. Turnigy 9X 9Ch transmitter w/module and 8Ch receiver \$69.97
 - d. Aeroquad shield v2.2 \$29.95
- 2. Drawbacks
 - a. the parts are going to take weeks to get here
 - b. Need to research on connections



AGENDA

October 9, 2014 11:00 – 12:00pm LAB1

Items for discussion:

1. Update on parts



MINUTES

October 9, 2014 11:00 – 12:00pm LAB1

- 1. Updates on parts:
 - a. Avi is going to pick up parts
 - b. Updates on ESSEF funding \$500 received



AGENDA

October 11, 2014 1:00 – 7:00pm LAB1

- 1. Work on functional specification document
- 2. Updates on parts



MINUTES

October 11, 2014 1:00 – 7:00pm LAB1

- 1. Start functional specification document
 - a. Created google docs
 - b. Letter of transmittal, Executive summary Lekabari
 - c. System requirements and conclusion Avi, Hesam, Gurjeet and Mehrdad
- 2. Update Avi got Gopro hero3+



AGENDA

October 14, 2014 10:00 – 6:00pm LAB1

Items for discussion:

1. Continue work on functional specification document



MINUTES

October 14, 2014 10:00 – 6:00pm LAB1

- 1. Review functional specification
- 2. Discuss system requirements and make appropriate changes
 - a. Frames, motors, battery, digital image processing, flight controller
- 3. Finish up functional specification



AGENDA

October 17, 2014 10:00 – 4:00pm LAB1

- 1. Distribute task
- 2. Updates on progress



MINUTES

October 17, 2014 10:00 – 4:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Responsibilities
 - a. Hesam Motors & Associated circuitry and integration
 - b. Gurjeet & Avi Flight controller/Software
 - c. Sam Over the Air Communication (Transmitter Receiver)
 - d. Grace System Integration (System Communication and control algorithms)
- 2. Current Progress:
 - a. All Parts are in and are in the process of being soldered for the Flight Controller
 - b. Frame is assembled and motor/ESC are being connected
 - c. Need to solder motors that came with frames so need to switch to multistar motors
 - d. But propellers don't fit so need new propellers
 - e. Need shield to make clean connections
- 3. Current Problems:
 - a. Connecting receiver to Arduino
 - i. Receiver has 10 pins, Arduino has 8
 - ii. Will it burn out if two extra pins aren't connected?
 - iii. Powering receiver from "bat" pins
 - iv. After assembling frames and adding motor, frames seem heavy. May affect flight height

Today's Tasks Completed: Using 7.453Kohms and 14.678kohms Connecting the receiver

Useful links:



 SEARCUE

 http://aeroquad.com/showwiki.php?title=Turnigy+9X+FAQ

 http://www.instructables.com/id/A-SK450-Dead-Cat-Quadcopter-to-Call-Your

 Own/step14/Program-Q-Brain/

 https://www.youtube.com/watch?v=DVt5GgZE3AA&spfreload=10%20Message%3A%20JSON

 %20Parse%20error%3A%20Unexpected%20EOF%20(url%3A%20https%3A%2F%2Fwww.yo

 utube.com%2Fwatch%3Fv%3DDVt5GgZE3AA

Searcue

AGENDA

October 21, 2014 4:30 – 6:30pm LAB1

- 1. Updates on parts
- 2. Test motor
- 3. Transmitter control operation



MINUTES

October 21, 2014 4:30 – 6:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Updates
 - a. Gurjeet bought Servo motor connector wires
 - b. Mehrdad and Hesam got batteries for the receiver
- 2. Continue to test motor
- 3. Transmitter control system figured out how to work around and navigate it
 - a. Successfully bound the transmitter to receiver using bind receiver
 - b. Fixed "Switch Error" problems with transmitter

TODO:

Figure out how to control the motors using the transmitter



AGENDA

October 22, 2014 12:00 – 3:30pm LAB1

- 1. Test motor
- 2. Bind transmitter and receiver



MINUTES

October 22, 2014 12:00 – 3:30pm LAB1

- 1. Continue to test motor
 - a. Move both toggle switches together?
 - b. Move pitch up slightly and down?
 - c. Throttle must be on reverse?
 - d. Set mode of receiver?
- 2. Revisit Binding process
 - a. Use bind button
 - b. Light should blink and turn solid
 - c. It stays bound!!



AGENDA

October 23, 2014 3:30 – 8:00pm LAB1

- 1. Finish motor test
- 2. Get lockers for parts



MINUTES

October 23, 2014 3:30 – 8:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Email lockers admin for lockers in lab1 Hesam
- 2. Motor test works
 - a. Need to use the throttle hub to calibrate Qbrain all-in-one ESC and ESC's should be in a certain order (white- brown- red- orange)
 - b. Bind to CH1 (throttle)
 - c. After bound, CH1 controlled motor correctly

Note: Need to have the transmitter on to run the motor



AGENDA

October 25, 2014 1:30 – 5:30pm LAB1

Items for discussion:

1. Make connections to shield and motor



MINUTES

October 25, 2014 1:30 – 5:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. TODO: Connect receiver to shield and motor
 - a. Look up connection online
- 2. Problems
 - a. Pins used to make connection don't line up
 - b. Unsolder?
 - c. Use wires to connect?

Send an email to Jamal for help - Lekabari

Note: some channels don't cause motor to run



AGENDA

October 28, 2014 3:30 – 5:30pm LAB1

Items for discussion:

1. Updates on parts



MINUTES

October 28, 2014 3:30 – 5:30pm LAB1

- 1. Update
 - a. Gurjeet got pcb
- 2. Discuss functional specification grade
 - a. Email TA?



AGENDA

October 31, 2014 12:00 – 4:30pm LAB1

- 1. Updates on progress
- 2. Prepare for oral report presentation



MINUTES

October 31, 2014 12:00 – 4:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Updates
 - a. Software is up and running
 - b. Need to use Github to work on software
 - c. Propellers don't fit. Need to get one from Snhobby
 - d. No longer using Razor IMU because it calculates the yaw, roll and pitch value. Need raw values
- 2. Discuss Oral Report presentation
 - a. Hesam has midterm Taken permission form Steve
 - b. Introduction Avi
 - c. Schedule-Gurjeet
 - d. Financial Avi
 - e. Progress Lekabari and Mehrdad

TODO:

Work on design spec

Continue to test motors



AGENDA

November 3, 2014 12:00 – 4:30pm LAB1

- 1. Continue work on functional specification document
- 2. Delegate responsibilities



MINUTES

November 3, 2014 12:00 – 4:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Functional and design specification
 - a. Gurjeet and Lekabari prepare outline for design and functional spec
- 2. Responsibilities
 - a. Hesam and Mehrdad Flying quadcopter
 - b. Mehrdad Sustainability and safety
 - c. Gurjeet System Overvies
 - d. Lekabari UAV
 - e. Avi Software and communication system
- 3. System Overview
 - a. Software Image processing
 - b. Hardware Quadcopter
 - c. Communication systems serverside

TODO:

Email Steve for free late - Lekabari

Hesam, Mehrdad and Lekabari - GPS and Image capturing

Avi and Gurjeet - Image processing



AGENDA

November 6, 2014 12:00 – 3:30am LAB1

Items for discussion:

1. Work on functional and design specification document



MINUTES

November 6, 2014 12:00 – 3:30am LAB1

- 1. Functional and design specification
 - a. Put things together
 - b. Discuss system overview
 - i. Image processing?
 - ii. Open source?
 - iii. App?
 - iv. Rogers connection?
 - v. Buy transmitter or use wifi over internet
 - vi. Raspberry Pi
- 2. Parts lee's and rp electronics, snhobby



AGENDA

November 7, 2014 12:00 – 3:30pm LAB1

- 1. Calibrate motor
- 2. Download Aeroquad software



MINUTES

November 7, 2014 12:00 – 3:30pm LAB1

- 1. Calibrate motor bind and then calibrate using mode 2 transmitter
 - a. Use throttle hub
 - b. Set throttle to high and then low and motor should spin
 - c. Don't ned programming card
- 2. Software
 - a. Downloaded Arduino zip file and Installer
 - b. Made sure to save in same folder
- 3. Autonomous flight
 - a. Used Aeroqaud configurator



AGENDA

November 9, 2014 12:00 – 3:30pm LAB1

- 1. Update on parts
- 2. Sign up for demo



MINUTES

November 9, 2014 12:00 – 3:30pm LAB1

- 1. Signed up for demo: last two days Gurjeet
- 2. Raspberry Pi sd card broke
- 3. Demo day Dec. 16th



AGENDA

November 14, 2014 11:30 – 3:00pm LAB1

- 1. Work on Aeroquad configurator
- 2. Check propellers



MINUTES

November 14, 2014 11:30 – 3:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Measured motor motor distance and max length of propeller
 - a. 9 X 6 or 10 X 4.7
 - b. Avi to get propellers for snhobby
- 2. Configurator disconnects
 - a. Error : "Insufficient location information"
- 3. Serial port disconnection issues
 - a. Doesn't detect it sometimes

TODO: Figure out Connections to Aeroquad shield



AGENDA

November 17, 2014 3:00 – 7:00pm LAB1

- 1. Divide work into software and hardware
- 2. Discuss written oral report
- 3. Update on parts



MINUTES

November 17, 2014 3:00 – 7:00pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Work division
 - a. Hardware Hesam, Lekabari and Mehrdad
 - b. Software (Image processing) Avi and Gurjeet
- 2. Written oral report
 - a. Introduction, schedule, summary, financial
 - i. Any update on finances?
 - ii. New costs?
- 3. Update
 - a. Got Raspberry Pi camera
 - b. Mo longer using GoPro camera
 - c. Using live feed for software
 - d. May be able to make an app
 - e. Hardware implementation still in progress
 - i. Need battery connectors
 - f. Avi got propellers
 - g. No battery connector at Snhobby

TODO:

Mehrdad and Hesam to get battery connector and return unused wire connectors



AGENDA

November 18, 2014 5:20 – 7:00pm LAB1

- 1. Update on parts
- 2. Check new connectors and solder



MINUTES

November 18, 2014 5:20 – 7:00pm LAB1

- 1. Updates:
 - a. Got battery connector
 - b. Need battery charger
- 2. Have connectors ready for flight
- 3. Test connections to shield
 - a. Software not available
- 4. EC5 connectors don't fit perfectly may need to get EC3 connectors



AGENDA

November 20, 2014 5:20 – 7:00pm LAB1

Items for discussion:

1. Solder battery to connector


MINUTES

November 20, 2014 5:20 – 7:00pm LAB1

- 1. TODO
 - a. Decide on connector to use
 - b. Solder
 - c. Test receiver and transmitter connections
 - d. Start software implementation
- 2. Altitude Hold (flying-in-house)
 - a. Check for high vibrations



AGENDA

November 24, 2014 12:00 – 6:30pm LAB1

Items for discussion:

1. Update on soldering



MINUTES

November 24, 2014 12:00 – 6:30pm LAB1

- 1. Updates
 - a. Soldering doesn't work and glue doesn't hold properly
 - b. Need to get new connectors



AGENDA

November 25, 2014 1:30 – 4:20pm LAB1

Items for discussion:

1. Update on connectors



MINUTES

November 25, 2014 1:30 – 4:20pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Updates
 - a. Connectors were bought and soldering done
- 2. Drawbacks
 - a. Wrong soldering to aeroquad shield need to unsolder
 - b. Gurjeet get the soldering iron

TODO:

Test manual flight

- Weight
- Propeller rotation

Need to figure out how to make connections to receiver



AGENDA

November 26, 2014 12:00 – 3:30pm LAB1

Items for discussion:

1. Update on software



MINUTES

November 26, 2014 12:00 – 3:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

- 1. Updates
 - a. Software
 - i. Can send and receive video streams but can't process it
 - b. Suggestion
 - i. Need to meet up with George to help out with flight and flight controller
 - ii. May need to communicate with Avi and Gurjeet for help

TODO:

Test manual flight

- Weight
- Propeller rotation



AGENDA

November 27, 2014 12:00 – 4:30pm LAB1

- 1. Unsoldering part
- 2. Flight controller orientation



MINUTES

November 27, 2014 12:00 – 4:30pm LAB1

- 1. TODO
 - a. Get started with unsoldering
 - b. Get George's contact info
 - c. Meet up with team
- 2. Need to get back to basics
 - a. Aeroquad manual
 - b. Connecting receiver to Aeroquad
- 3. Use Display to check if the throttle sticks are working
 - a. Arm and disarm motors
- 4. Check flight controller orientation



AGENDA

November 29, 2014 12:00 – 5:30pm LAB1

- 1. Software updtes
- 2. Progress on hardware



MINUTES

November 29, 2014 12:00 – 5:30pm LAB1

- 1. Updates
 - a. Software
 - i. Done with sending and receiving frames
 - ii. Two modes of detection face recognition and red ball
 - iii. Sending alert when object is found to recipients
 - iv. Need to buy a server
 - b. Hardware
 - i. Transmitter calibration
 - 1. Pitch and roll sometimes doesn't work in configurator
 - 2. Weak connections
 - ii. Esc calibration works for only 3 motors
 - iii. How to power shield when flying?



AGENDA

December 1, 2014 2:00 – 5:30pm LAB1

- 1. Software Updates
- 2. Hardware updates and work on it
- 3. Order parts



MINUTES

December 1, 2014 2:00 – 4:30pm LAB1

- 1. Progress
 - a. Software
 - i. Raspberry pi has its own battery
 - ii. Need to test distance with quadcopter flying
 - b. Demo Have live feed and display GPS location
 - c. Hardware
 - i. May need new frames because of extra weight of battery of raspberry pi
 - d. Priority test flying
 - e. Ordered new frame Mehrdad



AGENDA

December 4, 2014 12:00 – 5:30pm LAB1

- 1. Motor calibration
- 2. Work on detecting sensor Test using breadboard



MINUTES

December 4, 2014 12:00 – 5:30pm LAB1

- 1. Calibrate motor
- 2. Not detecting sensors
 - a. Can use serial monitor to run commands
 - b. Logic level converter needs to be working for sensor to turn on
 - c. Test using breadboard
 - i. Doesn't work
 - ii. Run in Aeroquad and check serial data No data
 - iii. Raspberry pi has its own battery
 - iv. Need to test distance with quadcopter flying
 - d. Need to unsolder



AGENDA

December 5, 2014 1:00 – 7:30pm LAB1

- 1. Work on creating website
- 2. Test sensors order new parts to test
- 3. Use configurator to calibrate sensor



MINUTES

December 5, 2014 1:00 – 7:30pm LAB1

- 1. Can't get the soldering iron
- 2. Start working on website nginx, rtmp, amazon aws
- 3. Can't get data- Ordering MultiWii flight controller detecting sensors
- 4. Got the 9DOF to be powered on with the logic level converter
 - a. Sensor stick works
 - b. Needs logic level converter
 - c. Can read and detect device
- 5. Calibrate motors again
- 6. Transmitter calibration
 - a. Using #define Normalreciver doesn't work
- 7. Get soldering iron to unsolder



AGENDA

December 6, 2014 1:00 – 7:30pm LAB1

Items for discussion:

1. Work on website



MINUTES

December 6, 2014 1:00 – 7:30pm LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

1. Can't get the soldering iron

Start working on website - nginx, rtmp



AGENDA

December 9, 2014 12:30 – 8:30pm LAB1

Items for discussion:

1. Test motor orientation



MINUTES

December 9, 2014 12:30 – 8:30pm LAB1

- 1. Test motor orientation 2CW and 2CCW
- 2. Motor1 on the Aeroquad shield doesn't work
 - a. HEXX configuration to run quadcopter? won't work
 - b. ESC bad?
 - c. Need to change port address of pin 1
 - i. FlighControlProceess.h -> change motors
 - ii. Motors_PWM_Timer.h
 - iii. Motors_PWM.h
 - iv. Motors.h



AGENDA

December 10, 2014 12:30 – 10:30pm LAB1

- 1. Updates on parts
- 2. Discuss progress



MINUTES

December 10, 2014 12:30 – 10:30pm LAB1

- 1. Updates
 - a. Got new ESC's
- 2. Working on flying
- 3. Website in progress
- 4. Rtmp in progress



AGENDA

December 11, 2014 12:30 – 3:00am LAB1

Items for discussion:

1. Work on flying quadcopter



MINUTES

December 11, 2014 12:30 – 3:00am LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

a. Focus on flying quadcopter i. Record videos



AGENDA

December 12, 2014 12:30 – 3:00am LAB1

Items for discussion:

1. Work on flying quadcopter



MINUTES

December 12, 2014 12:30 – 3:00am LAB1

Present: Lekabari Nghana, Avneet Gill, Gurjeet Matharu, Hesam Fatahi, Mehrdad Ahmari

a. Focus on flying quadcopter ii. Record videos



AGENDA

December 13, 2014 12:30 – 4:00am LAB1

- 1. Work on hardware and software
- 2. Work on website



MINUTES

December 13, 2014 12:30 – 4:00am LAB1

- 1. Hardware
 - a. Working to make it fly
 - i. ESC connection is loose
 - ii. Power distribution board deosn't work properly
 - iii. May need to use the chip?
 - iv. Receiver burnt!
 - 1. Check for stores to get them
- 2. Software
 - a. Work on streaming
- 3. Website in progress



AGENDA

December 14, 2014 1:30pm –8:00am LAB1

- 1. Get new parts
- 2. Solder Esc's to power board



MINUTES

December 14, 2014 1:30pm – 8:00am LAB1

- 1. Updates
 - a. Got receiver
 - b. Got power board
- 2. Solder ESC's to power board



AGENDA

December 15, 2014 1:30pm – 5:00am LAB1

- 1. Test Flight
- 2. Complete flight, image processing and website



MINUTES

December 15, 2014 1:30pm – 5:00am LAB1

- 1. Test Flight in- house
- 2. Website Done
- 3. Streaming- Done
- 4. Start Presentation



AGENDA

December 16, 2014 2:30pm – 10:30am LAB1

Items for discussion:

1. Finish up presentation and do a run through



MINUTES

December 16, 2014 2:30pm – 10:30am LAB1

- 1. Continue Test
- 2. Finish up presentation
- 3. Try flight video outside