Home Air Monitor

A cleaner, healthier home

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1.1

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1. Introduction

With pollution levels being released in the air increasing daily, certain measures must be taken to protect ourselves and our homes. While Vancouver may have better air quality than that of neighbouring cities, many illnesses still exist due to improper monitoring and care for our living space. Air quality is defined by the Fraser Health as "the state of air around us" and it is up to us to understand how air quality, both indoors and outdoors, can impact our lifestyles. [1]

There are many respiratory related illnesses such as asthma, allergies, and lung fibrosis that can be caused by having too many pollutants in the air. Common house dust is unavoidable, but when the amounts of dust mites reach a certain concentration, vulnerable individuals have a higher risk of asthma, which can lead to an increase in allergic reactions to dust. With over 235 million people currently affected by asthma worldwide, there is a need for something to track and reduce the amount of dust in a home. [2] Humidity and temperature also play large roles in the accumulation of pollutants in our surroundings.

Although asthma cannot be cured, we believe that by monitoring the home air quality will assist many families with prevention against these illnesses. For many of us, the majority of our lives are spent indoors in locations such as schools, work offices, and homes. In these environments, poor ventilation, mold, dust, and pollution can all play a major role to our respiratory health and well being.

1.1 Motivation

The objective of *Clean Space* is to create a device that allows users to take control of pollutant levels in their living space by monitoring air intake areas and thus, prevent pollutants from entering their home in the first place. This idea was developed after our personal experiences of having to clean out dusty areas such as furnaces, PC towers, and other filtration devices. Furthermore, all our group members have experienced the discomfort of indoor facilities that had poor ventilation, which motivated us to work on a project to improve indoor health and comfort as a whole.

1.2 Functionality

The designed inputs and outputs of the HAM system are outlined in Figure 1. As displayed below, the Arduino YUN will be the processing microcontroller that controls and conducts necessary calculations. For the prototype, we used three sensors connected to the microcontroller, with all sensor outputs visible from the mobile phone.

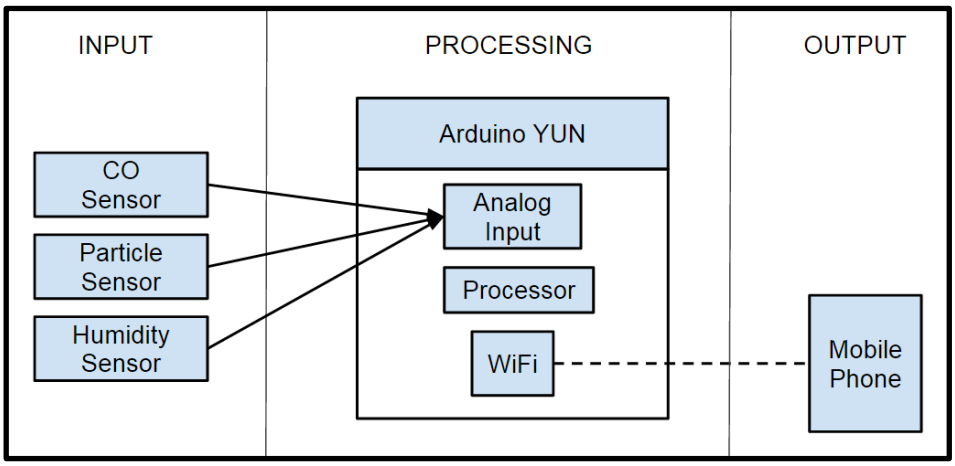

Figure 1: High level system diagram displaying communication for HAM

1.3 Project Modules

Development Stage 1:

24 Oct 14: Dust sensor is able to communicate with mobile application

17 Nov 14: Calibrate data from particle sensor, and work on mobile application functionality to display sensor data.

Development Stage 2:

22 Nov 14: Add carbon monoxide sensor to circuit, data can be displayed on app.

30 Nov 14: Add humidity and temperature sensor to circuit, data can be displayed.

Development Stage 3:

02 Dec 14: Complete project, and begin demo preparation.

1.4 Materials and Costs

In the beginning of the semester *Clean Space* received a total funding of $250 through the Engineering Student Society. While it was possible to apply for the Wighton fund at the end of the semester for outstanding purchases, it was desirable to keep our budget under $250 to meet our specifications of developing a cost effective system. The following table outlines the cost breakdown of materials that have been purchased.

Table 1.1: Cost breakdown of purchased materials

Quantity	Component	Total Cost
2	Sharp GP2Y1010AU0F (Optical Dust Sensor)	$21.56

1	Arduino Yun	$78.45
1	MQ 7 Carbon Monoxide Sensor	$11.70
1	RHT 03 Humidity/Temperature Sensor	$14.77
	PCB Materials	$33.46
	Case and other demo materials	$46.99

From the tables above, our approximate total spending is $206.93, with $43.07 remaining for demonstration preparation, and in the event any components fail before the presentation.

1.5 Schedule

At the start of the semester, we sat down together as a group to plan generally how much time we wanted to spend on each stage. The outline was followed for the majority of the first half, but adjustments needed to be made due to having a small group and the need for adding more complexity to our project after the Oral Progress Report. Our sensors were all incorporated by November 25th, while we concurrently worked on the software aspect until November 30th. Final integration, testing, and demo prep were completed from December 1st to December 10th. Overall, we spent more time on the hardware aspect than planned, but was able to catch up by spending less time on the integration, and by working on multiple aspects in parallel. On the next page, the darker colours below the first row on the timeline in *Figure 2* show actual time spent on each portion, and Gantt chart in *Figure 3* outline initial time goals we had for our entire project.

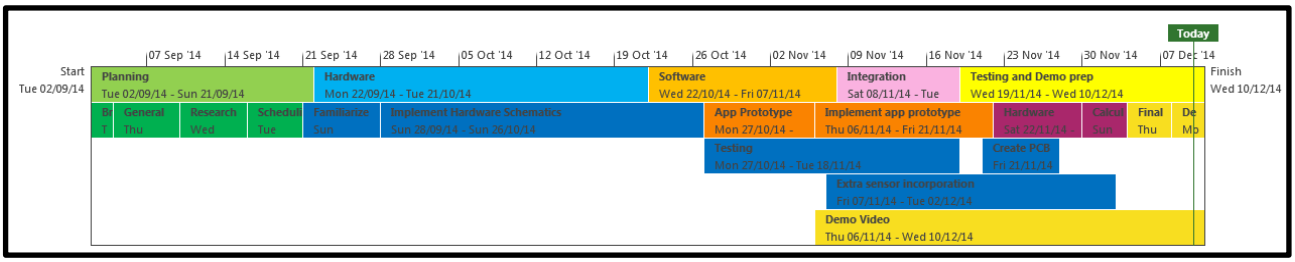

Figure 2: Timeline to summarize time spent on each portion of project.

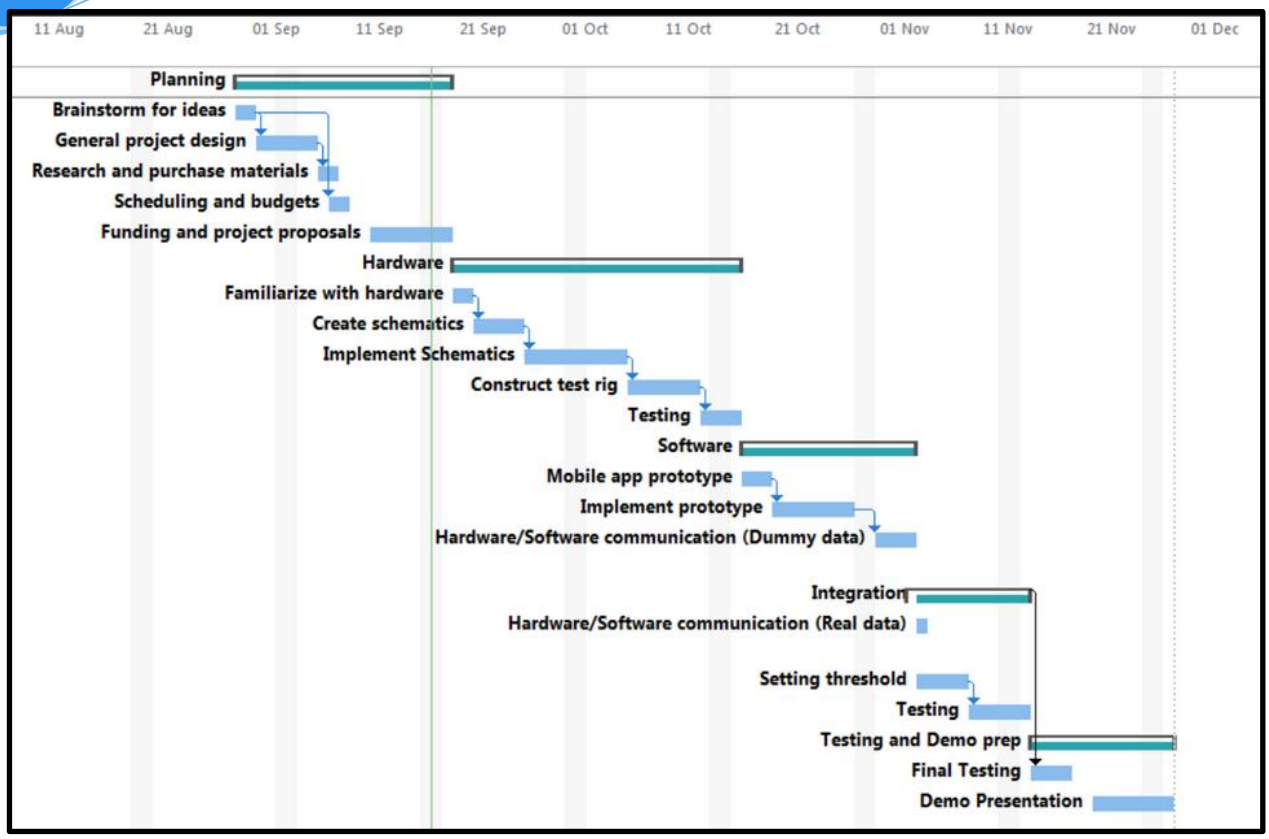

Figure 3: Gantt chart outlining timeline and planning for entire project.

2. Problems and Challenges

Losing member of group: In the beginning of the semester, we designed the project with four members in mind. Our fourth member attained an international Co-op position, and left our group during the first stage of development. This required some adjusting of time, and was a minor setback to our initial plans.

Addition of more sensors: After the Oral Progress Report, we decided that the project needed more complexity and added two sensors to the project. As our presentation was on November 7th, it only gave us one month to get the components, as well as incorporate them in our system. We resolved this by shifting our priorities to include the sensors instead of the testing and demo, and by clearly planning out our work so that parts could be done in parallel.

Arduino Wifi: When we first ordered the Arduino Yun, we did so for the built in Wifi capabilities. After working with it for a few days, we realized that the signal can be quite slow at times. The most trouble was around the end when all sensors were attached and

the Wifi was needed to return the data readings. We overcame this challenge by cleaning up the code and ensuring that the Wifi was only transmitted when necessary. The connection is not perfect, but will at least display the data consistently.

Creating the PCB: The most challenging part about the PCB was getting the initial image onto the board. From research, there were multiple techniques such as UV light transfer, heat and toner transfer, design pens, and much more. When we finally decided to use the UV method as it was supposed to be the most accurate, we faced a problem where the image did not seem to transfer at all. Due to time constraints, we opted to use the heat and toner transfer method, and was able to get a rough copper circuit. We used an iron to provide the heat to transferring the image, but had to play around with the heat settings before the ink actually stayed on the copper board. The cleanliness of the board was also a huge factor, and we had to attempt to transfer it three times before it was successful.

In order to etch the unnecessary copper away, we bought an etchant from RP Electronics. However, after speaking with several lab technicians, we were told that no labs in the school would be able to accommodate us making our PCB, and that we needed to make it at home. We ended up making the PCB in a group member's garage, and had to hand drill each of the holes for wiring, While this circuit functions for our needs, in the future we would like to try the UV method again to compare the results.

Humidity Sensor: When working with the RHT-03 sensor, we met a few frustrations with the data sheet not providing clear directions. After following several tutorials, the sensor was still not responding and we were unable to find the same problem online. We began to assume that the sensor was damaged, and had to contact the tech support from SparkFun for help. When they were not able to provide any advice, we were instructed to send it back to them for a replacement. However, after several more days of work on it, the power cycling seemed to activate the sensor and we were able to use our initial code to get a reading.

Ordering parts online: We intended to order all our hardware components online due to lower prices. With proper planning, and time management, we were able to get most of our parts on time for a decent price. However, we forgot to factor in high shippings costs from SparkFun, as well as custom fees of the parts. This cost us an additional $33, but luckily we had enough in budget to cover this.

3. Group Dynamics

Clean Space has been through an engaging four months over the course of this semester, with all members dedicating most of their free time to the project. There were very few times where a day went by without our members filling each other in with the progress of our tasks, or even just thinking about ways to improve the existing project. While we may have had different opinions at times, we were able to remain open minded and collaborated to solve the problems we encountered.

With only three members in our group, transparent communication and set goals were essential to ensure all work was covered. We completed our work in weekly sprint cycles, and had meetings twice a week; One in person for task breakdowns, and one online to discuss any problems we had.

Some skills that were required to complete our project include:

1. Software skills for programming the microcontroller, as well as mobile application
2. Hardware skills to design and construct test rig
3. Basic circuit construction skills
4. Understanding of air quality
5. Troubleshooting, debugging, and problem solving skills

Tasks were on a sign up basis, and while we tried to play to the strengths of our members, we also tried to allow everyone to experience all aspects of the project. Having basic knowledge of how other aspects of the project helped to solve conflicts when they arose. Having a smaller group was also helpful as it was easier to keep everyone in the loop.

4. Individual Learning Reflection

4.1 Elaine Chiang's Reflection

It has been an awarding four months to work on a project with two talented Engineers, who I started the program with in ENSC 100 five years ago. Joanne, Peterson, and I have not had very many classes together, and this project really gave us a chance to teach each other, as well as ourselves about the skills we have picked up over the years.
During this semester, I have gained valuable time management, task management, and organizational skills, as well as communication and technical collaboration with a small group. As the CEO for this company I was able to bring in leadership skills I have gained through work with the Canadian Forces, but most importantly, the knowledge of how to translate those leadership skills to a more technological work setting.

From the beginning of the project, I wanted this to be more than just a school course, and to create a product that I would be passionate to put work into. I feel that this project was a success because as we wrap things up, I am proud of the work we have done and the end product we have designed. A lesson I learned was that the development cycle is never perfect no matter how much planning and discussion is involved. Components not working as expected and code not behaving properly are always things that we should account more time for when planning. Another thing I wished we did was to have a better scope of the project early on, and decide if we needed more sensors before the last month of development. While we discussed the idea of adding complexity to the project in October, I should have taken the initiative to push it forward and actually implement it. Fortunately, our group was able to pull together and introduce the extra components at the end, but perhaps more could have been done with them had we had more time.

On the technical side, it was a great experience to finally work with an Arduino, and it has opened doors to a few ideas that I can develop in the future. It is one thing to do a lab for a course, but entirely different to design and make something work the way you intend. The details with working on electronics, and debugging skills I gained from the hardware as well as software are invaluable, and will be very useful in the future.

Overall, this was a great hands on experience, and has gotten me thinking about possibilities of other projects. I thoroughly enjoyed working with Peterson and Joanne, and hope to be able to collaborate again in the future.

4.2 Joanne Leong's Reflection

This project has been a great learning experience for me. During the project I was able to develop my time management and communication skills. As CFO of Clean Space, I was able to apply my co-op experience with time estimation and task management. Working with Elaine and Peterson has been a rewarding experience, as I have not had many opportunities to work with them in past courses. We were able to work around our course schedules and were able to plan out and execute the tasks necessary for the success of our project.

There were several learning curves that I had to overcome to help out with the project. I have not had much development experience using Java, and had no experience at all working on a mobile application. However with tips and pointers from my group members, I was able to quickly begin working on the programming aspect of the system. My main tasks for this project were working with the optical dust sensor, carbon monoxide sensor and mobile application development. The most difficult aspect of the project for me was

trying to create the network communication between the Arduino and mobile application, and getting the application to store sensor data to a file. Because we were all using different devices, I learned that we had to code to adapt with the different devices, and different permissions were necessary to access memory on android devices.

I also learned that keeping to a schedule is tricky. Other coursework needed to be balanced alongside this project and at one point, because I was unable to get the network communication working on time, it pushed some of our plans back a few days in order to get this crucial aspect of the system done. The amount of time that this project actually required was also due to a number of unforeseen circumstances that came up during the semester. Testing and debugging were time consuming tasks that were necessary for the success of our system. The addition of two more sensors to our system required us to use time from our testing period to incorporate the sensors to our hardware and I had to spend additional time learning about the new sensors and incorporating the carbon monoxide sensor to our system and adding it's information in the mobile application.

Overall I felt that this project was a great experience. I learned a lot of things, from dust pollution to writing code to start networked communication between devices. Elaine and Peterson are great engineers and as team members, were encouraging, hardworking and essential to the success of Clean Space. I would definitely work with Elaine and Peterson again on future endeavours.

4.3 Peterson Poon's Reflection

In deciding on the proposal for our capstone project, we wanted to do something that is beneficial to our health and safety, which lead us to create a company called Clean Space and the Home Air Monitor product to monitor indoor dust levels in filtration devices. Working on the Home Air Monitor for the past four months with Elaine and Joanne has been a rewarding experience allowing us to simulate a startup company and introducing a product for potential investors. As the COO of Clean Space, I was able to apply skills that I have learnt over the past four years in school to this project while picking up new skills along the way.

My main focus on the project was the graphical diagrams and the hardware functionality of the Home Air Monitor. Working with an Arduino Yun and the different sensors has allowed me to apply the skills that I have gained from previous circuitry and system design courses. I am now more confident in setting up a piece of hardware given the datasheet and the operating specifications. In addition to hardware, I have also worked on the graphics for

the documentations using sketchup to provide 3D diagrams of our product. Overall, I've learnt that designing a completely new product is no easy task, and there are many aspects of a project with different skill requirements. My group and I have covered most of the areas and we were able to troubleshoot any problems that we encountered.

One of the main lessons I've learned in dealing with a capstone project is to never underestimate the amount of time needed to properly plan the whole scope of the project. If we were able to identify the complexity issue at an earlier time, we would have been able to allocate more time in the beginning of the semester to research. Integration of the hardware and software was also one of the main issue where we underestimated the amount of time needed.

Aside from technical skills, I enjoyed working with Elaine and Joanne who are both exceptional group members, they are both dependable and contributed immensely to the success of our project. Elaine has been an active team leader and was able to initiate a lot of the work and documentations of our project. She was able to keep us on track by organizing weekly sprint meetings and allowed us to complete the task in very tight deadlines. As for my second group member, Joanne has provided valuable feedback and contribution to both the hardware and software aspect of the project. As a group, I believe we have a great deal of trust and understanding for each other and it is one of the strengths we have, allowing us to work effectively and complete our tasks on time. I am fortunate to be able to work with these two outstanding engineers and will definitely consider working with them again in the future.

4.4 Workload Distribution

Table 4.1: Work Distribution chart

High-Level Task	Elaine	Joanne	Peterson
Documentation Writing	XX	X	X
Documentation Planning	XX	X	X
Documentation Editing	X	XX	X
Mechanical Design	X	XX	XX
Mechanical Work	X	XX	X

Circuit Design	X	X	X
PCB Creation (Printing, soldering, testing)	XX	X	X
Sensor Research	X	X	XX
Arduino To Use Sensors	X	XX	XX
Mobile Application Design (Includes prototype)	XX	X	X
Mobile Application Implementation	XX	XX	X
Testing	X	X	XX
Administrative tasks	X	X	X
Purchasing parts, Budgeting	X	X	X

X = some or equal responsibility
XX = Primary responsibility

Note: Mechanical design included drafting of test rig and creating imagery with measurements for packaging the entire project.

5. Conclusion

Clean Space has successfully created an economical and compact device that can work to improve the indoor health of our users. Currently, the Home Air Monitor is able to detect the particle level, humidity, temperature, and amount of carbon monoxide inside a living space, and can provide alerts to the user when the surroundings become non ideal. We have collaborated well as a group, and have met all our timeline and personal goals.

While we believe that this product would be successful on the market, more work needs to be done to improve data storage, as well as the user interface. If this were to be put on a larger scale, a more secure back end or server will need to be implemented, and code would have to be altered for the Arduino to connect to the backend as opposed to the mobile phone. This way, our data will be more secure, and the graphing can be more accurate. Furthermore, if we had time, we would have liked to expand the functionalities for the mobile application to include a camera, and more accurate calculations of sensor data based on the sample area. Incorporation of other sensors such as an area survey

sensor, or a webcam sensor would enhance the features and calculations for air quality done by the application. Based on the time we had, the prototype was extremely successful since we met our goal of creating an economical and functional device, which cost under $200 with spare parts.

6. Meeting Minutes and Sprint Planning

6.1 Meeting Minutes

02 Sept 14 Meeting Minutes - Project Topic Planning
10:20 Meeting commences

Members present at meeting:
Joanne Leong
Peterson Poon
Janice Mardjuki
Elaine Chiang

Purpose of meeting was to brainstorm project fields we want to create something for. A product for health and safety sector was agreed on.

Potential project topics:

1. Sound cancelling device (For inside MRI or CT Scans)
    a. More research needs to be done to see if we can cancel noise without interfering with scans.
    b. Original idea from "Sono" prototype design to stick device on window and filter out street sound.
2. Food Safe Alerts
    a. Have alerts in kitchen when food safe is not practiced. (Temperatures of food, cleanliness, amount of time food is sitting out)
3. IFit band modifications
    a. Add more features including GPS signals and alerts to turn left or right through vibrations
    b. Add glasses? For maps?
    c. Voice detector? To choose which path you want?
4. Air Purification Alert
    a. To be attached to air filters at home to signify when it becomes too dusty. (Need to look into how that can be done)
    b. Potential alert on phone?

   c. Use Laser particle counters? (They are super expensive)
5. Dust Home Safety
   a. Focus on 3 features (Vacuum, air filters, laundry dryer filter) and all provide alerts on phone when dust levels are too high.
6. Roomba Blueprint Mapper
   a. Let roomba roll and create a map of the building
7. Smoking Alert
   a. When smokers smoke too close to a restaurant or building door, the alert will sound and purify the air around the door.
   b. Smoke detector

Decided to have one online meeting (Time TBD), and one in person meeting (Tuesdays at 1030) weekly. Compared schedules to find meeting and work times. At the moment we will have Mondays to end a sprint, and Tuesdays to start a new sprint.

1200 Meeting commenced

09 Sept 14 Meeting Minutes

Meeting start time: 1030

Attendees:
Janice
Elaine
Peterson
Joanne

Topics Discussed:

1. Project topic decided to be air filter notifier. We will develop a sensor that connects to an arduino computer that compares the amount of dust to a threshold. When the threshold is reached, the chip will send an alert to our Android phone app that will remind the user to change the filter soon.

2. We want to make this sensor as versatile as possible so that we can use it for other locations such as inside a PC, in a ventilation system, or in an air purifier. In that sense, we want to keep costs low, and make sure the sensor and hardware part is small. Our app would also have to allow adding more sensors, and a way to connect the sensor to our phone.

3. Formal group planning meetings will happen weekly on Tuesday after 1030 class to do task breakdowns and to cover any problems our team encountered. We are aiming to finish each sprint of work on the Monday before the Tuesday meeting.

4. Did the breakdown of work for the remainder of the semester. 13 weeks total with 1 week for research, 5 weeks for hardware development, 3 weeks for software development, 2 weeks for testing, 2 weeks for demo prep and documentation.

5. For Week 1 (09 Sept 14 - 15 Sept 14) we will complete the following:
    a. Set up environments (SVN, github, ecllipse, android development platform) (All responsible to set up their own environments, Peterson to do SVN set up)
    b. Start MS Project (Everyone to familiarize themselves with the program
    c. Research and budget the parts we need to use (Arduino, sensor, etc.)
        i. Have this done by Friday so that we can purchase over the weekend
    d. Start proposal (Everyone to add to the purpose of project, Joanne to start a file)
    e. Research Arduino for data sheets, the air monitor sensor for any more details.

Next meeting to be 12 Sept 14 (Friday) to submit budget sheet
Meeting end time: 1230

12 Sept 14 Meeting Minutes

Attendees:
Janice, Peterson, Elaine, Joanne

Meeting begins: 1540

Discussion topics:

1. Follow up on budget research for hardware parts
2. Breakdown of tasks and assignments for Sprint 1 (12 Sept 14 - 22 Sept 14) Decided on longer sprint as it is first week and we may need adjustment time.

Tasks, deadline and assignment for Sprint 1:

Category	Task	Due Date	Assigned to

Hardware Decision	Decide on what hardware to use (Arduino, sensors)	13 Sept 14	All
Hardware Decision	Buy hardware materials	14 Sept 14	Elaine
Hardware Decision	Read spec sheets for hardware we will be using. (Compile google doc)	14 Sept 14	All
Project Set up	Set up environments at home (Ecllipse, android bundle)	17 Sept 14	All
Project Set up	Set up git hub account & connect to Peterson's project	17 Sept 14	All
Research	Research how Arduino connects to mobile android app	19 Sept 14	All
Brainstorm	NAME?!?!	15 Sept 14	All
Project Proposal	1. Introduction 2. Background 3. System Overview 4. Possible Design Solutions 5. Proposed Design Solutions 6. Sources of Information 7. Budget and Funding 8. Schedule 9. Company Profile 10. Conclusion	21 Sept 14	1. Joanne 2. Joanne 3. (Should break down between members) 4. Elaine 5. Peterson 6. Elaine 7. All 8. Elaine 9. Elaine 10. All
Mobile App	App Design & Simple prototype	22 Sept 14	Elaine
Mobile App	Skeleton of app project on git hub	21 Sept 14	?
Funding	Funding Proposal	22 Sept 14	Elaine & Joanne
Schematic	Draw Schematic for sensor, bread board, Arduino	19 Sept 14	?

Decided halfway point of project will be when Hardware can send some form of data to mobile app for display. Halfway point for our project will be 24 Oct 14.

Meeting ends: 1700

22 Sept 14 Meeting Minutes

Attendees:
Elaine
Joanne
Peterson

Meeting commenced: 1600

Topics of discussion:

1. Sprint 1 completion and reflection
2. General idea of work for sprint 2
3. Funding proposal discussions

Sprint 1 completion and reflection:

- worked well together, good division of tasks
- All tasks we set out to do were complete
- Funding proposal submitted, oral presentation on 23 Sept 14 at 1850
- Arduino YUN has arrived from shipping

General idea of work for sprint 2:

- Starting hardware components
- Research and understanding of arduino and sensor
- Drawing schematics to show connections
- Try to connect arduino to a wifi network

Funding proposal discussion:

- Details will be discussed at group meeting tomorrow before we plan for sprint 2
- Need to outline why the equipment is necessary
- 5 minute demo, 5 minutes for questions
- Poster/flip chart paper to show table of costs and need
- Elaine to bring cue cards for notes

Team meeting tomorrow to discuss sprint 2 and plan funding proposal. Meeting at 1630 to 1830 before oral presentation to ESSS for funding.

Meeting ended: 1645

23 Sept 14 Meeting Minutes

Attendees:
Elaine
Joanne
Peterson

Meeting commenced: 1620

Topics to discuss:

1. Funding Proposal
2. Sprint 2 task breakdown

Funding Proposal:

- Completed power point presentation
- Rehearsed parts
- Discovered additional cost of battery source

Sprint 2 Task Breakdown

- Sprint 2 is from 23 Sept 14 to 29 Sept 14

Category	Task	Additional Details	Due Date
Arduino	Read Arduino YUN spec sheets	• Figure out connecting ports we need • Power needed at each port	25 Sept 14
Sensor	Read Sensor spec sheets	• Compile google doc with essential details	25 Sept 14
Arduino	Connect it to Wifi	• Find most convenient way to connect • Test connection to a wifi source	27 Sept 14
Planning	Draw Spec sheets	• Show how Arduino and sensor connect	28 Sept 14
App	Keep editing fluid ui to	• Do it	29 Sept 14

	figure out functional specs		

Next meeting will be Friday morning.
Meeting ended : 1740

30 Sept 14 Meeting Minutes

Attendees:
Joanne, Peterson, Elaine

Topics to be discussed:

1) Outstanding items from Sprint 2
2) Goal for Sprint 3
3) Task breakdown for sprint 3

Meeting commenced: 1330

1) No items outstanding, the task to research the Sensor was not really needed as there was not much to read about. Also, it was covered in the schematics task.
    a) Potential task for sprint 3 to put schematic in LT spice
    b) Be more thorough in task breakdown so we don't have repeated tasks
2) Hardware focus have arduino and sensor connected and demonstrate some communication.
    a) All hardware that we think is needed has arrived
    b) Start implementing schematic on circuit board
    c) Look into timings of sensor so that we can implement next sprint
    d) Functionality specs doc due Oct 13
    e) Start planning for test rig

3) Task Breakdown Sprint 3- 30 Sept 14 to 06 Oct 14

Category	**Task**	**Completion Criteria**	**Time Estimate (Days)**	**Due Date**
Proposal	Start skeleton for funding spec	Google doc is created with proper headings	0.25	01 Oct 14

	Fill in functionality specs of hardware	FIll in hardware details	1	03 Oct 14
	Fill in functionality specs of software	Fill in software details	1	05 Oct 14
	Proofreading and formatting	Export to dropbox doc and do formatting	1	06 Oct 14
Schematic	Better schematic format	Put the schematic on LT spice	0.5	02 Oct 14
Implement schematic	Build circuit	All wiring is clean	1	We need to decide on a day to go lab
	Test circuit	Set up a text file for sensor to dump data in Check text files to make sure data is comprehensible	1.5	06 Oct 14
Test Rig	Make plan for construction of demo test rig	Google doc showing equipment needed and what we are building	0.5	04 Oct 14
	Make general test cases	Test cases for hardware and software that should pass for each step. Google doc	1	05 Oct 14
Timings	Look into LED pulse timings of sensor	Data sheets only show density diagram, need to figure out if we need to do our own calculations to get a value	0.5	06 Oct 14

- Decided next week sprint will be longer due to Thanksgiving
- Will try to finish functionality specs earlier so that we have time to test and change things if necessary after building circuit

Meeting ended: 1430

06 Oct 14 Meeting Minutes

Attendees:
Joanne, Elaine, Peterson

Meeting commenced: 2000

Topics to discuss:

1) Leftover tasks from sprint 3
2) New timeline
3) Next sprint planning

1) Things left to do
    a) Finish functional specs:
        i) Software requirements (labels)
        ii) Hardware requirements (labels)
        iii) Test plan
        iv) Test rig design (Decided to add this to functional spec if possible)
        v) Formating
    b) Look up timings for LED pin

2)
    a) Finish functional specs for Wednesday to allow time for formatting. New sprint planning for Thursday.
    b) Meet on Tuesday (07 Oct 14) to work on sensor sending information to a file on Arduino.

3) Ideas for next sprint:
    a) Mobile app design and implementation
    b) Implement different pages (navigations between pages)
    c) App icon
    d) Look into communications with android and wifi

Next meeting: Thursday 09 Oct 14 to plan next sprint.

Meeting ended: 2050

10 Oct 14 Meeting Minutes

Attendees : Joanne, Peterson, Elaine
Meeting commenced: 1700

Topics to discuss:

1. Leftover tasks from Sprint 3
2. Sprint 4 planning

1. Leftover Tasks from Sprint 3
    - Functional Specifications just need formatting (Page numbers and editing table of contents) and submit (Joanne)
    - Have not been able to display sensor data on PC yet

2. Sprint 4 planning:

This sprint will be from : 10 Oct 14 - 20 Oct 14

Category	**Task**	**Completion Criteria**	**Time Estimate**	**Deadline**
Functional Spec	Finish edit and submit	Submitted	0.5	12 Oct 14
Arduino	Get sensor data to actually display on PC	-Sensor data is accessible on PC	3	14 Oct 14
Demo	Research/document/ FIeld Trip test rig	- Google doc on what we need to buy for making test rig -schematic for what test rig looks like (includes dimensions)	2	13 Oct 14
Hardware Enclosure	Research/ Document hardware casing	- Google doc on what dimension of case we need to buy -Find where to buy it	2	13 Oct 14
App	Make BLANK Main	-3 pages exist with proper	1	14 Oct

	page, Details page, Edit Page with navigation	titles and can be navigated back and forth to -Tested on phones/emulator		14
	Make app icon the cleanspace logo	-App icon shows on our phones as logo	0.5	15 Oct 14
	Make "holder" text fields for main page, details page, edit page (Just so we know where text goes)	Dummy test fields match fluidui designs: https://www.fluidui.com/editor/live/	1	16 Oct 14
	Research communication between wifi and mobile devices (Keep working on this if time permits, find examples)	Google doc on findings	2	18 Oct 14

Meeting ended : 1800

17 Oct 14 Meeting Minutes

Attendees: Peterson, Joanne, Elaine

Meeting commenced: 1230

<u>Topics to be discussed:</u>

- Test rig design
- Hardware system casing

<u>Hardware System casing:</u>

- Purchase the larger Arduino YUN case so that all our components can go in it
    - Peterson has drawn out a schematic here: https://docs.google.com/document/d/1OdBE35IEIlL0v9ZUdH7ZEVB0XfIrHu932ifAu0y1DPg/edit
- We need to get the prong to solder our wires to from Ash

- Also need to look into size of PCB (This will be a future thing, after we do our prototype, the PCB size will be determined by the size of the Arduino case)
- To separate the bottom of PCB and the Arduino, we will tape the bottom with electric tape

Test Rig Design:

- Dependent on size of filter
- Make a clear tunnel to have air run through it
- Buying acrylic sheets that will bend to fit the filter
- Potential in using flour to simulate dust particles
- Maybe buy sucky cheap filters for testing, and if it works the way we want it to, get the more expensive ones

Things we need to look into buying:

Hardware:

- Hardware Casing (Peterson has this in budget sheet already)
- Copper board / chemicals to make PCB
- Prongs to solder with

Test Rig:

- Acrylic sheets
- Filters
- Some cushioning to go between the filter and acrylic to seal the gap.

Idea for communication between app and Yun:

For testing purposes, we can set up buttons on app to hit the local.arduino server and turn on/off the sensor, then get the data.

Decided that we will not purchase PCB and casing until we do our Oral presentation to get some feedback. Will focus on software and hardware communication for now.

Meeting ended:
1330

20 Oct 14 Meeting Minutes

Attendees:
Joanne, Peterson, Elaine

Topics to be discussed:

1) Outstanding items from Sprint 4
2) Goal for Sprint 5
3) Task breakdown for sprint 5

Meeting commenced: 2130

1) No outstanding items from Sprint 4! Will continue to look into communication between arduino and phone though, since no decisions have been made.
2) Communication between sensor and app (Does not matter what at this point)
3) Task breakdown for 21 Oct 14 - 27 Oct 14

Category	**Task**	**Completion Criteria**	**Time Estimate (Days)**	**Due Date**
Communication	Decide what is necessary to implement in order for phone and sensor to communicate	-Communicated and agreed on by group that those things need to be done	0.5	22 Oct 14
	Prototype/test setting up TCP on Arduino	Google doc on how it is done, and how to recreate if necessary	1	22 Oct 14
	Test communication with dummy data	Getting the phone app to retrieve dummy data from sensor	1	24 Oct 14
	Have app actually get different data from the sensor	Data on phone changes when refreshed	2	25 Oct 14
Oral Progress Report	Doc to show what each person has done	Go through sprint task sign ups and note who has done what in a google doc	0.5	26 Oct 14
Design Spec Report	Google doc with headings for design spec	References the rubric	0.5	27 Oct 14
	Read the rubric	...read it	0.5	27 Oct

				14

Meeting Ended: 2230

28 Oct 14 Meeting Minutes

Attended: Peterson, Elaine, Joanne

Meeting commenced: 1015

Topics to be covered:

1) Leftover work from Sprint 5, and talk about what work has been done
2) Planning for next sprint
3) Oral Progress discussion

1) Communication between Arduino and mobile application
    a) Things that have been done:
        i) Created testing button on app so that clicking it creates a socket and tries to connect to TCP server
        ii) TCP server is created, works when you have Arduino somewhere and telnet to communicate
        iii) Currently pressing the button is supposed to update the text field in Android to say “Testing connection” (It does not right now)
    b) Need to:
        i) Get sockets working…
        ii) Look at example of socket communication on Arduino forum

2) Mainly focussing on design specification, along with getting socket to work.

Category	**Task**	**Completion Criteria**	**Time Estimate (Days)**	**Due Date**
Communication	Get sockets to work	Any proof of connection from Arduino to Android	3	31 Oct 14

Design Spec	Write the intro and abstract		0.5	29 Oct 14
	Make wireframe of the app	Use fluidui to display navigating around the app	0.25	29 Oct 14
	Make/ copy all the diagrams of our hardware	-Use the 2 from functional spec -Add dimensions on diagrams (large numbers)	0.5	30 Oct 14
	Make diagram for test tunnel	-Use dimensions, and potential material	1	30 Oct 14
	System Overview	-Write dem overviews.	1	31 Oct 14
	Hardware Sensor System specifications	-Add LT spice diagrams	1	31 Oct 14
	Wireless Communication Specifications		1	1 Nov 14
	Mobile Application specifications		0.5	1 Nov 14
	Microcontroller specifications		0.5	1 Nov 14
	Power Unit Specification		0.5	2 Nov 14
	Test Plan	Unit and system test plans	1	2 Nov 14
	Conclusion		0.5	2 Nov 14
	References and Formatting	Page numbers, headers, footers	1	3 Nov 14

3) Date of presentation is on 31 Oct 14, but Joanne has a Midterm, we are going to try to have it moved.

a) We have gone over the oral report content, and have split up the parts https://docs.google.com/document/d/1jEy-lznf3eacG1TUsDFWdQPJBi247pZab0Bel4aU6x0/edit

Meeting ended : 1115

05 Nov 14 Meeting Minutes

Attendees: Joanne, Peterson, Elaine

Meeting commenced: 1335

Topics to cover:

1. Leftover items from Sprint 6
2. Goals for Sprint 7
3. Upcoming goals/deadlines
4. Sprint 7 breakdown

1. Leftover items:
    a. Minor formatting for Design specifications and then submit. Should be complete by end of day
2. Goals for Sprint 7:
    a. Purchase clear case for hardware
    b. Buy PCB materials and make it
    c. Create algorithm to calculate threshold given certain area
    d. Change IP of Arduino to dynamic
    e. Mobile application work
        i. Overall look and feel of app
        ii. refresh button on details page to update status of filter
    f. Test motor to see if it will be compatible with our system
3. Upcoming Goals/deadlines
    a. No more written reports
    b. Oral Progress report is this Friday 4:50
        i. Practice parts on our own time, get together to rehearse once at 4:20 after Joanne's class
4. Sprint timeline will be from 05 Nov 14 until 11 Nov 14

Category	Task	Completion Criteria	Time Estimate (Days)	Due Date
Design Spec	Finish formatting and Submit	It is submitted	0.5	05 Nov 14
Algorithm	Research/Test appropriate thresholds	Documentation on numbers to aim for, and when to turn on alert?	1	06 Nov 14
Algorithm	Create algorithm to calculate threshold based on given area	Changing area to be monitored will change threshold level accordingly. When particle count surpasses threshold, the count will be returned in red	3	09 Nov 14
PCB	Research and buy PCB materials	Document what is needed to create PCB, buy materials for it.	1.5	06 Nov 14
Research and buy	Clear Hardware case, short micro USB cable, Test tunnel materials (Filter, clear acrylic,	-Purchase these materials	1	10 Nov 14
App	Apply general look and feel of app	Follow FluidUI designs	2	11 Nov 14

Meeting ended : 1420

11 Nov 14 Meeting Minutes

Attendees: Joanne, Elaine, Peterson

Meeting Commenced: 1530

Topics to Cover:

1. Leftover tasks from Sprint 7
2. Plans for Sprint 8
3. New Sensors for Sprint 9

1. Leftover items:
    a. Application data save file
    b. Purchasing parts
        - carbon monoxide detector
        - humidity sensor
        - test rig components
    c. Remove hard-coded components of application
2. Tasks for Sprint 8, scheduled for 12 Nov 14 to 18 Nov 14
    a. Work on the Application
        - Sensor Data
        - Save Sensor details(name, sample area etc) on device
        - Save Sensor Data (measured values) on device
    b. Read Data Sheets for new Sensors

Category	Task	Completion Criteria	Time Estimate (Days)	Due Date
Research	Read data sheets for new sensors		1	14 Nov 14
Parts	Purchase/ look into rig parts		2	14 Nov 14

Application	Acquire Sensor Data	Real Sensor Data shows up on the phone application	2	15 Nov 14
	Save Sensor Details on Device	Sensor Details can be saved on and retrieved from phone	2	16 Nov 14
	Save Sensor Data to Device	Sensor Data can be saved to a file on the phone	3	17 Nov 14
	Full App Functionality	Working App	2	18 Nov 14

Meeting Ended: 1650

18 Nov 14 Meeting Minutes

Attendees: Peterson, Joanne, Elaine

Meeting Commenced: 1040

Topics to discuss:

1. Leftover items from Sprint 8
2. Things to do for demo
3. Sprint 9 planning

1. No leftover items from Sprint 8, Peterson will push code to have app and sensor communication tonight.
2.
    a. Video
        i. Write out background and introduction for filming
        ii. Shots of construction and individual components and working on project
        iii. Complete project shot with user case scenario
        iv. App functionality clips
    b. Powerpoint

i. Use Funding proposal slideshow, make modifications
ii. Add more diagrams and images

c. Post Mortem
   i. Start writing down notes for problems we encounter
d. Test Plan
   i. Grab from design specs and modify

3. 18 Nov 14 - 24 Nov 14

Category	**Task**	**Completion Criteria**	**Time Estimate (Days)**	**Due Date**
Demo	Type out background/intro for talking parts	Have speaking parts ready for filming	1	22 Nov 14
App	Clean up code	Ready for new sensors to be added	1	20 Nov 14
Sensors	Get CO sensor on breadboard and connect to arduino	CO Sensor returns data to Arduino	2	22 Nov 14
	Get humidity sensor on breadboard, connect to arduino	Humidity sensor returns data to Arduino	2	22 Nov 14
	CO Sensor to display data on app	App can display CO data, saves to a new file under sensor folder	1	24 Nov 14
	Humidity and temp	App can display humidity and temp data, saves to a new file under sensor folder	1	25 Nov 14
Post Mortem	Start Post Mortem Doc	Create google doc, start writing down problems we have encountered	0.5	25 Nov 14
Test Plans Doc	Start Google Doc	Pull test plan from	1	26 Nov 14

		functional spec, make mods		
Demo	Film intro/background of project	Film it	1	22 Nov 14

Will be meeting on Saturday 22 Nov 14 to work on sensor connections.

Meeting ended 1120.

25 Nov 14 Meeting Minutes

Attendees: Peterson, Joanne, Elaine

Meeting commenced 1020

Topics to discuss:

1. Leftover work from Sprint 9
2. Sprint 10 planning
3. Demo prep

1. Leftover from Sprint 9:
    a. Humidity/Temp sensor connectivity, the app is ready to add a thread for communication
    b. Test document complete, Post mortem 50%
2. Sprint 10 tasks:

Sprint 10 from 25 Nov 14 - 02 Dec 14

Category	**Tasks**	**Completion Criteria**	**Time Estimate**	**Due Date**
PCB	Make LT Spice diagram with all sensor connections	Lt Spice is ready for printing	1	30 Nov 14
PCB	Make PCB	PCB with soldered elements exists.	1	1 Dec 14
Sensor	Humidity/Temp	Get feedback from sensor	3	28 Nov

	sensor connectivity			14
Sensor	Display Humidity/ Temp data on app	App updates humidity details with other sensors, writes to file	0.5	29 Nov 14
App	App to poll for sensor data in background	Background service exists with polling to sensor at certain time intervals Notification status alerts user when status is bad	1	27 Nov 14
	Button to have red background when status is bad	Button turns red appropriately, grey when fixed	0.5	26 Nov 14
Test Rig	Make test rig	Drill holes for exhaust and intake, Ready for testing	1	2 Dec 14
App	Debug/Testing for crashes	Pressing back in editActivity doesn't crash	0.5	28 Nov 14
Demo	Work on Video		1	29 Nov 14
Test Doc	Submit the Test doc	..do it	0.001	26 Nov 14

3. Demo Prep
    a. Filming early next week to get footage in
    b. Start slideshow after project is working
    c. Still need to put together all the pieces of hardware

6.2 Sprint Breakdown and Printing

Sprint 1 Task Breakdown

Category	Task	Due Date	Assigned to	Complete
Hardware Decision	Decide on what hardware to use (Arduino, sensors)	13 Sept 14	All	X
Hardware Decision	Buy hardware materials	14 Sept 14	Elaine	X

Hardware Decision	Read spec sheets for hardware we will be using. (Compile google doc)	14 Sept 14	All	X
Project Set up	Set up environments at home (Ecllipse, android bundle)	17 Sept 14	All	X
Project Set up	Set up git hub account & connect to Peterson's project	17 Sept 14	All	X
Research	Research how Arduino connects to mobile android app	19 Sept 14	Joanne	X
Brainstorm	NAME?!?!	15 Sept 14	All	X
Project Proposal	1. Introduction 2. Background 3. System Overview 4. Possible Design Solutions 5. Proposed Design Solutions 6. Sources of Information 7. Budget and Funding 8. Schedule 9. Company Profile 10. Conclusion	21 Sept 14	1. Joanne 2. Joanne 3. (Should break down between members) 4. Elaine 5. Peterson 6. Elaine 7. Elaine 8. Elaine 9. Peterson 10. ?	X
Mobile App	App Design & Simple prototype	22 Sept 14	Elaine	X
Mobile App	Skeleton of app project on git hub	21 Sept 14	Elaine	X
Funding	Funding Proposal	22 Sept 14	Joanne & Elaine	X
Schematic	Draw Schematic for sensor, bread board, Arduino	19 Sept 14	All	X

Sprint 2 Task Breakdown:

Category	Task	Additional Details	Assigned	Due Date	Done
Arduino	Read Arduino YUN spec sheets	• Figure out connecting ports we need • Power needed at each	Elaine	25 Sept 14	X

		port			
Sensor	Read Sensor spec sheets	• Compile google doc with essential details		25 Sept 14	X
Arduino	Connect it to Wifi	• Find most convenient way to connect • Test connection to a wifi source	Elaine	27 Sept 14	X
Planning	Draw Spec sheets	• Show how Arduino and sensor connect	Joanne	28 Sept 14	X
App	Keep editing fluid ui to figure out functional specs		Elaine	29 Sept 14	X

Sprint 3 Task Breakdown

Category	**Task**	**Completion Criteria**	**Time Estimate (Days)**	**Due Date**	**Assigned to**	**Done**
Proposal	Start skeleton for funding spec	Google doc is created with proper headings	0.25	01 Oct 14	Elaine	X
	General requirements	Google doc to fill in general requirements of whole system	1	03 Oct 14	Elaine	X
	Fill in functionality specs of hardware	FIll in hardware requirements	1	03 Oct 14	Joanne	X
	Fill in functionality specs of software	Fill in software requirements	0.5	04 Oct 14	Peterson	X
	Introduction and Executive summary	Could be quite similar to project proposal	1	04 Oct 14	Elaine	X

	Write System test plan	Test cases for hardware and software	1	05 Oct 14	Peterson	X
	Proofreading and formatting	Export to dropbox doc and do formatting, table of contents, list of figures	1	06 Oct 14	Elaine	X
Schematic	Better schematic format	Put the schematic on LT spice	0.5	02 Oct 14	Joanne	X
Implement schematic	Build circuit	All wiring is clean	0.5	02 Oct 14	All	X
	Write code to show sensor is connected	Be able to show if sensor is connected	0.5	03 Oct 14	All	X
	Test circuit	Set up a text file for sensor to dump data in Check text files to make sure data is comprehensible	1.5	06 Oct 14	All	X
Test Rig	Make plan for construction of demo test rig	Google doc showing equipment needed and what we are building	0.5	04 Oct 14	Peterson	X
Timings	Look into LED pulse timings of sensor, or figure out what to do with 3rd pin on sensor	Data sheets only show density diagram, need to figure out if we need to do our own calculations to get a value	0.5	06 Oct 14		X

Sprint 4 Task Breakdown

Category	Task	Completion Criteria	Time	Deadline	Assigned to	Done

Functional Spec	Finish edit and submit	Submitted	0.5	12 Oct 14	All	X
Arduino	Get sensor data to actually display on PC	-Sensor data is accessible on PC	3	14 Oct 14	Joanne	X
Demo	Research/document/ FIeld Trip test rig	- Google doc on what we need to buy for making test rig -schematic for what test rig looks like (includes dimensions)	2	15 Oct 14	Peterson	X
Hardware Enclosure	Research/ Document hardware casing	- Google doc on what dimension of case we need to buy -Find where to buy it	2	15 Oct 14	Peterson	X
App	Make BLANK Main page, Details page, Edit Page with navigation	-3 pages exist with proper titles and can be navigated back and forth to -Tested on phones/emulator	1	14 Oct 14	Elaine	X
	Make app icon the cleanspace logo	-App icon shows on our phones as logo	0.5	15 Oct 14	Elaine	X
	Make “holder” text fields for main page, details page, edit page (Just so we know where text goes)	Dummy test fields match fluidui designs: https://www.fluidui.com/editor/live/	1	16 Oct 14	Elaine	X
	Research communication between wifi and mobile devices (Keep working on this if time permits, find examples)	Google doc on findings	2	18 Oct 14	Joanne	X

Sprint 5 Task Breakdown

Category	Task	Completion Criteria	Time Estimate (Days)	Due Date	Assigned to	Done
Communication	Decide what is necessary to implement in order for phone and sensor to communicate	-Communicated and agreed on by group that those things need to be done	0.5	22 Oct 14	Peterson	X
	Prototype/test setting up TCP on Arduino	Google doc on how it is done, and how to recreate if necessary	1	22 Oct 14	Peterson	X
	Test communication with dummy data	Getting the phone app to retrieve dummy data from sensor	1	24 Oct 14	Joanne	X
	Have app actually get different data from the sensor	Data on phone changes when refreshed	2	25 Oct 14	Joanne	X
Oral Progress Report	Doc to show what each person has done	Go through sprint task sign ups and note who has done what in a google doc	0.5	26 Oct 14	Elaine	X
Design Spec Report	Google doc with headings for design spec	References the rubric	0.5	27 Oct 14	Elaine	X
	Read the rubric	...read it	0.5	27 Oct 14	Errbody	X

Sprint 6 Task Breakdown

Category	Task	Completion Criteria	Time Estimate (Days)	Due Date	Assigned to	Done
Communication	Get sockets to work	Any proof of connection from Arduino to Android	3	31 Oct 14	All	X
Design Spec	Write the intro and abstract		0.5	29 Oct 14	Elaine	X
	Make wireframe	Use fluidui to display	0.25	29 Oct	Elaine	X

	of the app	navigating around the app		14		
	Make/ copy all the diagrams of our hardware	-Use the 2 from functional spec -Add dimensions on diagrams (large numbers)	0.5	30 Oct 14	Peterson	X
	Make diagram for test tunnel	-Use dimensions, and potential material	1	30 Oct 14	Peterson	X
	System Overview	-Write dem overviews.	1	31 Oct 14	Elaine	X
	Hardware Sensor System specifications	-Add LT spice diagrams	1	31 Oct 14	Peterson	X
	Wireless Communication Specifications		1	1 Nov 14	Joanne	X
	Sensor Specifications	Sensor details	1	1 nov 14	Elaine	X
	Mobile Application specifications		0.5	1 Nov 14	Elaine	X
	Microcontroller specifications		0.5	1 Nov 14		X
	Power Unit Specification		0.5	2 Nov 14	Joanne	X
	Test Plan	Unit and system test plans	1	2 Nov 14	Elaine	X
	Conclusion		0.5	2 Nov 14	Joanne	X
	References and Formatting	Page numbers, headers, footers	1	3 Nov 14	Joanne	X

Sprint 7 Task Breakdown

Category	Task	Completion Criteria	Time Estimate (Days)	Due Date	Assigned to	Done
Design Spec	Finish formatting and Submit	It is submitted	0.5	05 Nov 14	Joanne	X
Algorithm	Research/Test appropriate thresholds	Documentation on numbers to aim for, and when to turn on alert?	1	06 Nov 14		X
Algorithm	Create algorithm to calculate threshold based on given area	Changing area to be monitored will change threshold level accordingly. When particle count surpasses threshold, the count will be returned in red	3	09 Nov 14		X
PCB	Research and buy PCB materials	Document what is needed to create PCB, buy materials for it.	1.5	06 Nov 14	Elaine	X
Research and buy	Clear Hardware case, short micro USB cable, Test tunnel materials (Filter, clear acrylic,	-Purchase these materials	1	10 Nov 14	Elaine	X
App	Apply general look and feel of app	Follow FluidUI designs	2	11 Nov 14		X

Sprint 8 Task Breakdown

Category	Task	Completion Criteria	Time Estimate (Days)	Due Date	Assigned To	Done
Research	Read data sheets for new sensors		1	14 Nov 14	Everybody	X

Parts	Purchase/ look into rig parts		2	14 Nov 14	Elaine	X
Application	Acquire Sensor Data	Actual Sensor Data shows up on the phone application	2	15 Nov 14	Peterson	X
	Save Sensor Details on Device	Sensor Details can be saved on and retrieved from phone (from previous sprint)	2	16 Nov 14	Joanne	X
	Save Sensor Data to Device	Sensor Data can be saved to a file on the phone	3	17 Nov 14	Elaine+Joanne	X
	Full App Functionality	Working App	2	18 Nov 14	Errbody	X

Sprint 9 Task Breakdown

Category	**Task**	**Completion Criteria**	**Time Estimate (Days)**	**Due Date**	**Assigned To**	**Done**
Demo	Type out background/intro for talking parts	Have speaking parts ready for filming	1	22 Nov	Elaine	X
App	Clean up code	Ready for new sensors to be added	1	20 Nov 14	Elaine	X
Sensors	Get CO sensor on breadboard and connect to arduino	CO Sensor returns data to Arduino	2	22 Nov 14		
	Get humidity sensor on breadboard, connect to arduino	Humidity sensor returns data to Arduino	2	22 Nov 14		
	CO Sensor to display data on app	App can display CO data, saves to a new file under sensor folder	1	24 Nov 14		

	Humidity and temp	App can display humidity and temp data, saves to a new file under sensor folder	1	25 Nov 14		
Post Mortem	Start Post Mortem Doc	Create google doc, start writing down problems we have encountered	0.5	25 Nov 14	Elaine	
Test Plans Doc	Start Google Doc	Pull test plan from functional spec, make mods	1	26 Nov 14	Elaine	X
Demo	Film intro/background of project	Film it	1	22 Nov 14	Everyone	

Sprint 10 Task Breakdown

Category	Tasks	Completion Criteria	Time Estimate	Due Date	Assigned to	Done
PCB	Make LT Spice diagram with all sensor connections	Lt Spice is ready for printing	1	30 Nov 14	Joanne	X
PCB	Make PCB	PCB with soldered elements exists.	1	1 Dec 14	Elaine	X
Sensor	Humidity/Temp sensor connectivity	Get feedback from sensor	3	28 Nov 14	Peterson	X
Sensor	Display Humidity/ Temp data on app	App updates humidity details with other sensors, writes to file	0.5	29 Nov 14	Peterson	X
App	App to poll for sensor data in background	Background service exists with polling to sensor at certain time intervals Notification status alerts user when status is bad	1	27 Nov 14	Elaine	X

	Button to have red background when status is bad	Button turns red appropriately, grey when fixed	0.5	26 Nov 14	Elaine	X
Test Rig	Make test rig	Drill holes for exhaust and intake, Ready for testing	1	2 Dec 14	All	X
App	Debug/Testing for crashes	Pressing back in editActivity doesn't crash	0.5	28 Nov 14	All	X
Demo	Work on Video		1	29 Nov 14	All	X
Test Doc	Submit the Test doc	..do it	0.001	26 Nov 14	Elaine	X