CO_2 Software Capstone Presentation

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Problem Statement

- Ecological data collection in the field

- Requires Windows laptop

- Long setup / teardown process

- Outputs unreadable text files

- Stats must be computed

  by external software

Problem Statement

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```
LogFile1 - Notepad
File  Edit  Format  View  Help
"2017-10-13 at 13:01"
Date(Y-M-D) Time(H:M:S) CO2(ppm) H2O(ppt) H2O(C) Cell_Temperature(C) Ce
2017-10-13 13:01:35 49109.70 21.04 14.59 51.31 79.23 0.6014 0.0949
2017-10-13 13:01:36 49149.10 21.05 14.60 51.29 79.21 0.6014 0.0949
2017-10-13 13:01:37 49098.90 21.05 14.60 51.25 79.20 0.6013 0.0950
2017-10-13 13:01:38 49103.40 21.06 14.60 51.28 79.21 0.6013 0.0949
2017-10-13 13:01:39 49089.10 21.05 14.60 51.28 79.23 0.6013 0.0949
2017-10-13 13:01:40 49081.60 21.03 14.59 51.29 79.21 0.6013 0.0949
2017-10-13 13:01:41 9416.53 21.81 15.19 51.31 79.42 0.3533 0.1114
2017-10-13 13:01:42 7126.35 45.37 27.32 51.31 80.38 0.4713 0.1608
2017-10-13 13:01:43 117865.00 43.80 26.71 51.28 80.34 0.6603 0.1563
2017-10-13 13:01:44 69343.00 41.87 25.78 51.25 79.56 0.6174 0.1467
2017-10-13 13:01:45 51403.70 39.64 24.80 51.25 79.29 0.6058 0.1448
2017-10-13 13:01:46 49868.80 40.17 25.02 51.25 79.24 0.6048 0.1461
2017-10-13 13:01:47 49684.30 40.55 25.17 51.25 79.22 0.6045 0.1468
2017-10-13 13:01:48 49519.60 40.66 25.22 51.29 79.22 0.6042 0.1469
2017-10-13 13:01:49 49397.30 40.66 25.22 51.29 79.23 0.6041 0.1469
2017-10-13 13:01:50 49309.20 40.63 25.20 51.28 79.23 0.6040 0.1468
2017-10-13 13:01:51 49357.80 40.61 25.19 51.25 79.21 0.6040 0.1467
2017-10-13 13:01:52 49364.00 40.57 25.18 51.25 79.21 0.6040 0.1467
2017-10-13 13:01:53 49362.20 40.53 25.16 51.27 79.22 0.6040 0.1466
2017-10-13 13:01:54 49396.50 40.50 25.15 51.29 79.22 0.6041 0.1465
2017-10-13 13:01:55 49443.40 40.49 25.15 51.29 79.21 0.6041 0.1465
```

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Our Solution

# Requirements and Specifications

- Mobility

- Communication with LI-840A Gas Analyzer

- Live visual data readout

- Organization of data sets

- In app statistical computations

- Transfer data out of the application

Solution Overview

| Solution	Key Feature
Android Mobile Application	Mobile Android Device
Android USBSerial Library	Connection from LI-840A to Device
Android GraphView Library	Real Time Data Streaming
Data Management	Scientific MetaData Template
Apache Common Math Library	Data Review and Statistical Analysis
Email Functionality	Built in Email Support

Architecture Overview
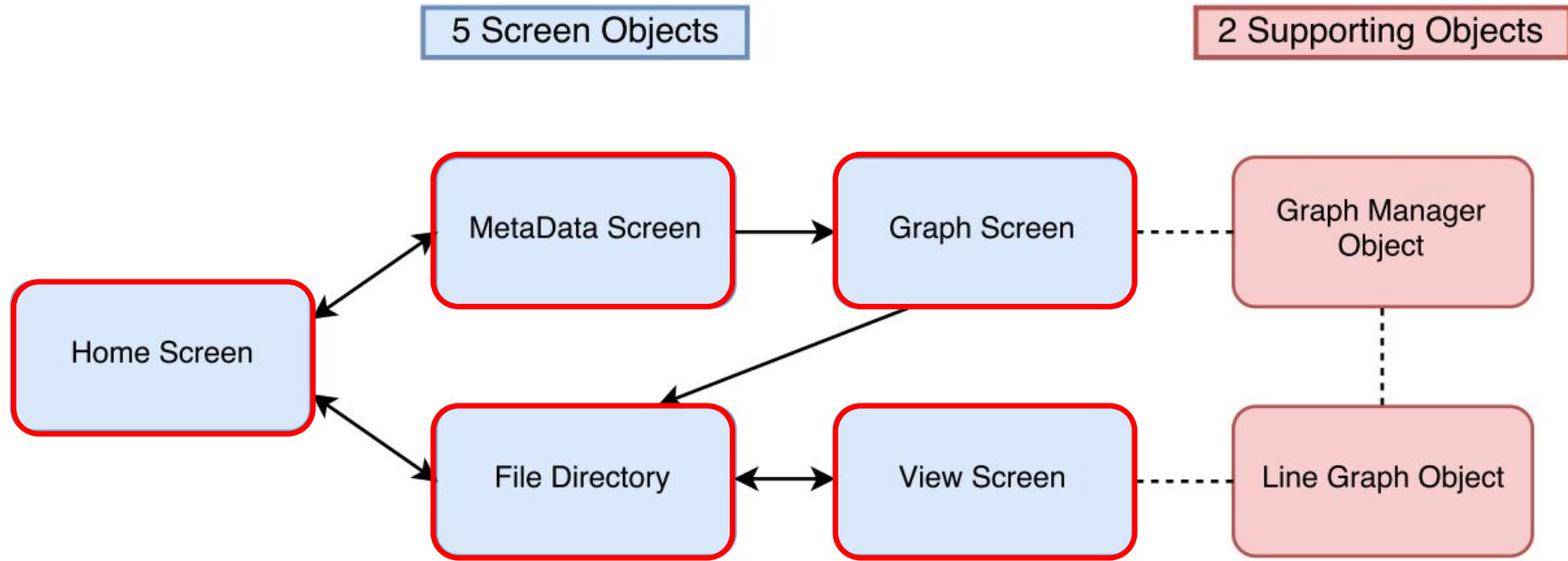
Solution Implementation

- Our solution is a Mobile App, CO2 Flux

- Consists of five different windows that each provide different functionalities

- Functions all serve to meet Requirements
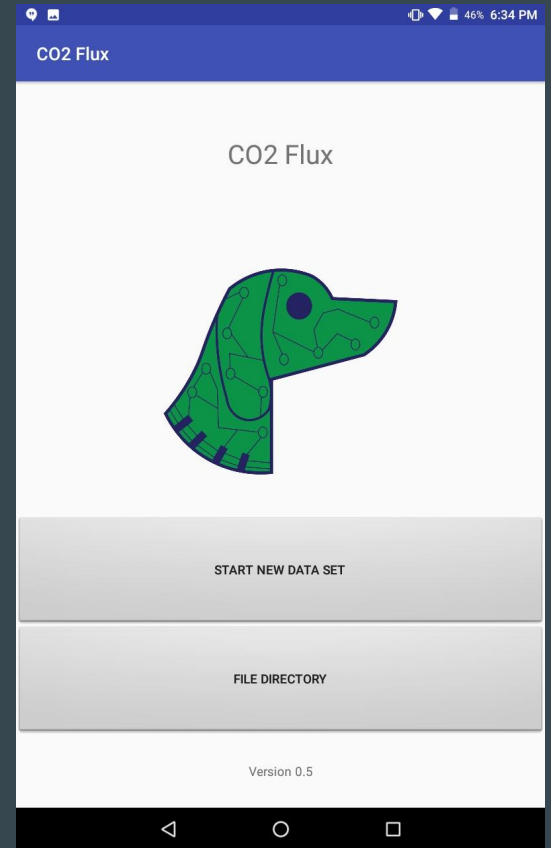
Real-Time Data Streaming

- Data Streamed from LI-840A gas analyzer via USB connection

- Visualizes Data in Graphs

- App creates Data sets of Graph, Meta, and Image Data
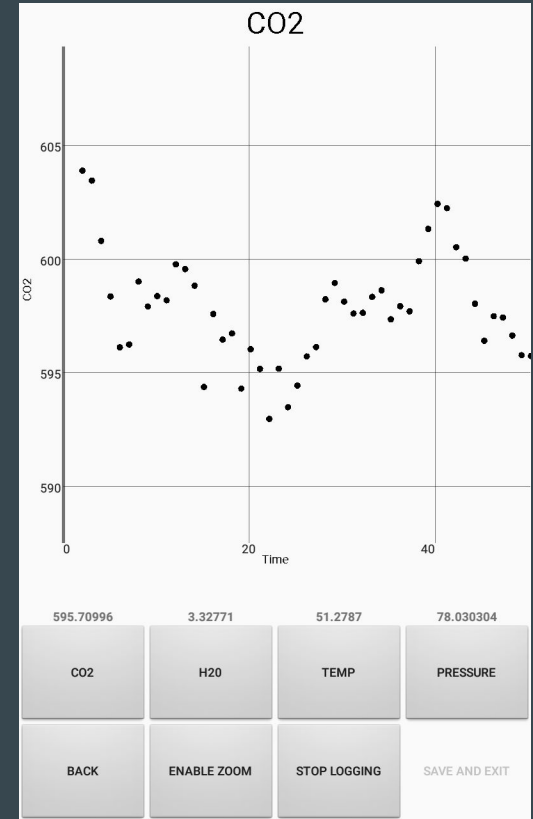
Data Management and Transference

- File Directory Screen

- Integrated email client functionality.

- User is able to delete any unwanted files

- Individual Data Sets can be examined with more detail
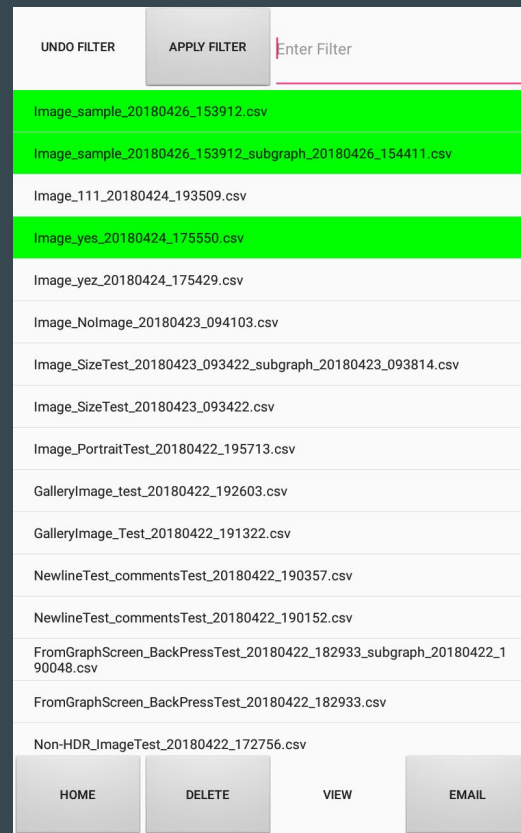
Data Review/ Subset Creation

- Displays the saved data set with adjustable scaling

- Plots a regression line and provides Statistical Computation

- If a user is interested in one section of the graph, they are able to make a subgraph, which is saved and named in the file directory.
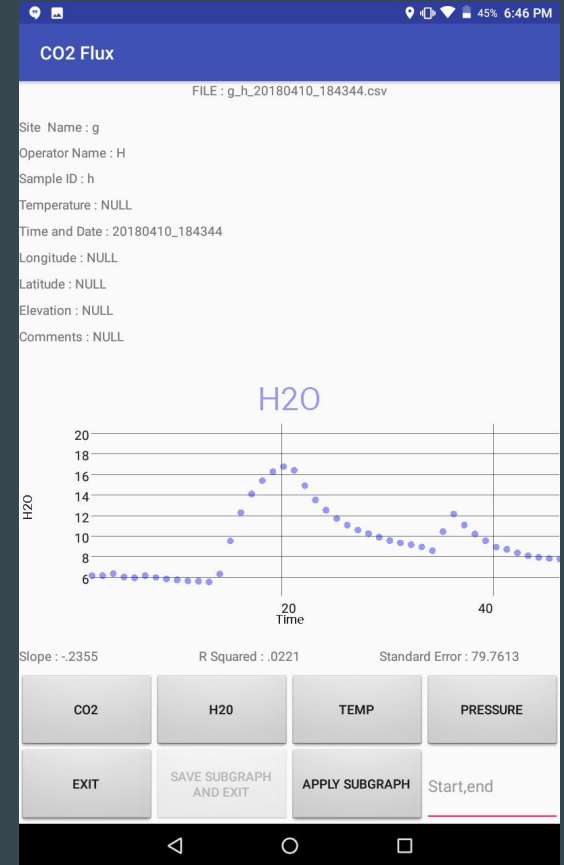
Prototype Review

- Walkthrough of typical Use-Case of app

CO2 Flux

START NEW DATA SET
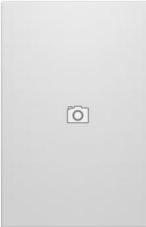
FILE DIRECTORY

Version 1.0
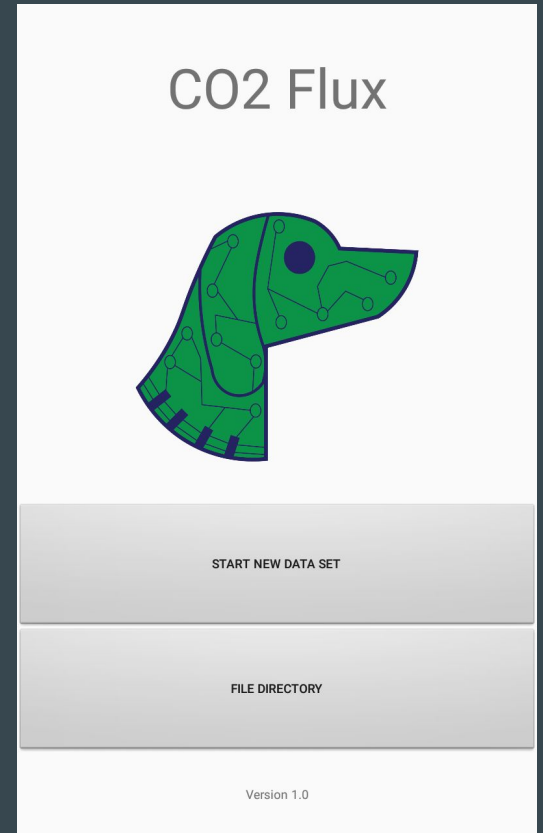
MetaData Screen

Meta Data

Operator Name: Required

Site Name: Required

Sample ID: Required

Temperature: Degrees in Celsius

Additional Comments

No Image Taken

Apr 26, 2018 3:55:00 PM   Tap To Enter Longitude

Tap To Enter Elevation   Tap To Enter Latitude
(meters)

CANCEL   FINISH
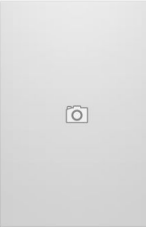
MetaData Screen

Graphing Screen
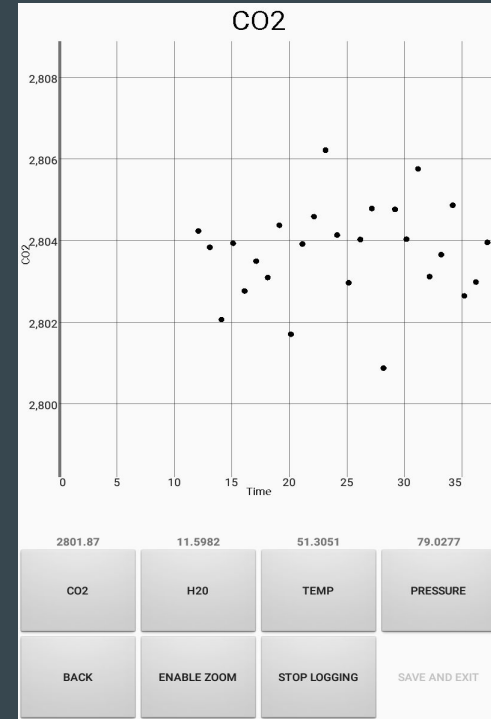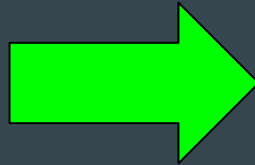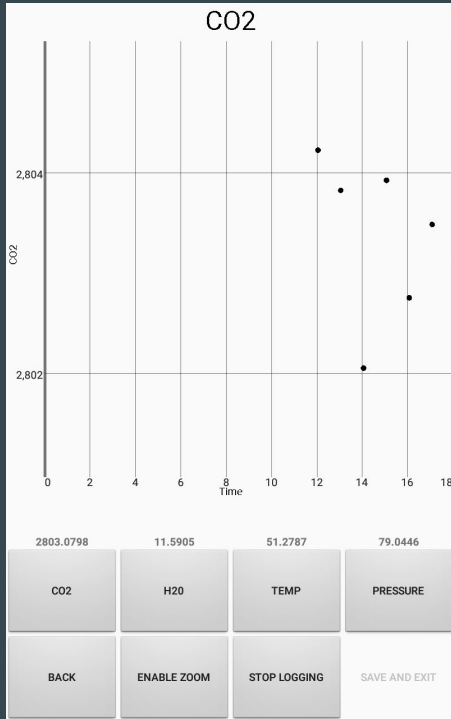
File Directory Screen

UNDO FILTER | APPLY FILTER | Enter Filter

Image_sample_20180426_153912.csv

Image_sample_20180426_153912_subgraph_20180426_154411.csv

Image_111_20180424_193509.csv

Image_yes_20180424_175550.csv

Image_yez_20180424_175429.csv

Image_NoImage_20180423_094103.csv

Image_SizeTest_20180423_093422_subgraph_20180423_093814.csv

Image_SizeTest_20180423_093422.csv

Image_PortraitTest_20180422_195713.csv

GalleryImage_test_20180422_192603.csv

GalleryImage_Test_20180422_191322.csv

NewlineTest_commentsTest_20180422_190357.csv

NewlineTest_commentsTest_20180422_190152.csv

FromGraphScreen_BackPressTest_20180422_182933_subgraph_20180422_1
90048.csv

FromGraphScreen_BackPressTest_20180422_182933.csv

Non-HDR_ImageTest_20180422_172756.csv

HOME | DELETE | VIEW | EMAIL

Viewing Screen
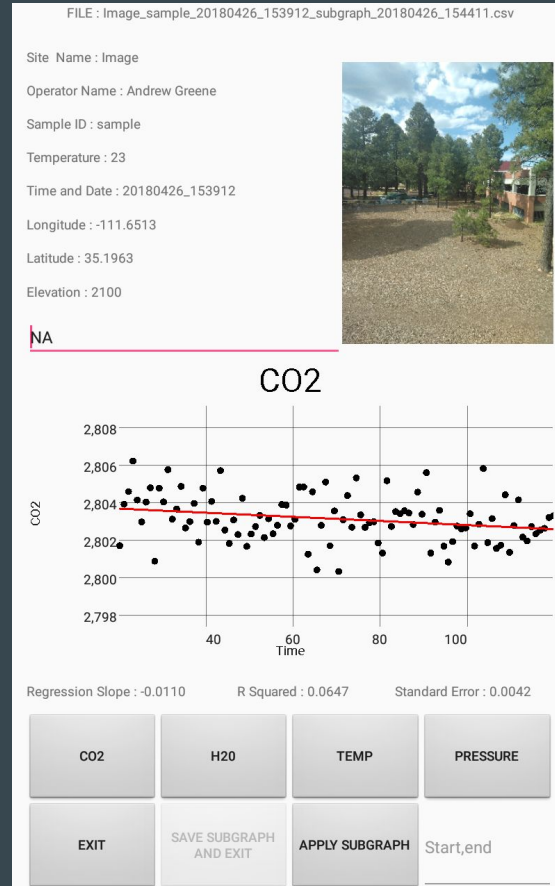
File Directory Screen
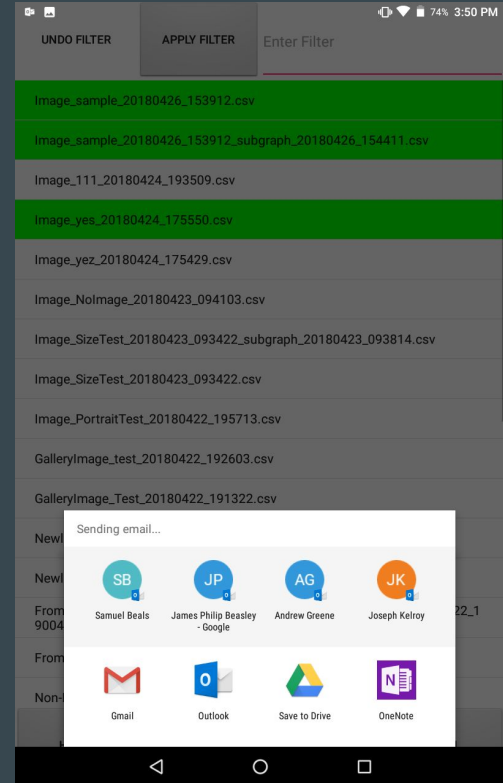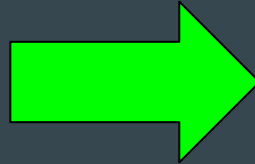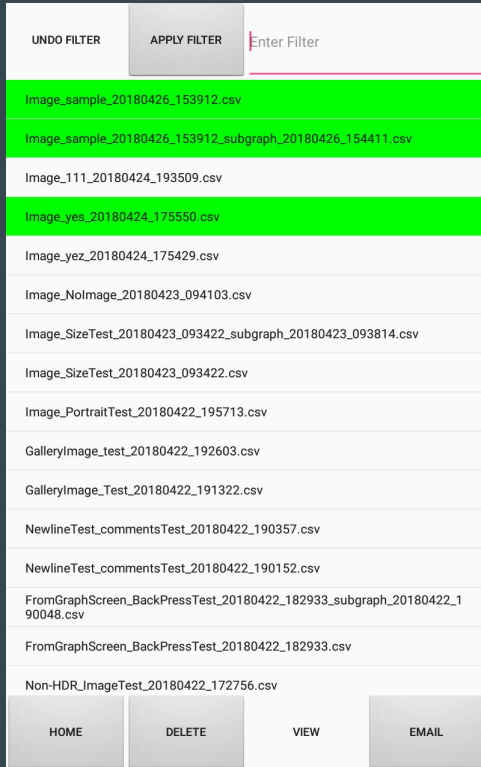
Email

Testing

- Unit Testing

  - Testing main functions

- Integration Testing

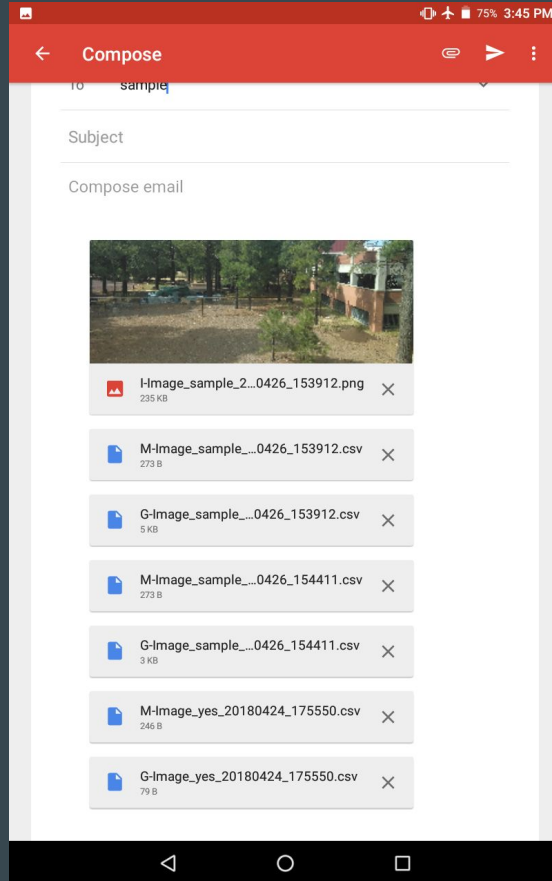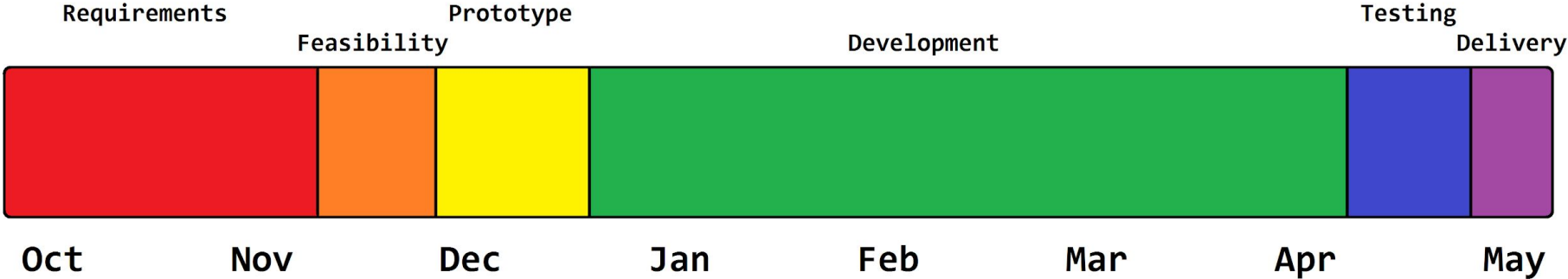 - Making sure application handles data as intended

- Usability Testing

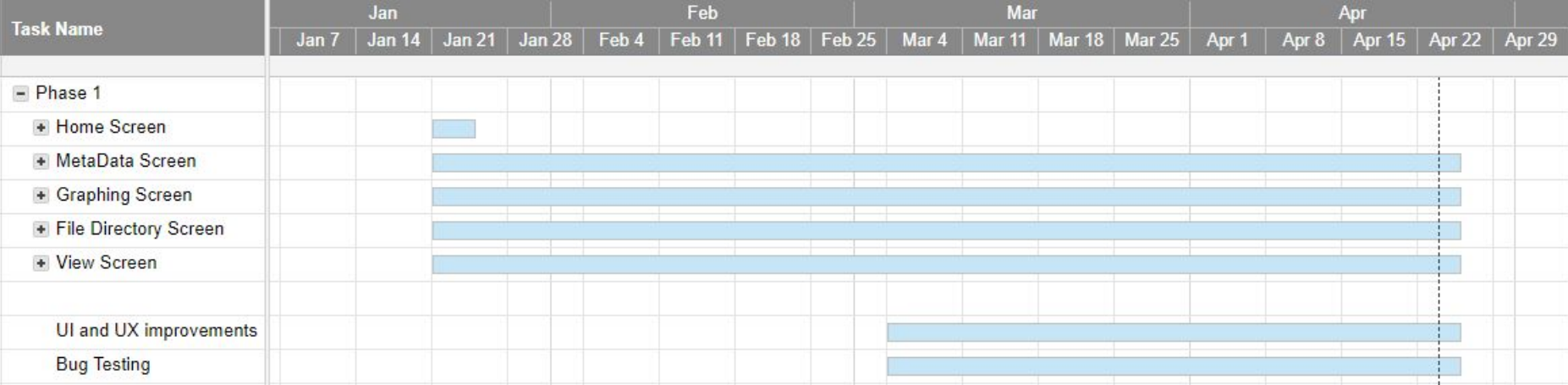 - Time tests based on new and experienced users

Challenges

- Connection

  - Serial data streaming to the application

- Android application development

  - General learning curve

- Overall design

  - Revisions with clients needs

Milestone Timeline

| Requirements | Feasibility | Prototype | Development | Testing | Delivery |

| Oct | Nov | Dec | Jan | Feb | Mar | Apr | May |

Gantt Chart

Task Name	Jan				Feb				Mar				Apr				
	Jan 7	Jan 14	Jan 21	Jan 28	Feb 4	Feb 11	Feb 18	Feb 25	Mar 4	Mar 11	Mar 18	Mar 25	Apr 1	Apr 8	Apr 15	Apr 22	Apr 29
− Phase 1																	
+ Home Screen			▭														
+ MetaData Screen			▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬														
+ Graphing Screen			▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬														
+ File Directory Screen			▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬														
+ View Screen			▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬														
UI and UX improvements									▬▬▬▬▬▬▬▬▬▬▬▬								
Bug Testing									▬▬▬▬▬▬▬▬▬▬▬▬								

Future Work

- Compatibility with other gas analyzers

- Additional statistical analysis

- Multiple picture functionality

- Writing a publication on the application

Conclusion

- CO2 Flux: A Mobile Application for Ecological Data Collection

- Improves the CO2 data collection process

  - Mobile

  - Visual Data Readout

  - Faster

- All the functionality of the previous system and more

Questions?

Contact Information
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