

CO₂ Software Design Review 3



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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



Problem Statement

```
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) Cell_Temperature(F)
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
```

Requirements and Specifications

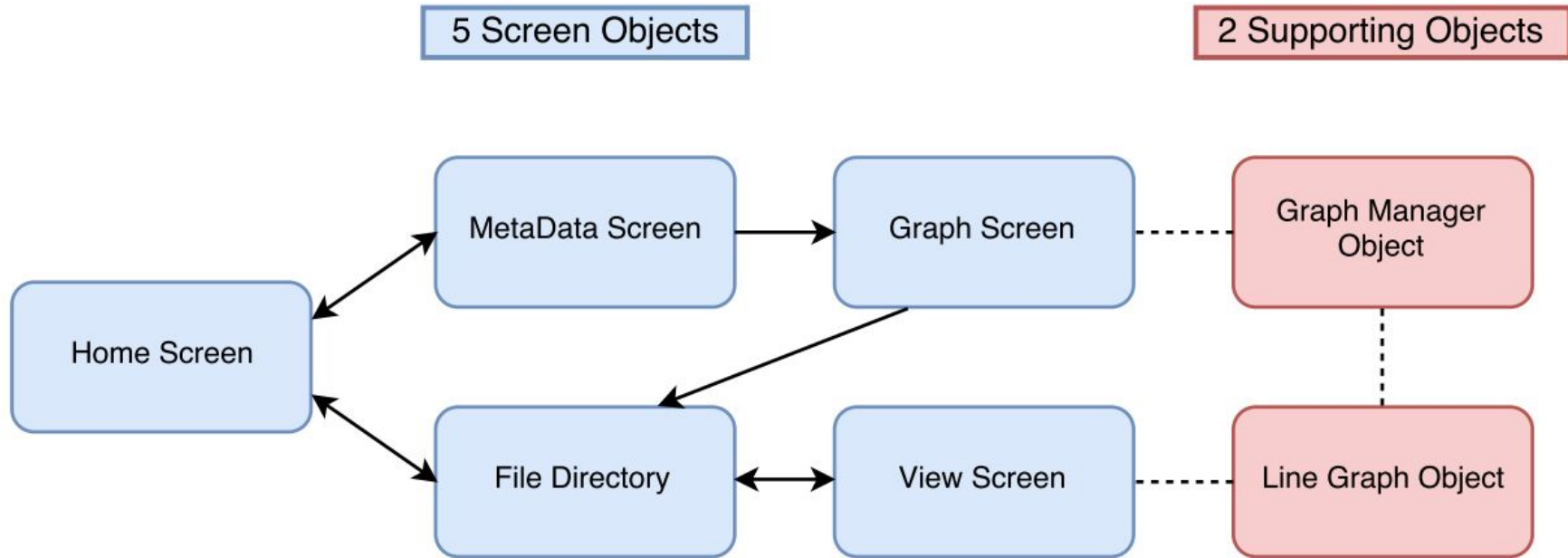
- Mobility
- Communication with LI-840A Gas Analyzer
- Live visual data readout
- Organization of data sets
- In app statistical computations
- Transfer data out of the application



Solution Overview

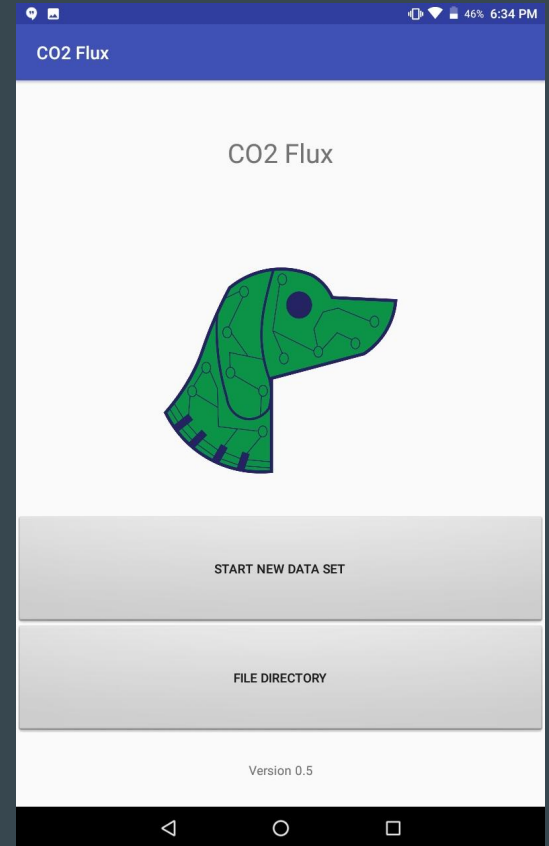
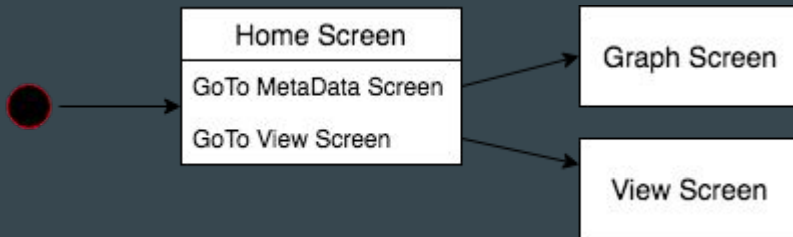
- Android Mobile Application
- Android UsbSerial Library
- Android GraphView Library
- Data Management
- Apache Common Math Library
- Email Functionality

Architecture Overview



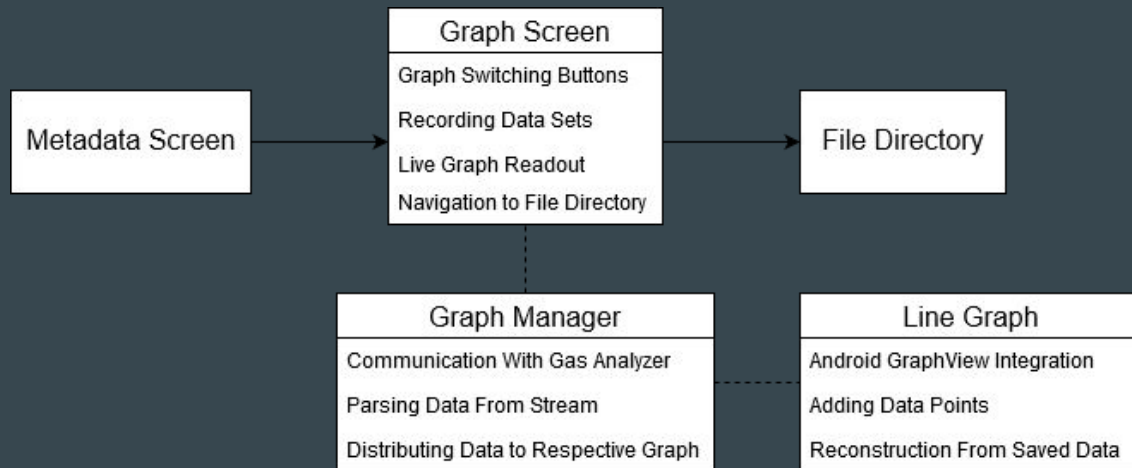
Solution Implementation

- Our solution is a Mobile App, CO2 Flux
- Consists of five different windows that each provide different functionalities
- Functions all serve to meet Requirements



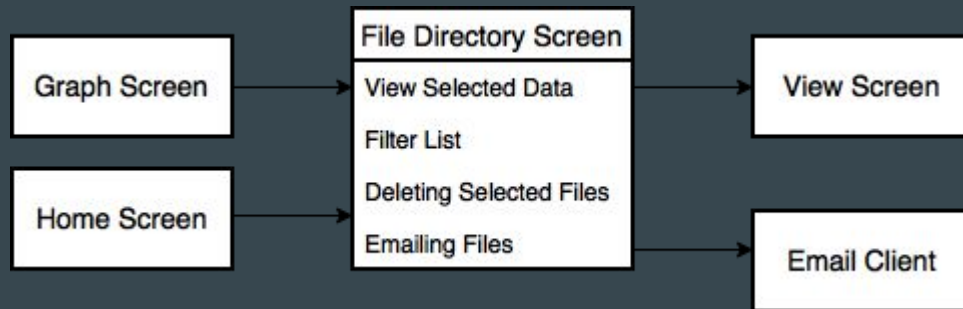
Real-Time Data Streaming

- 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



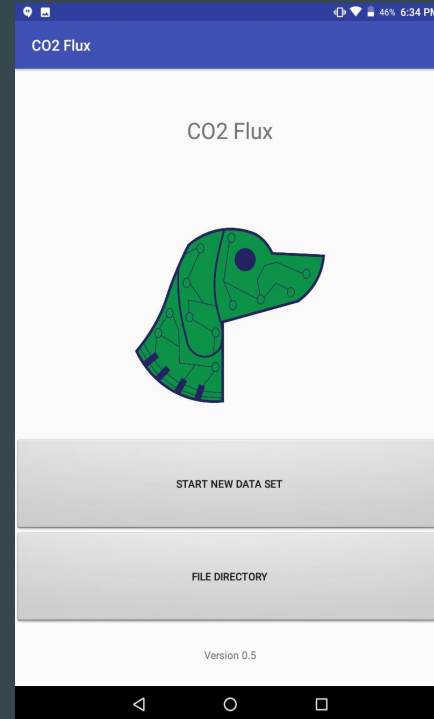
Data Review/ Subset Creation

- 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



MetaData Screen

CO2 Flux

Meta Data

Operator Name: **Required**

Site Name: **Required**

Sample ID: **Required**

Temperature: Degrees in Celsius

Additional Comments

No Image Taken

Apr 10, 2018 6:34:16 PM

Tap To Enter Longitude

Tap To Enter Elevation

Tap To Enter Latitude

CANCEL FINISH

MetaData Screen

CO2 Flux

Meta Data


Operator Name: Andrew Richardson


Site Name: Flagstaff

Sample ID: ab32

Temperature: 55

Comments go here.



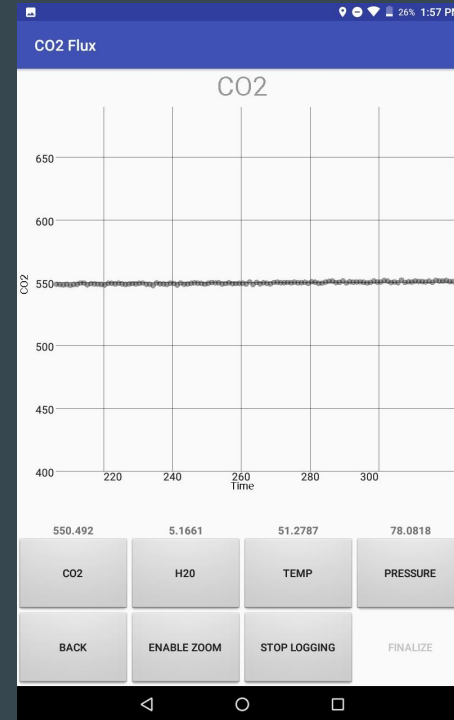
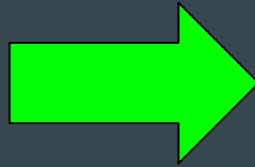
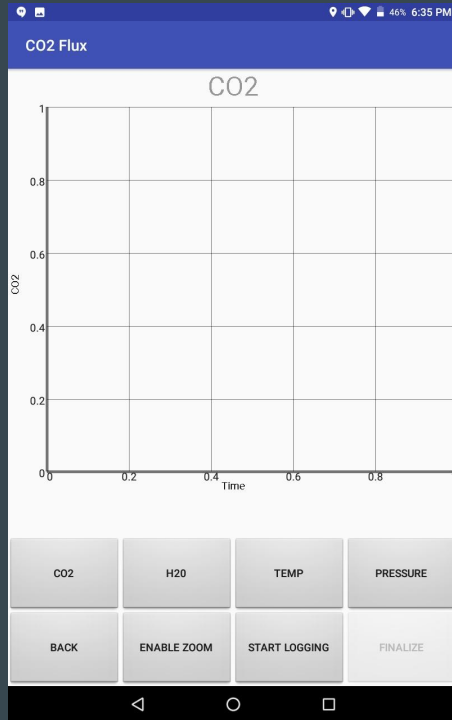


Apr 12, 2018 1:45:36 PM -111.6513

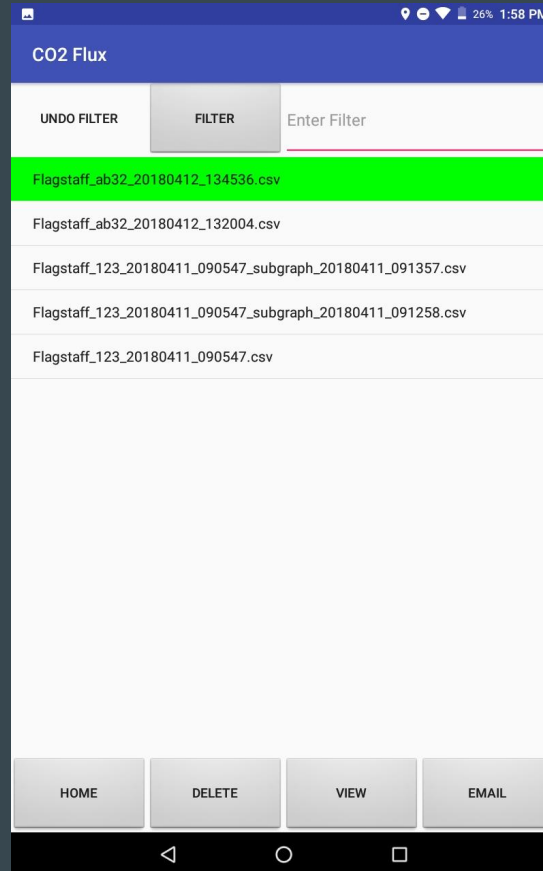
2100 35.1983

CANCEL FINISH

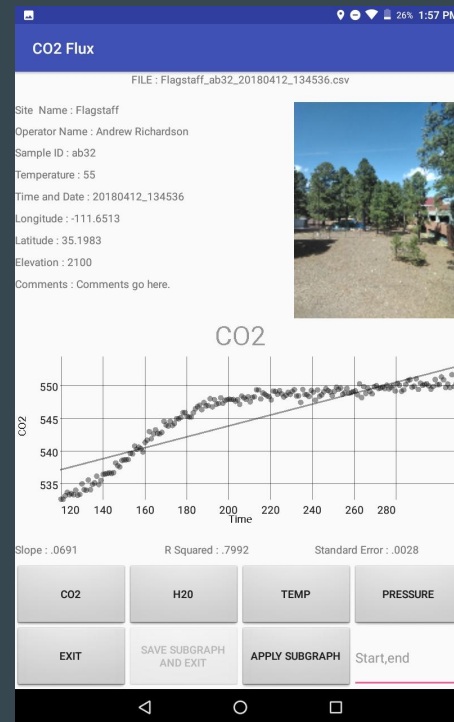
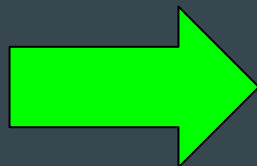
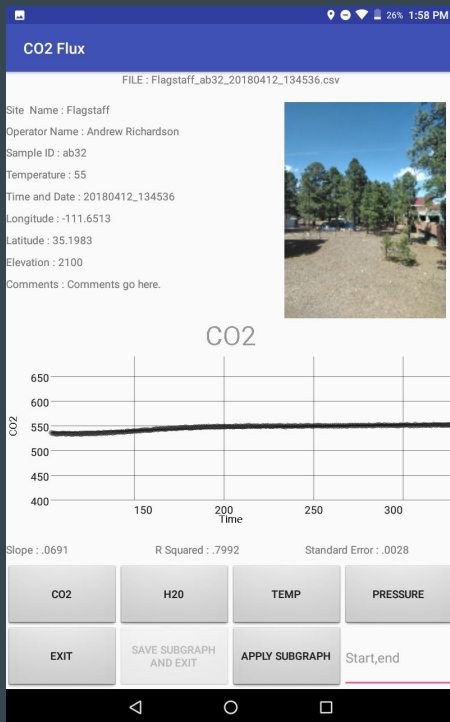
Graphing Screen



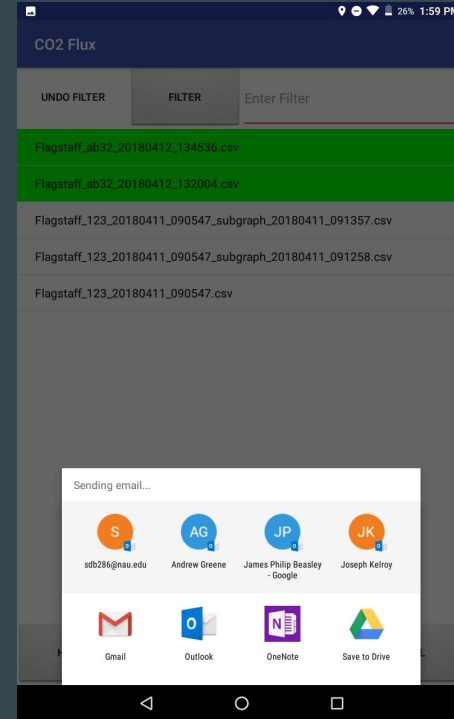
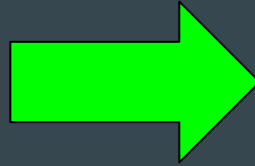
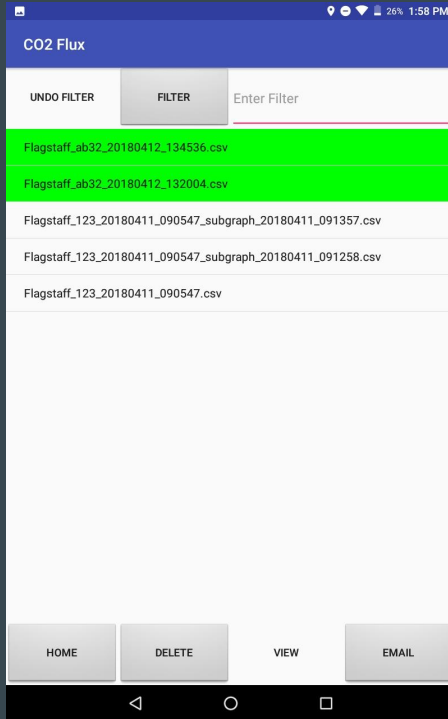
File Directory Screen



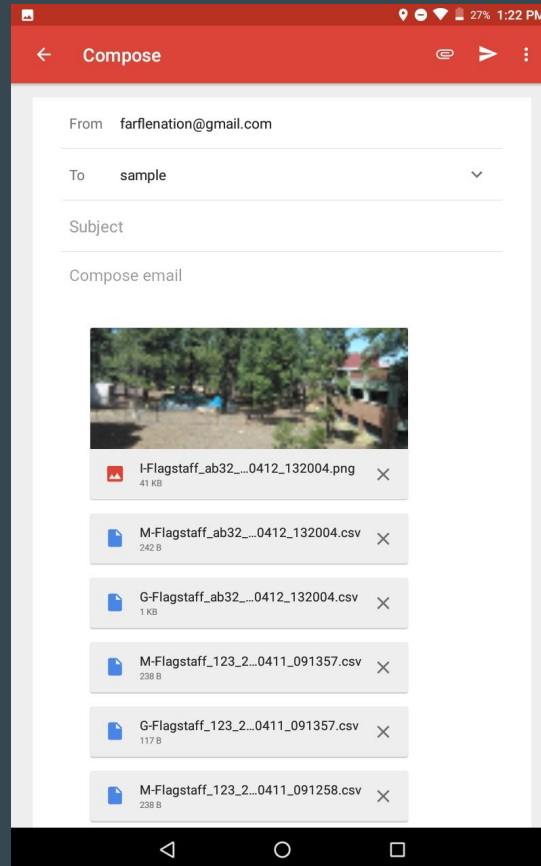
Viewing Screen



File Directory Screen



Email



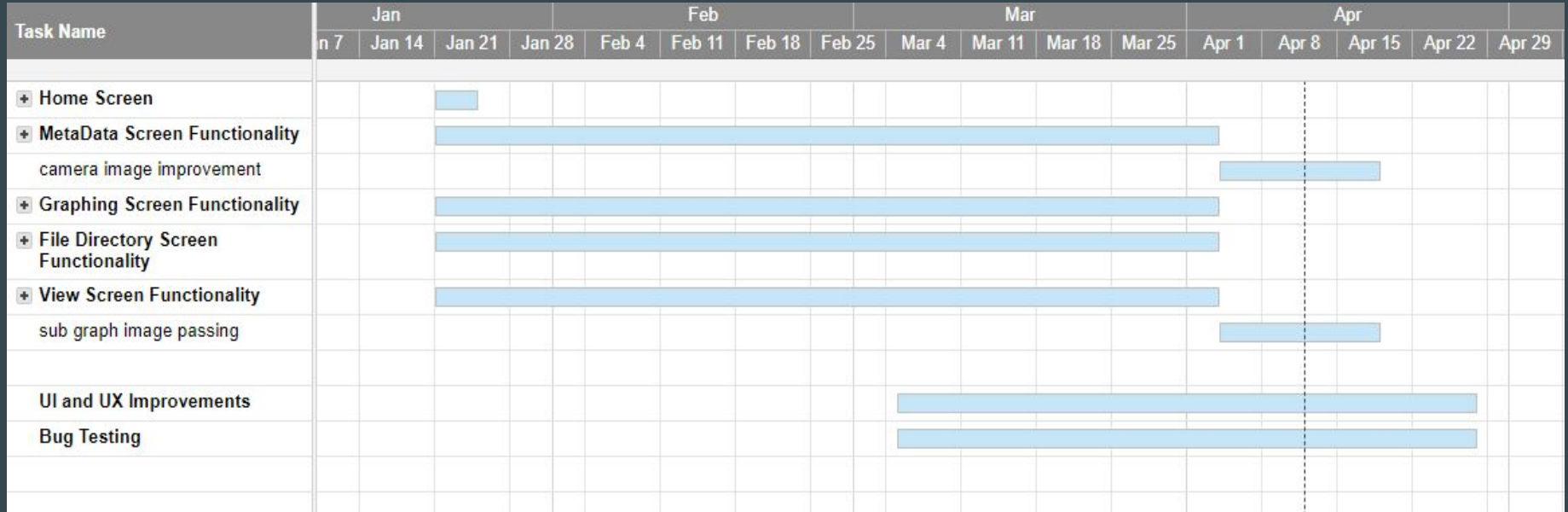
Testing

- Unit Testing
 - Testing functions
- Integration Testing
 - Making sure application handles data as intended
- Usability Testing
 - Time tests based on users with no prior use of the application
- Fix as we find
 - Known bugs are the only thing left to change in the application

Challenges

- Connection
 - Serial data streaming to the application
- Android application development
 - General learning curve
- Overall design
 - Numerous changes

Schedule



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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