Design Review II

DENDRO-DAWGZ

Growing A Brighter Future

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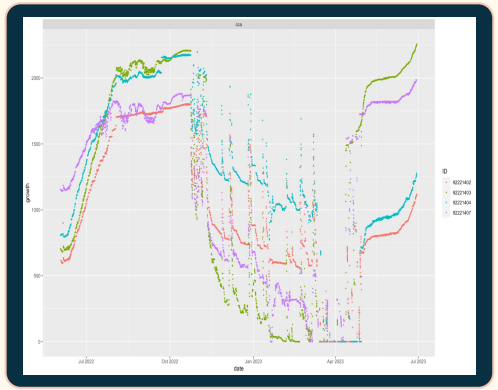
Problem Statement

- Must use laptop while in a tree
- Not the most reliable software
- Can only view one dataset at a time
- Have to share data via google drive

Solution Overview

- Develop an Android application
  - Portable and affordable
  - Able to use with one hand
- Display several dendrometers on the same graph
  - Interactive graphs
  - Comprehensive data
- Export data to the cloud
  - Data and file sharing
  - Viewable from anywhere



Requirements

Functional

- Obtaining data from a dendrometer
- Visualizing data from a dendrometer
- Sharing data over the cloud

Environmental

- Android application
- Wired connection through TMD Adapter
- Restriction to C and Java FTDI libraries

Non-Functional

- Swift download and graph rendering times
- Interactive graphs and intuitive UI
- Secure data storage

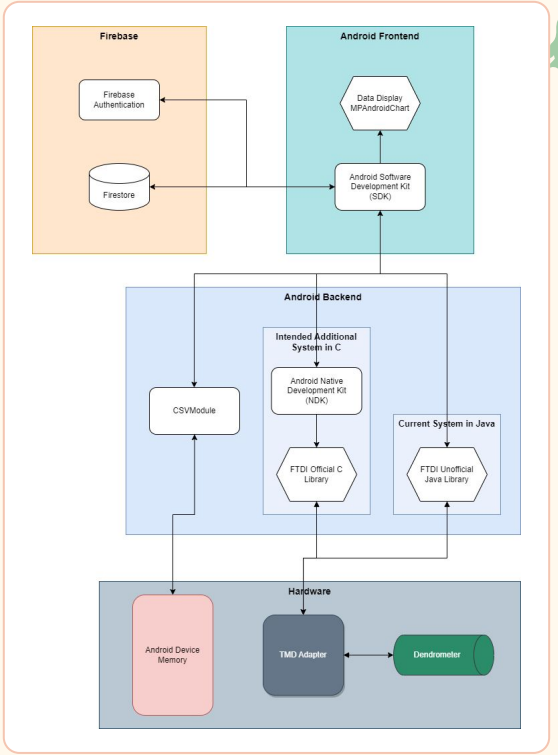
Obtaining Requirements

- Weekly client meetings and emails

Implementation Overview

- Core features of the application are implemented
  - Android application developed
  - Hardware connection and complete data retrieval
  - Data visualization

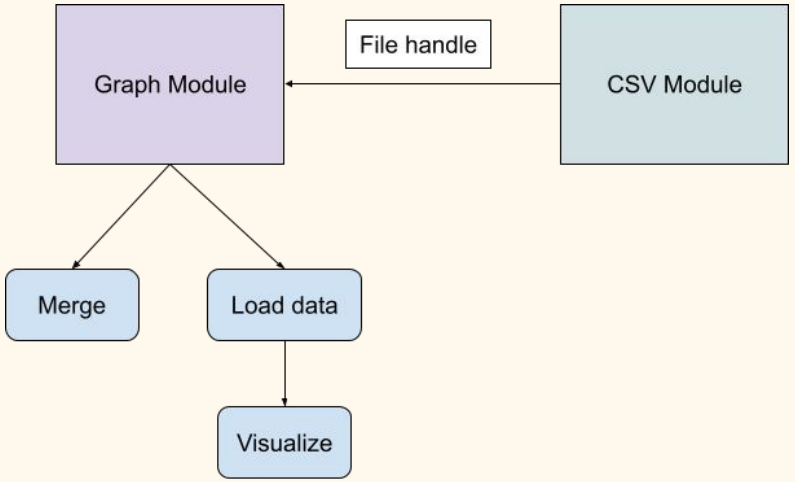
- Additional features
  - Merging CSV files together
  - Graph visualization of data analysis and several CSV files
  - Cloud authentication and export functionality
  - Optimization of hardware connection in backend



Merging CSV Files

- CSVReader -> CSVFile
  - CSVFile provides simplified API to interact with files

- GraphFragment
  - Merges N data sets into a single data set
  - Provides header for metadata



Example of header single data set file:

```
1;
83974;1;1;
83974;
// data
```

Example of header merged data set file:

```
3;
83974;1;1;
72941;1;0;
13621;2;1;
// first data set
```

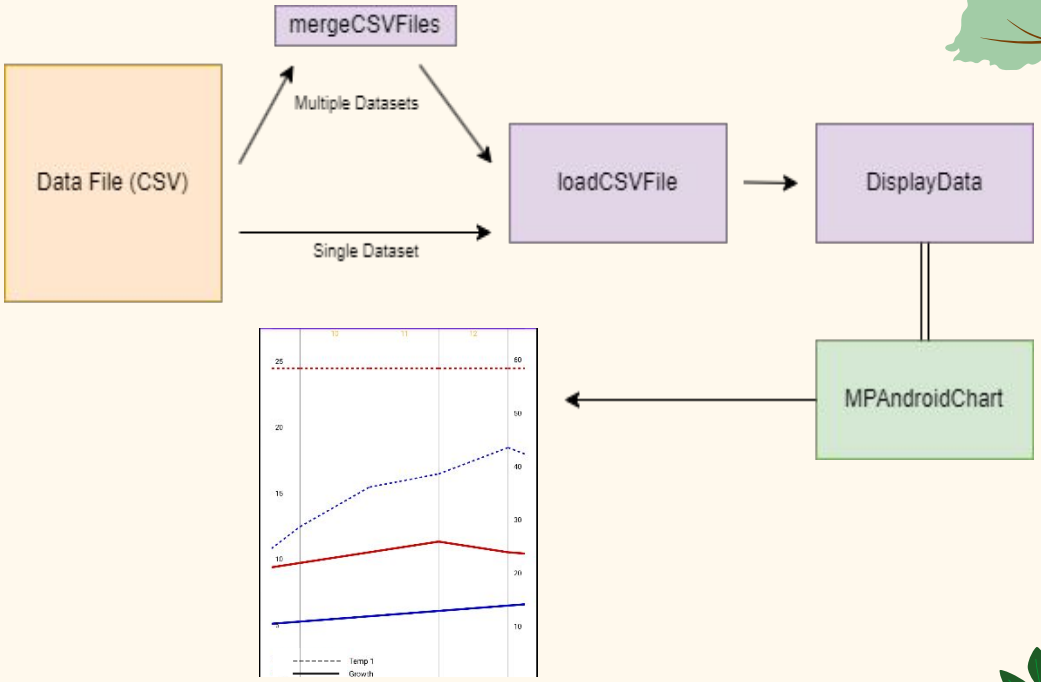
Graph Visualization

LoadCSVFile

- Converts CSV file into arrays
  - Temperature measurements
  - Compression measurements

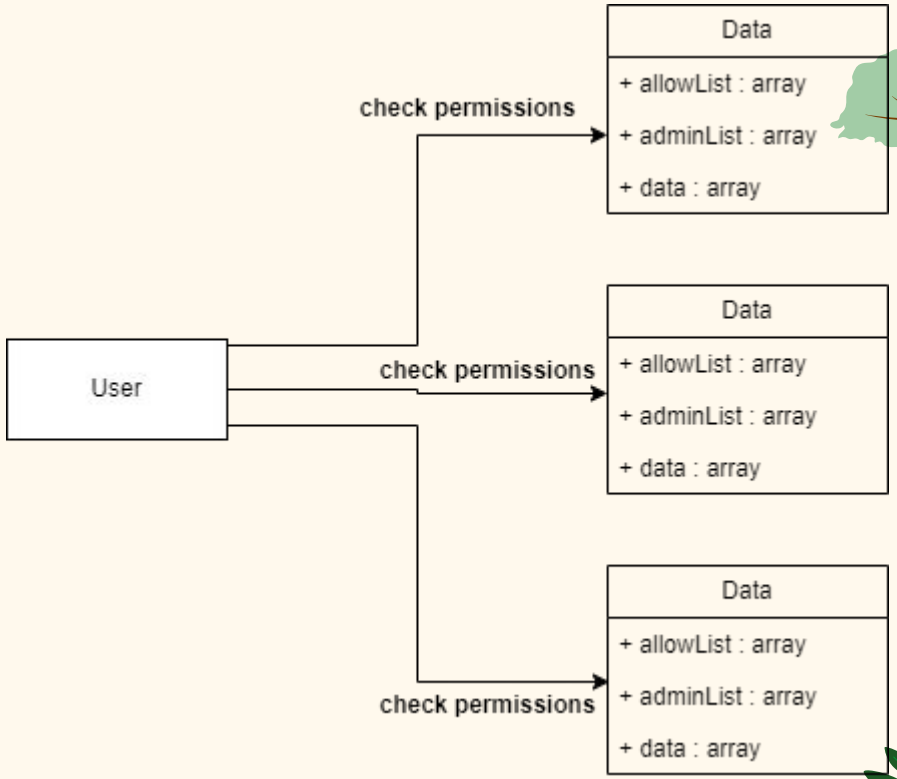
DisplayData

- Utilizes MPAndroidChart library
  - Inputs arrays as graph entries
  - Sets color of lines
  - Outputs line onto view



Cloud Export

- User Authentication is implemented via email and password
- Storing on Firebase with email, password, and a unique id
- To see data stored on Cloud Firestore, must be signed in
- Go through each data entry
- Check if current user is in the allow list
- Only users in the admin list can add users to the data set



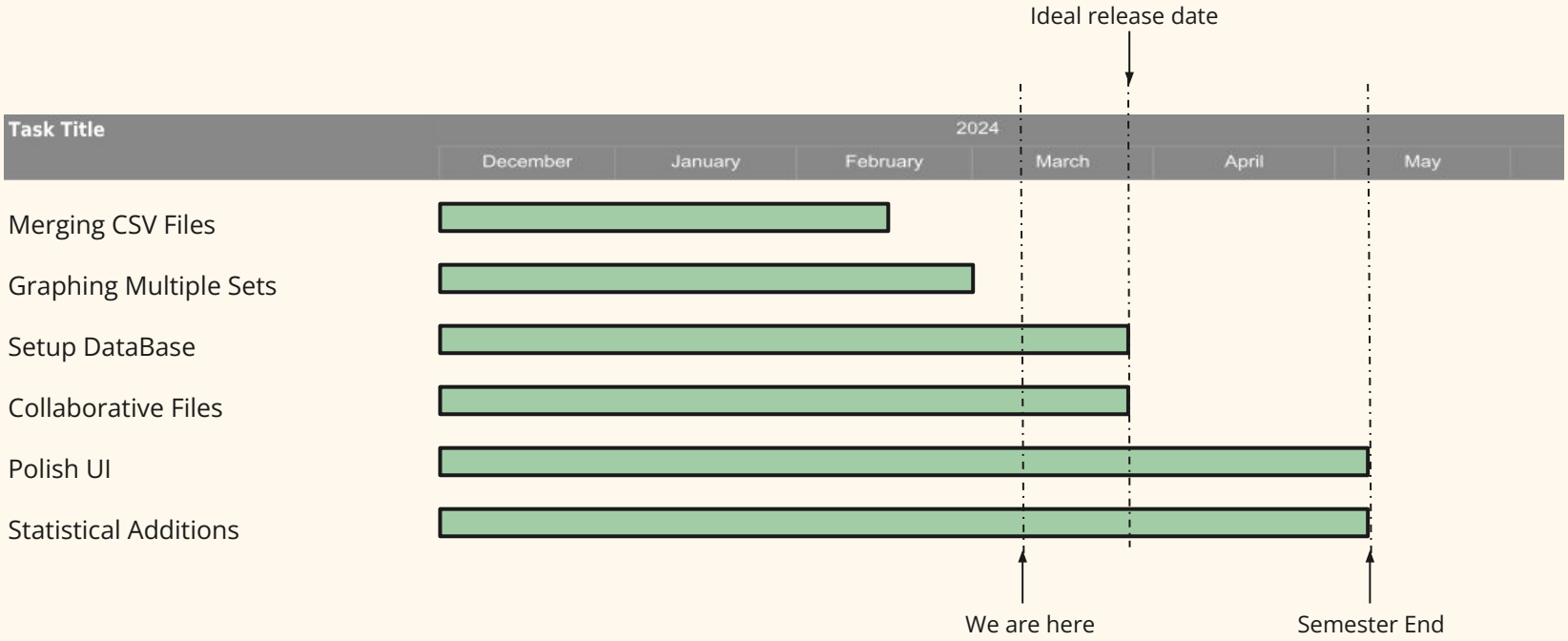
Backend

- Currently written in Java
  - Using an unsupported and unofficial FTDI chip library
- Translate key features to C
  - Official FTDI C Library
  - Faster with low level / hardware connection tasks
- Native support additionally required within application
  - Android NDK / JNI
  - Integration of FTDI Library and LibUSB library in native environment
    - Added as submodules, built before native code

Challenges and Resolutions

	Merging	Graph	Cloud	Backend
Concern:	Merge time increases with number of data sets; data is not formatted in a format with which it is easy to work	Graphing times increase with number of entries.	Data will only be uploaded when the device is connected to the internet. Adding the risk that not all data will get uploaded to the database	Data marshalling between native code and application code introduces inefficiencies and potentially lower speeds when performing hardware communication
Mitigation:	**Parallelize** merging code, and allow for **selecting a time frame**; implement multiple data formats	Parallelize display function	Store the data on the device, once device gets internet connection, upload to database.	Minimize marshalling by performing necessary calculations in C and reducing frequency of transfer

Schedule


Ideal release date
Task Title
2024
December
January
February
March
April
May
Merging CSV Files
Graphing Multiple Sets
Setup DataBase
Collaborative Files
Polish UI
Statistical Additions
We are here
Semester End

Conclusion

Our clients want a **better solution** to the current way of collecting data from dendrometers. Having to carry a laptop into a tree makes process harder and more dangerous

We will create a mobile application for Android which will have the ability to **read** in data, **store** data, **merge** data, **visualize** data, as well as **share** data with others using a cloud solution

We asked our clients about what the app needs to do, designed and reviewed with clients, identified missing pieces

We evaluated process for risks, feasibility, and other environment requirements

After this, we plan to focus on **finishing backend code**, **merging**, **visualizing**, **cloud export**, and **creating necessary UI elements** to show off for the alpha version

Thank You!