TEXAS A&M UNIVERSITY Engineering

EPS Booth: 335

Plant Attribute Extraction

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Problem Definition

Texas A&M AgriLife Research at Corpus Christi uses an automated system to read orthomosaic and canopy height model data to evaluate crop growth trends. Previously, they have only been able to generate one date at a time. This meant the generated tables and shapefiles can only present one date, not across multiple dates in the project.

Methodology

Our project was broken into 3 subsystems; Directory Management, User Interface, and Attribute Modification & Storage.

Directory Management

- Making the website utilize the generated data more.
- If the same date attributes were to already be generated, the user can still download that data.
- Any data is deleted after two weeks of its initial generation.

User Interface

- Ability to filter out generation results based on restrictions
- .Configured to be more friendly towards the user
- Overall cleaner and more efficient

Attribute Manipulation & Storage

- Users can generate results for multiple files/dates during one result generation.
- Users can generate Canopy Cover(CC) and Excess Greeness(EXG) results without a CHM, and Canopy Height(CH) and Canopy Volume(CV) for orthomosaic files with a CHM, and this can be done in one results package.
- For result packages with multiple orthomosaics, a merged CSV and SHP file will be made for each attribute with results from all files that were input for easy comparison and analysis.
- All results with be downloaded within a zipped results folder, containing a zip folder for each attribute.

Engineering Analysis

Our project is fully comprised of software, unlike most of our Electrical Engineering companions. We used our past coding knowledge and the newfound knowledge we learned to complete the front and back end development of this project.

- Front end development used HTML and Javascript to allow users to upload input files into the database, prohibit users from incorrectly inputting parameters, and passing along user input to the back end development.
- The back end used Javascript, PHP, Python, and a vast number of Python libraries to generate up to four plant attributes with up to four result file types. We use RGB image manipulation to get the Digital Surface Model(DSM) and Canopy Height Model(CHM) to calculate the plant attributes. This data is then zipped and downloaded. The zip files will contain a merged data file if there were multiple input files selected.
- The back end also contains some other features. If the user selects an existing result package, the website will skip attribute generation and let the user select their wanted file types and immediately download. To maintain directory storage we delete existing results 2 weeks after their last download.

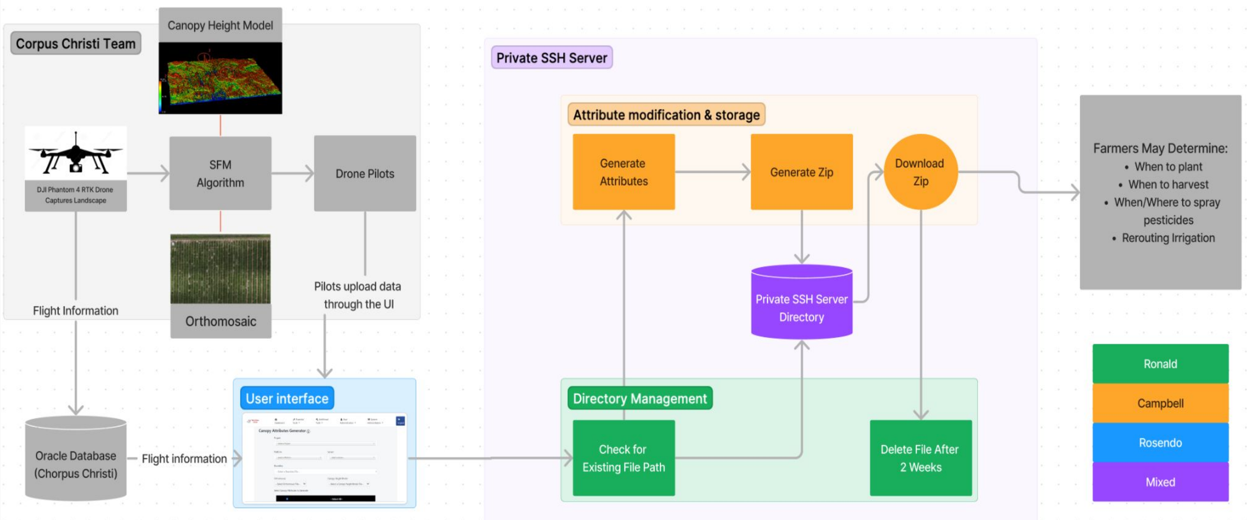

Figure X. Subsystem Diagram

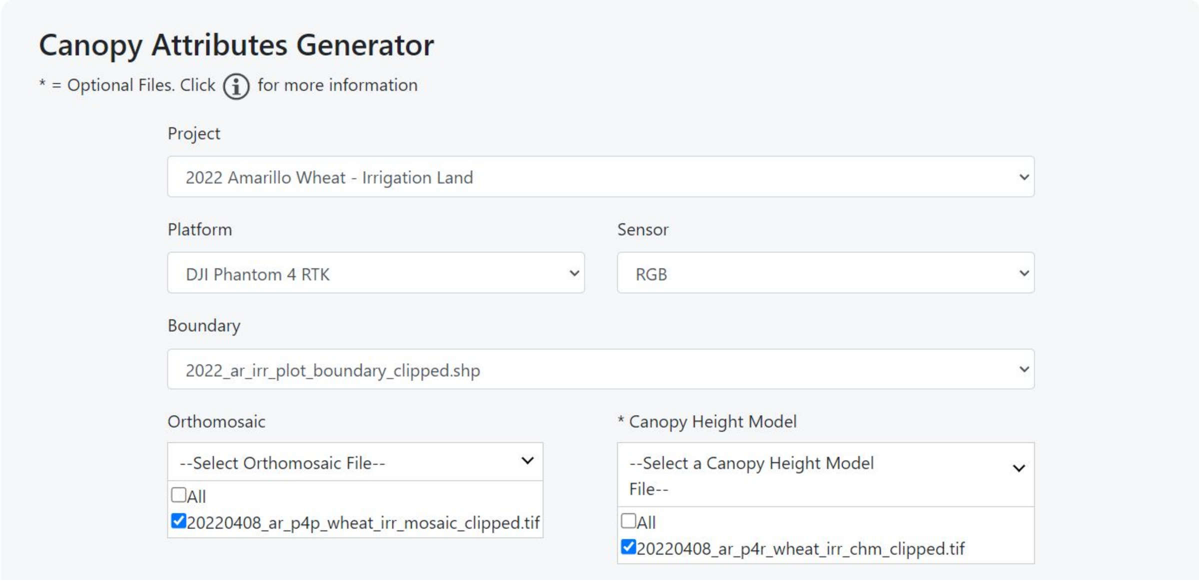

Figure X. User Interface

Outcomes

The data generated in and downloaded through the website are used to observe tabular data to observe the changes in the crops analytically. The shp files used on a software called QGIS to compare the difference in the crop data visually.

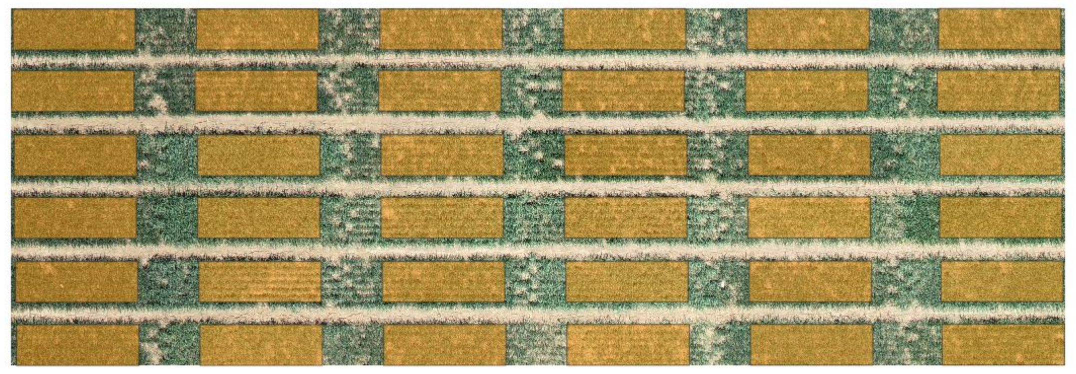

Figure 4. Exemple of Using QGIS with Generated Data

What the Results Mean for the User

With the results gathered, the user can compare between different dates and test different methods of growing the crops based on the previous methods used and the data collected. The user/farmer can continue to use new images to check their progress over time and eventually find the best method based on the soil and location of the crops in question.

	id	left	top	right	bottom	20220408	20220427	20220523
0	9	641748.7	3073982	641758.7	3073980	0.016754	0.778081	0.902052
1	10	641748.7	3073980	641758.7	3073978	0.015598	0.784338	0.976982
2	11	641748.7	3073978	641758.7	3073976	0.01389	0.725447	0.994453
3	12	641748.7	3073976	641758.7	3073974	0.016896	0.842167	1.150672
4	13	641748.7	3073974	641758.7	3073972	0.018278	0.846724	1.088762
5	16	641758.7	3073982	641768.7	3073980	0.006797	0.731845	0.934732
6	17	641758.7	3073980	641768.7	3073978	0.006794	0.773701	0.955759
7	18	641758.7	3073978	641768.7	3073976	0.007307	0.794439	1.074013
8	19	641758.7	3073976	641768.7	3073974	0.011292	0.783522	1.169409
9	20	641758.7	3073974	641768.7	3073972	0.010201	0.705987	1.11635
10	23	641768.7	3073982	641778.7	3073980	0.006452	0.723834	1.048257
11	24	641768.7	3073980	641778.7	3073978	0.006135	0.737712	1.080687
12	25	641768.7	3073978	641778.7	3073976	0.007281	0.777502	1.129211
13	26	641768.7	3073976	641778.7	3073974	0.006974	0.834796	1.158324
14	27	641768.7	3073974	641778.7	3073972	0.008149	0.83309	0.941573

Table 1. Canopy Height Data for a Corpus Christi Project

Impact

By improving the allocation and manipulation of the generation of attributes, the user will have a better understanding of the change in crop growth by being able to better compare the data between each boundary. This will also help the user make more knowledgeable decisions on how to improve the growth of crops and eventually discover new methods with the use of this data.

Acknowledgements

We wouldn't have been given this project without the aid of the ECEN department and the Senior Design Courses. We also acknowledge Jose L. Landivar Scott for his aid and guidance throughout the course of the project to the point it is at now.