Tea Plantation Drone Cutter Documentation

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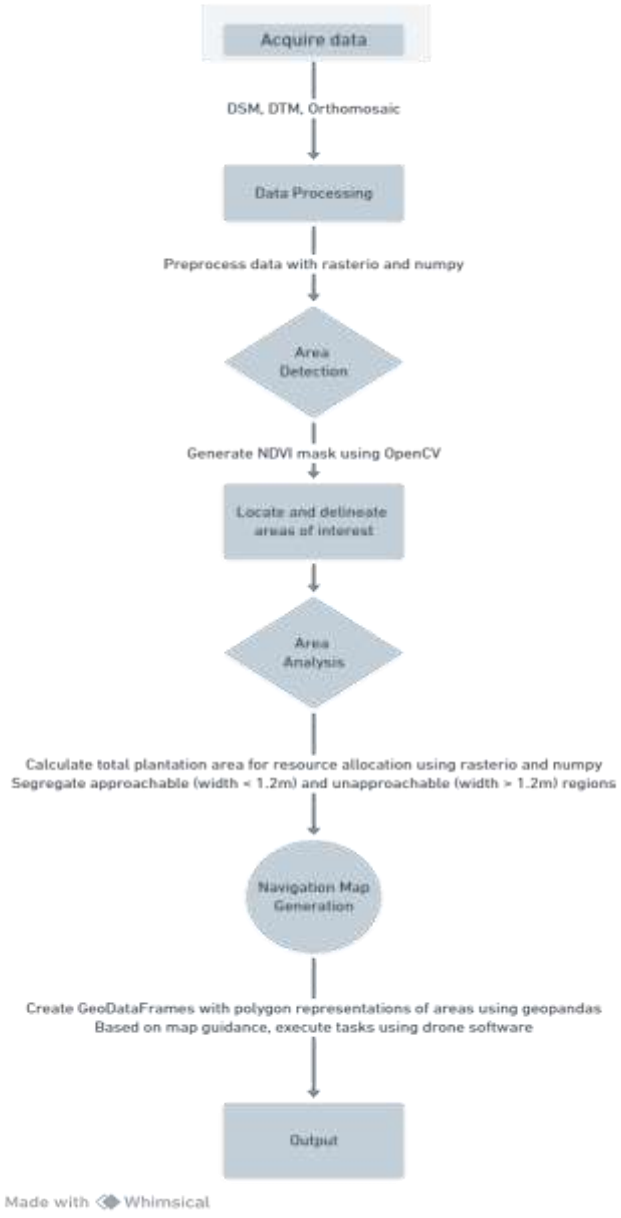
Summary:

This document details the development and functionalities of a Python and OpenCV-based program designed to revolutionize tea plantation management through drone technology. Leveraging satellite imagery and advanced algorithms, the program facilitates efficient area identification, vegetation analysis, and navigation map generation for precise drone operation.

1. The Approach:



a) Data Processing:

- Digital Surface Model (DSM), Digital Terrain Model (DTM), and Orthomosaic files are processed using libraries like rasterio and numpy.
- Normalized Difference Vegetation Index (NDVI) is calculated to distinguish vegetated areas from non-vegetated ones.

b) Area Detection:

- NDVI-derived masks are employed to precisely locate and delineate areas of interest within the plantation.

c) Area Analysis:

- Total plantation area is calculated for informed resource allocation.
- Vegetation width analysis (using DSM and DTM) aids in segregating approachable and unapproachable regions for optimized drone navigation.

d) Navigation Map Generation:

- GeoDataFrames containing polygon representations of different plantation areas are created using geopandas.
- These dataframes are exported as shapefiles to generate navigation maps guiding the drone.

2. Experimentation Results:

- Data Processing: Successfully processed DSM, DTM, and Orthomosaic files to derive meaningful insights.
- Area Detection: Efficiently identified vegetated regions using NDVI masks, confirming the accuracy of area detection.
- Width Analysis: Conducted width analysis to segregate approachable and unapproachable areas, enhancing the precision of drone navigation.
- Map Generation: Generated navigation maps incorporating vital plantation information, ensuring optimal drone maneuverability.

3. Observations:

- Accuracy: The program demonstrated high accuracy in identifying areas of interest and segregating approachable and unapproachable regions.
- Efficiency: Leveraging satellite imagery and drone technology significantly expedited plantation management processes, resulting in improved operational efficiency.
- Utility: The generated navigation maps proved instrumental in guiding the drone, highlighting areas requiring special attention due to varying bush widths.

Conclusion:

This project showcases the immense potential of technology in transforming agricultural practices. By streamlining plantation management, the program enhances operational efficiency and optimizes resource utilization. Further integration with real-world drone systems can lead to practical implementation, boosting productivity and profitability in tea plantations