Plant Height Measurement System

Overview

The Plant Height Measurement System is an automated image-processing tool designed to analyze plant growth over time. By processing images of plants taken over a period of 14 days, the system detects and measures plant height using computer vision techniques. This tool is particularly useful for researchers, farmers, and plant enthusiasts who need an efficient way to track plant growth.

Features

- Automatic Image Processing: Extracts plant height from images without manual intervention.
- HSV-Based Segmentation: Identifies plant regions based on color thresholding.
- Morphological Operations: Reduces noise and refines detected plant boundaries.
- Contour Detection: Identifies plant structures for height measurement.
- Growth Visualization: Generates a graphical representation of plant height over time.

How It Works

The system processes images captured daily and applies image processing techniques to extract plant height. The results are plotted in a graph, showing plant growth trends.

Function Descriptions

1. **enhanceImage(image)**

   This function processes the input image to enhance plant visibility by:

   - Converting the image from BGR to HSV color space for better segmentation.
   - Applying a color threshold to create a binary mask, isolating green regions.
   - Using Gaussian blurring to smooth the mask and remove noise.
   - Performing morphological operations (opening and closing) to refine the plant region.

2. **measurePlantHeight(imagePath, outputFolder)**

   This function processes an individual image to measure plant height:

   - Loads an image and applies the enhanceImage function to segment plant regions.
   - Identifies contours of the plant and filters out small, irrelevant contours.
   - Detects the largest contour, assuming it represents the plant.

- Draws a bounding box around the detected plant and calculates its height in pixels.
- Saves the processed image with the bounding box in the output folder.

3. **main(folderPath, outputFolder)**

This function processes multiple images from a specified folder:

- Iterates through a set of daily images for 14 days.
- Calls measurePlantHeight for each image to extract plant height.
- Stores the extracted height values and associates them with corresponding days.
- Generates a time-series plot displaying plant growth trends over 14 days.
- Saves and displays the growth graph for further analysis.

Usage

1. Place plant images in the projectImages folder.
2. Run the script to process images and measure plant height.
3. View the results in the detectedContours folder, where processed images with bounding boxes are saved.
4. Check the plotted graph for a visual representation of plant growth over time.

Applications

- Agricultural research for monitoring plant development.
- Home gardening and plant tracking.
- Automated greenhouse monitoring for optimizing growth conditions.