Rajarata University of Sri Lanka

Faculty of Applied Sciences -Department of Computing

ICT2403 – Graphics and Image Processing

Image Segmentation Model Report

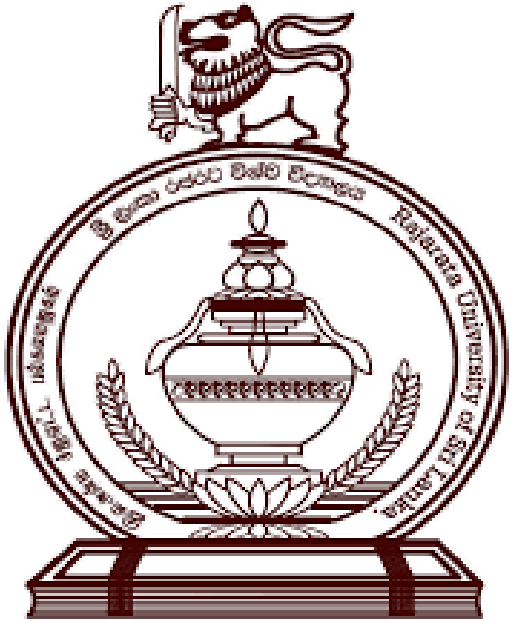

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Image Segmentation Model Report

I. Introduction

This report provides an overview of an image segmentation model designed to analyze plant growth parameters, including leaf count, plant height measurement, and structural changes over time. The segmentation techniques applied enable precise isolation of the plant from the background, ensuring accurate analysis of its growth.

II. Segmentation Setup

The system setup includes:

- **Software Tools:** Python, OpenCV, NumPy, and Matplotlib
- **Hardware Requirements:** A computer with an adequate processor and mobile phone camera for capturing images
- **Processing Environment:** Jupyter Notebook for implementing and testing segmentation algorithms
- **Lighting Conditions:** Controlled illumination (Table lamp) to minimize background interference and ensure consistent segmentation

III. Segmentation Techniques Applied

Several image processing techniques were applied for segmenting the plant from the background:

1. **Thresholding:** Binary thresholding and adaptive thresholding were used to isolate the plant from the background.
2. **Edge Detection:** Canny edge detection was applied to detect plant boundaries and refine segmentation.
3. **Contour Detection:** Contours were used to extract features such as plant height and leaf count.
4. **Morphological Operations:** Dilation and erosion techniques were implemented to remove noise and improve segmentation accuracy.

IV. Segmentation Parameters and Consistency

To ensure accuracy and consistency:

- Threshold values were calibrated based on lighting conditions.
- Edge detection parameters were adjusted to capture fine details.
- Contour detection methods were fine-tuned to avoid detecting background noise.
- A time-lapse image series was analyzed to ensure uniform segmentation performance.

V. Segmentation Results and Discussion

- **Plant Height Measurement:** The tallest contour was detected, and a bounding box was drawn to determine plant height in pixels.
- **Leaf Count Estimation:** Contour analysis and shape filtering techniques were used to count individual leaves.
- **Edge Detection Outcome:** Edge-based segmentation provided a clear plant outline, aiding in growth tracking.
- **Thresholding Performance:** Adaptive thresholding was more effective in handling variable lighting conditions compared to simple binary thresholding.

VI. Assessment of Plant Growth

- Growth trends were analyzed by comparing height measurements over time.
- Leaf count was tracked to monitor new leaf formation and overall plant health.
- A combination of segmentation methods provided a more reliable growth assessment than a single technique.

VII. Evaluation Metrics.

- **Visualization:** Growth trends and leaf count were represented through graphs.

DAY	COUNT
1	0
2	0
3	2
4	2
5	3
6	3
7	3
8	3
9	4
10	4
11	3
12	4
13	4
14	4
15	4
16	4