Digital Image Processing

23.2F

Project Proposal

Plant Health Level Indicator

Higher National Diploma in Software Engineering - 23.2F

Team Member Details

Leader - COHNDSE23.2F-040 - J.I.JAYARATNA

Member 1 - COHNDSE23.2F-046 - G.P.S WIMALASOORIYA

Member 2 - COHNDSE23.2F-047 - H.A.C.P RANASINGHE

Member 3 - COHNDSE23.2F-101 - H.M.S.D RATHNAYAKE

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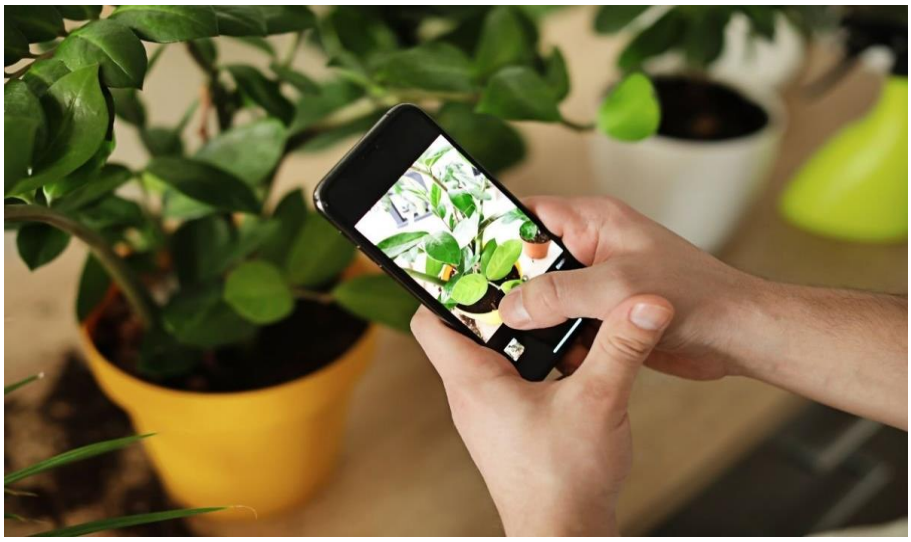
1.0 Introduction

In agriculture and gardening, observing plant health is critical for maximizing yield and make certain defendable practices. As in usual of evaluate plant health frequently manual examination, which can be prolonged, prejudiced, and prone to human fault. In addition, farmers and gardeners would not all the time have the skill to perfectly diagnose the situation of the plant based of their visual prompt alone.

Presently the plant health monitoring application depend on high cost sensors or need large manual data input. These solution can be unreachable to small-scale farmers or hobbyists due to costly and difficulty. Furthermore, some other digital tools may supply only general information in absence of adjust insights based on particular plant types or condition.

The plant health level indicator focus to control these limitations by manipulating image-processing capability to examine the color of leaves and flowers. This proceed towards offers an economically, feasible and accessible solution for audit plant health. By detecting color difference that specify potential matter such as nutrient obtainable, disease, pressure the application can supply real-time response and reachable advice.



2.0 Objectives of the Project

Main Objective:

Building a tool with Google Collab that will process images of plant leaves or flowers, recognize their color using digital image processing methods and give the user an extensive report on the health of plants alongside suggestions for improvement.

Specific Objectives:

Image Upload and Processing:

- Create models with openCV and save and Upload the Plant Leaf/Flower Image In Collab.
- Apply image preprocessing such as noise reduction and contrast enhancement to ensure a clear color detection result.

Color Recognition:

- Use DIP (Digital Image Processing) techniques to recognize & classify colors appearing in the uploaded images.
- Learn to differentiate in various shades of green, yellow and brown or any other relevant colors so you can determine the health status of a plant.

Plant Health Assessment:

- Create a color-model database that relates certain patterns to the most common health problems (e.g., nutrient deficiencies, diseases or water stress).
- Write an algorithm where detected colors are tested with a database and its health condition.
- Customized Treatment Recommendations
- Create customized health & care prompts based on the results including ways to improve plant health.
- Provide advice on watering, feeding for taking care of the plant.

Validation and Testing:

- Have a dataset of images for plants and process the output between salt image detection and health analysis
- It should be widely tested on different plant species and environmental conditions to demonstrate its validity as a tool.

Documentation and User Guide:

- Version of the tool: exists as a documentation Developed algorithms Yes Concept behind it running how it gives output, etc.

- Systematic instruction manual about how to upload images and translate health reports & tips

After reaching these defined the plant health level, then Plant Health Level Indicator gives a trustworthy rating on how they are and excellent suggestions for overall care of plants leading to greener space.

3.0 Expected Deliverables

1. Image upload and processing Area.

A well-designed Google Collab notebook enables users to send images about plant leaves either flowers.
Use of classical image preprocessing methods in order to improve the quality of images, which leads at making them more robust when implementing analysis.

2. Color Detection Module:

Color fact algorithm for image processing - true to how precise or fast it is at detecting colors, depending on the photo we uploaded.

Ex: Green and bleaching - Green (all bending), Brownish. Some other to check on plant wellness.

3. Health Examination Method:

A color explain and investigate the system to recognize the health of the plant from detected colors.

The color patterns related with usual plant health issues in a database are coordinate with the notice palates for correct evaluation of herb wellness.

4. Plant Health Reports:

Health reports - Automatically generated in-depth reviews of the health conditions related to color analysis.

Detecting the likely plant health problems during nutrient nutrients, disease and water stress.

5. Recommendation Engine:

Health diagnosis-based recommendations for care process personalization.

Proven techniques for care of the plants watering, implantation and pest remover to help enhance plant health

6. Verify and Assessment Document

Full experiment results that supply verification as to the perfection and trustworthiness of the color detection, health inspection algorithms.

Verification reports to make sure the tool work well in dissimilar scheme and with various plant species.

7. Manual and confirmation

Well-documented evolutionary operation, algorithms and characteristic of the tool.

4.0 Project Team Composition

This project was built with 4 members of the group. The process of this project was delegated to all the members of this Group.

As 4 members of this group, we had to manage how things should happen at different times this project idea did not come up with the full operation it was developed with other members' ideas as well. As a Plant health indicator, the project had some testing areas which is it identifies the color of the project and outputs the health status of the given plant for that application within the coding knowledge we are able to build the project.

5.0 Project Description

5.0.1 Study on Previous Projects

Formation of Plant Health Level Indicator prior to starting our work on constructing a plant health level indicator, we went through a large review of earlier global studies and connected projects. We comprehensive extracted practical knowledge and ideas:

Literature Review: Initially, we searched academic articles related to image process for plant health detection. We then search guided with keywords, such as Plant health monitoring or Image processing in agriculture and Leaf disease detection.

These included analyses of case studies published by different agricultural research institutes and universities that had implemented plant health monitoring systems effectively. The present build is understandable what the actual world occurrence & challenges.

Plan Reports: We google at project plan reports created by earlier university groups, open-source concepts like GitHub to research the methodologies.

Through these learnings, we identify usual image processing techniques like color examination, division, and machine studying algorithms worn for plant health assessment. We also pick out suggestion on how to preprocess images, chosen applicable characteristics, and implement structuring models to diagnose plant health situation.

5.0.2 Project Area & Title

Domain: Agriculture Technology (Plant Health Monitoring)

Title of the Project: Plant's Health level Indicator

Our project is to create a Plant Health Level Indicator where when an image of the leaf or flower from the plant will be taken and based on its condition, then machine would classify that whether in which category(RED (Unhealthy), YELLOW(Medium) & GREEN(Healthy)) our concerned Image belongs. Plant Digitization for Growers - This tool will enable scanning and monitoring of plant health on need basis, enrich available resources (IOT devices), integrate with external sources/map-based solutions or carry out necessary actions to enhance and sustain the same if it is optimum.

For our project needs, below key areas were identify that should align:

Image Processing Techniques: Our aim is to utilize color analysis, segmentation and machine learning algorithms for detecting and classifying different aspects of plant health.

Data Collection: The images will be collected by clicking self-snapped photos and using normal photographs in smartphones, or brought-in cameras. This ensures that the data is real world representative.

Colab interface: The system will have an interface where they can upload images and the health report would be generated with prescriptions what to do next.

Taking advantage of the experience obtained from previous research, we will initiate a profitable monitoring system that can be quite useful in assessing plant health. The title of our project "Plant Health Level Indicator" clearly explains what the system is for and why it performs this way.

5.0.3 Methodology & Technology Stack

Methodology:

1. **Aim:** Generate a structure that examine the health of leaves or flowers by focus at pictures

2. Image Processing Approach:

Color Analysis- it assist in recognize the health matter like chlorosis or necrosis by examine a distribution concerning the colors present on images.

Image Segmentation: Apply different image segmentation techniques, such as Otsu's threshold or k-means clustering for leaf and flower background separation.
Feature Vector: Computation of Feature vectors using color histograms, texture patterns and shape descriptors.

Classify Use machine learning methods (e.g. SVM, Random forest etc.) to categorize the health of plant form on extracted property.

3. Software Tools:

Collab: Google Collaboratory for apply and examine our algorithms. Provide a cloud-based surrounding with GPU support for speed image processing as well as model instruction.

OpenCV: For task like image processing (filter, segment and find features)

4. Data Collection:

Figure: assemble plant leaf and flower images over dissimilar origin, e.g., self-captured photos & publicly obtainable online datasets

Recommendations: Use a mixture of healthy and infected specimens traverse different type to enlarge model applicability.

5. Coding Procedure:

Development Environment - Development and testing must be complete in Google Colab.

Version Control: Used GitHub toward track replace in the source code and improve collaborate on projects with additional developers.

Software Quality Control: Perform exhaustive reviews, among unit tests to the combination of different modules and conclude with user acceptance test.

Privacy: Retrieve dataset with Info Group API Given that we will be using data from the public domain (Info Group), there are no privacy considerations outside of ensuring volunteer consent in creating our training datasets.

5.0.4 Timeline & Milestone

To help track progress and to enable for the most accurate evaluation possible our project is broken down into a series of phases with specific milestones associated.

Our Team plans to develop a robust, user-friendly Plant Health Level Indicator system that covers all targets and allow for more insights into the plant-health monitoring by following this timeline.

- Day 01 – Project Start
- Day 02 to 04 – Planning
- Day 05 - Testing
- Day 06 - Deployment
- Day 07 - Project End

6.0 Team Declaration

We hereby declare this project, Plant Health Level Indicator to be an authentic record of our own work. We have not copied any existing solution or simply duplicated the same; we are also using no type of AI machine learning algorithms for content generation. We have all worked tirelessly to come up with fresh approach helping us solve the chosen problem.

This work is a joint project of Induwara Jayaratna - COHNDSE23.2F-040

Pasindu Sahansith - COHNDSE23.2F-046

Chamodya Piyasarani - COHNDSE23.2F-047

Senuki Rathnayake - COHNDSE23.2F-101

Every member had a hand, offering his or her expertise in the different phases of the project from developing concept until finalizing layout.