Functional Requirements

Project title :FERTILIZER RECOMMENDATION SYSTEM FOR DISEASE PREDICTION
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Image Acquisition:

Plants are structures specialized for photosynthesis and are arranged on the tree in such a way as to maximize their exposure to light without shading each other. In this module, we can upload the leaf images from the datasets. This database called herbs was originally created for experiments with recognition of wood species based on a leaf shape. It contains plants of species growing in the Czech Republic, both trees and bushes; native, invasive and imported (only those imported species which are common in parks are included). The number of samples (plants) of one species varies from 2 to 25; their total number in the database is 795. The plants were scanned with 300 dpi, threshold (binarized) ,preprocessed (denoising and cleaning) and saved in PNG format.

Preprocessing:

In this module convert the RGB image into gray scale image. The colors of plants are always green shades and the variety of changes in atmosphere cause the color feature having low reliability. Therefore, to recognize various plants using their plants, the obtained leaf image in RGB format will be converted to gray scale before pre-processing. The formula used for converting the RGB pixel value to its grey scale counterpart is given in Equation.

$$Gray = 0.2989 * R + 0.5870 * G + 0.1140 * B$$

where R, G, B correspond to the color of the pixel, respectively.

Then remove the noises from images by using filter techniques. The goal of the filter is to filter out noise that has corrupted image. It is based on a statistical approach. Typical filters are designed for a desired frequency response. Filtering is a nonlinear operation often used in image processing to reduce "salt and pepper" noise.

Image Segmentation:

In this module, we can implement Guided active contour method with automatic descriptors. Unconstrained active contours applied to the complex natural images we aim at dealing with would produce unsatisfying contours, that would try and make their way through every possible gap and aw in the border of the leaf. The solution we propose is to use the polygonal model obtained after the first step not only as an initial leaf contour but also as a shape prior that will guide its evolution towards the real leaf boundary.

Use the resulting polygon as a shape prior to drive the evolution of an active contour

- Set the initial contour on a contracted version of the polygon
- Constraint the contour to remain close to the polygon

Energy Formulation

- For a contour τdelineating a region $\Omega(\tau)$:
- $E(\tau) = \alpha ELeaf\ (\tau) + \beta EShape(\tau) + \gamma EGradient(\tau) + \delta ESmooth(\tau) - \delta EBalloon(\tau)$

Instead of having an external energy term based on color consistency, or distance to a mean, we decided to reuse the dissimilarity map from the previous step, considering we have already an efficient measure of how well a pixel should fit in the leaf, in terms of color.

Disease Prediction:

Plants are affected by bacteria, fungi, virus and other insects. In this module implement support vector machine algorithm to classify the leaf image as normal or affected. Vectors are constructed based leaf features such as color, shape, textures. Then hyperplane can be constructed with conditions to categorize the preprocessedplants. And also implement multiclass classifier, we can predict diseases in herbs images with improved accuracy.

Fertilizer Recommendation:

In this module recommend the fertilizer for affected plants based on severity level. Fertilizers may be organic or inorganic. Admin can store the fertilizers based on disease categorization with severity levels. The measurements of fertilizers can be extracted based on disease severity.

Non - Functional Requirements

Usability

The system shall allow the users to access the system with pc using web application. The system uses a web application as an interface. The system is user friendly which makes the system easy

Availability

The system is available 100% for the user and is used 24 hrs a day and 365 days a year. The system shall be operational 24 hours a day and 7 days a week.

Scalability

Scalability is the measure of a system's ability to increase or decrease in performance and cost in response to changes in application and system processing demands.

Security

A security requirement is a statement of needed security functionality that ensures one of many different security properties of software is being satisfied.

Performance

The information is refreshed depending upon whether some updates have occurred or not in the application. The system shall respond to the member in not less than two seconds from the time of the request submittal. The system shall be allowed to take more time when doing large processing jobs. Responses to view information shall take no longer than 5 seconds to appear on the screen.

Reliability

The system has to be 100% reliable due to the importance of data and the damages that can be caused by incorrect or incomplete data. The system will run 7 days a week. 24 hours a day.