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SURVEILLANCE FOR LEAF DETECTION USING HEXACOPTER

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Abstract – *The project consists of different image processing techniques. Which are used to detect plant leaf. The main objective of this technique is the detection and implementation of image analysis. This is used for classification of the leaf. We will implement this system on Hexacopter. Basic system setup consists of the framework which is made up of four parts 1) Preprocessing 2) Segmentation of the leaf to identify the different types of plant leaf 3) Support Vector Machine (SVM) used for classification & 4) Gray-Level Co-Occurrence Matrix (GLCM) is used for feature extraction.*

Key Words: *Classification, Segmentation, GLCM, SVM*

1. INTRODUCTION

The leaf is an important parameter while studying plant nutrition, plant photosynthesis, respiration rate, crop ecosystems, plant protection measures, transpiration rate and soil-water relations. To conserve plant species, their identification is the first step. Therefore, it is highly essential to have an object recognition system to identify various species and protect them from being endangered. The developments in the field of computer vision can be utilized for this purpose of human vision possible by electronically capturing an image. Plant science has stimulated the importance of leaf area determination. Different methods for leaf area measurement like blueprinting, photographing, width and length correlation and usage of electronic devices etc. In general, a digital camera is used to capture the image of the leaf. Then these image is transferred to the computer system where analysis of leaf is carried out [3].

The proposed method uses the combination of shape & colour features to classify the query leaf on comparison with the leaves present in the database. Leaf identification can be done by using many features. Image of a leaf can be identified by a database using an appropriate algorithm. Various features have been extracted to describe different leaf Shape. [1] The centre distance curve method is used for calculation of the distance between the centre of contour and each point on contour. This is further used for the representation of leaf images. [5] Different geometrical features and invariant moment features like rectangularity, aspect ratio, eccentricity etc used for extraction of leaf images.

Fig 1. Healthy Leaf image and effected image

Fig.2 & Fig.3 HSV and Segmented leaf

2. LITERATURE SURVEY

1. R. Radha, and Jeyalakshmi.

In this research paper, the different nutrient status, deficiency symptoms and the diseases can be determined by the effective algorithm for edges and detection of veins in leaf images. The algorithm used in the process of images processing is Sobel edge detection and Canny's edge detection which are an effective tool that provides accurate and positive results.

2. R.A Gopal, S. Prudheshwar Reddy, V Gayatri.

The paper is about the classification of a variety of selected medicinal plant, where its database of the system comprised of 52 different shapes of the leaf, 13 type of edge, a type of tips 11 bases, 12 types of surface

and 28 types of trichomes. Statistical discriminant analysis, clustering of neural network and also curvature scale space technique and K-means classifiers are used for the identification of the leaf images.

3. G. P. Saraswathy, G. Ramalakshmi and R. Meena Prakash.

In this paper the defects in the plant leaves and different leaf diseases. There are different processes followed for the image processing setup. For these processes, different algorithms are used such as for 1. Segmentation is done by K-means clustering. 2. Grey level co-occurrence system (GLCM). 3. State vector machine (SVM) of the leaf using leaf image. Hence in this paper, the different leaf images are analyzed for the detection of the disease in the leaf.

3. PROPOSED METHODOLOGY

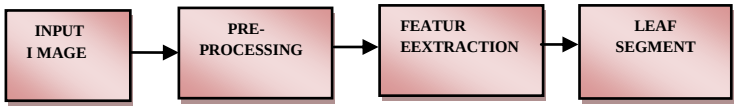

Fig 4.Overview of Proposed Method

1. INPUT IMAGE

This image processing module has input as an image captured by the camera. This input image was taken by the camera in real time as well as from online database i.e. Plant Village dataset available on the internet source.

2. PRE-PROCESSING

This image is pre-processed to make it suitable for further process. Filtering is the important operation of pre-processing. Here the median filter is used to remove noise and to make the image smoother. Median filtering is a nonlinear method used to remove noise from images. It is widely used as it is very effective at removing noise while preserving edges. It is particularly effective at removing 'salt and pepper' type noise. The median filter works by moving through the image pixel by pixel, replacing each value with the median value of neighbouring pixels. The pattern of neighbours is called the "window",

this slides, pixel by pixel over the entire image pixel, image. The median is calculated by first sorting all the pixel values from the window into numerical order, and then replacing the pixel being considered with the middle (median) pixel value

3. FEATURE EXTRACTION

The plant leaves can be represented by the textures. Hence in this system, we can distinguish the leaves by texture features. The well-known algorithm for texture feature extraction is the Gray Level Co-occurrence Matrix (GLCM). In statistical texture analysis, texture features were computed on the basis of the statistical distribution of pixel 7intensity at a given position relative to others in a matrix of the pixel representing the image. Depending on the number of pixels or dots in each combination, we have the first-order statistics, second-order statistics or higher-order statistics. Feature extraction based on grey-level co-occurrence matrix (GLCM) is the second-order statistics that can be used to analyzing image as a texturing is a tabulation of the frequencies or how often a combination of pixel brightness values in an image occurs. Features are the statistical data of the image. GLCM is the method which is used to extract different features form Gray and binary image. In the proposed approach following GLCM features are extracted.

4. LEAF SEGMENTATION

It is the statistical method of investigating texture which considers the spatial relationship of pixels. The GLCM functions characterize the texture of images by computing the spatial relationship among the pixels in the images. The statistical measures are extracted from this matrix. In the creation of GLCMs, an array of offsets which describe pixel relationships of varying direction and distance have to be specified. There are four features are extracted which include contrast, energy, homogeneity and correlation. Let Pij represents the (I, j) the entry in the normalized Gray-Level Co-occurrence Matrix. N represents the number of distinct grey levels in the quantized image. The different features extracted are defined as follows.

5. GRAY LEVEL CO-OCCURRENCE MATRIX(GLCM)

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1. Contrast

Contrast measures the local variations in the grey-level co-occurrence matrix.

$$\text{Contrast} = \sum_{i,j} |i-j|^2 p(i,j)$$

2. Homogeneity

Homogeneity measures of the closeness of the element distribution in GLCM to GLCM diagonals.

$$\text{Homogeneity} = \sum_{i,j} \frac{1}{1+(i-j)^2} p(i,j)$$

3. Dissimilarity

Dissimilarity is a measure that defines the variation of grey level pairs in an image.

$$\text{Dissimilarity} = \sum_{i,j} |i-j| p(i,j)$$

4. Autocorrelation

Autocorrelation is the measure of the relation between the neighbour pixels in an image. It says that the image has no pixel element that is correlated that everything is unique.

$$\text{Autocorrelation} = \sum_{i,j} p(i,j)/log\ (p(i,j))$$

6. SCALE VECTOR MACHINE(SVM)

SVM efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces works on the principle of structural risk minimizations is a binary classifier that separates two classes. Two important aspects for developing SVM as a classifier are the determination of the optimal hyperplane which will optimally separate the two classes and the other is the transformation of non-linearly separable classification problem into a linearly separable problem. Linearly separable binary classification problem with no possibility of miss-classification data

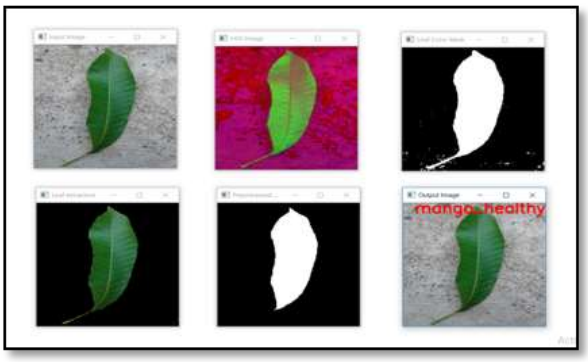

Fig 5. Leaf detection

4. CONCLUSION

The plant leaf species detection system has been studied. The images are taken from online Plant Village dataset and own data set is created. The segmentation of leaf part is carried out using HSV threshold. The texture, colour and some statistical features are extracted which are useful for the machine learning algorithm to classify. We are going to implement this system by using Raspberry Pi and python on Open-CV platform

5. REFERENCES

[1] Radha, R., & Jeyalakshmi, S. (2014). "An Effective Algorithm for Edges and Veins Detection in Leaf Images". World Congress on Computing and Communication Technologies.

[2] Gopal, A., Prudhveeswar Reddy, S., & Gayatri, V. (2012)." Classification of selected medicinal plants leaf using image processing". International Conference on Machine Vision and Image Processing (MVIP).

[3] Prakash, R. M., Saraswathy, G. P., Ramalakshmi, G., Mangaleswari, K. H., & Kaviya, T. (2017). "Detection of leaf diseases and classification using digital image processing". International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS)

[4] Wang, B., Brown, D., Gao, Y., & Salle, J. L. (2013). "Mobile plant leaf identification using smart-phones".IEEE International Conference on Image Processing.

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