LEAF DISEASE DETECTION SYSTEM USING RASPBERRY-PI USING NEURAL NETWORK

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ABSTRACT: The main objective of this research is to develop a prototype system for detecting the disease in paddy which are bacterial leaf spot, target spot, sectorial leaf spot, leaf mold disease. This paper concentrate on the image processing techniques used to enhance the quality of the image and neural network technique to classify the disease in plants. The methodology involves image acquisition, pre-processing and segmentation, analysis and classification of the paddy disease. For image segmentation we use K-means clustering method and features are computed from disease affected cluster. Features such as Contrast, Correlation, Energy, Homogeneity, Mean, Standard Deviation and Variance are extracted. The extracted features from disease cluster are given as classifier inputs to classify the disease.

KEYWORDS: Raspberrypi, paddy disease, Neural Network, Homogeneity, Standard Deviation, MATLAB.

INTRODUCTION: A product quality control is fundamentally required in order to gain more value-added products[2]. Many studies show that the quality of agricultural products can be reduced from many causes. One of the most important factors of such quality is plant diseases. Consequently, minimizing plant diseases allows substantially improving quality of the products. Rice known as Oryza Sativa (specific name), is one of the most utilized food plants and widely grown originated in ASIA. [4] Rice is an important crop for worldwide and over half of the world population relies on it for food. Many people in the world including Malaysia eat rice as staple food. However, there are many factors that effect paddy rice production become slow and less productive. One of the main factors is disease.. An abnormal condition that injures the plant or leads it to function improperly is called as a disease. Diseases are readily recognized by their symptoms. There are a lot of paddy disease types which are Bakanae, red disease virus, brown spot disease and many more.[1] Image processing and computer vision technology are very beneficial to the agricultural industry. They are more potential and more important to many areas in agricultural technology [1]. Paddy Disease Detection System is one of the very beneficial systems. It can help the paddy farmer to detect the disease faster. This study aims to develop a prototype system that automatically detect and classify the disease in paddy by using image processing techniques as an alternative or supplemental to the traditional manual method. India is fast developing country and agriculture is the back bone for the countries development in the early stages. Due to industrialization and globalization concepts the field is facing a lot of hurdles. On top of that the awareness and the necessity of the cultivation need to be installed in the minds of the younger generation. Nowadays technology plays vital role in all the fields but till today we are using some old methodologies in agriculture. Identifying plant disease wrongly leads to huge loss of yield, time, money and quality of product. Identifying the condition of plant plays an important role for successful cultivation. In olden days identification is done manually by the experienced people but due to the environmental changes,the prediction became so tough. So we can use image processing techniques for identification of plant disease. Generally we can observe the symptoms of disease on leafs, stems, flowers etc. so here we use leafs for identification of disease in affected plants. The feature extraction is done in RGB, HSV, YIQ and Dithered Images. The feature extraction from RGB image is added in the suggested system. A new automatic method for disease symptom segmentation in digital photographs of plant leaves. The diseases of different plant species has mentioned. Classification is done for few of the disease names in this system. The disease recognition for the leaf image is performed in this work. India is eminent for Agriculture that means most of the people are engaged towards agriculture industry. The agriculture industry act as a significant role in the economic sectors.

LITERATURE REVIEWS:

This chapter briefly reviews, explains and discusses on existing literature review related with the current project which is "Paddy Disease Detection System Using Image Processing" that will be developed later. This chapter comprises three sections. The first section describes the overviews of paddy. The subsections are the definition, type of paddy disease, paddy symptom and paddy management. The second section is the review of some existing system that used same techniques and methods. The third section discusses the review on technique and method used by the system. The subsections are image acquisition, image segmentation and artificial neural network.

There are many factors that make paddy rice production become slow and less productive. One of the main factors is paddy disease. The table below will show you type of paddy disease, the symptom of paddy disease and the management of paddy disease. This researches focus on three types of diseases, which are paddy blast, brown .Gavhale, and U. Gawande, Gavhale and Gawande (2014) presented reviews and summarizes image processing techniques for several plant species that have been used for recognizing plant diseases. The major techniques for detection of plant diseases are: back propagation neural network (BPNN), Support Vector Machine (SVM), K-nearest neighbor (KNN), and Spatial Gray-level Dependence Matrices (SGDM). These techniques are used to analyses the healthy and diseased plants leaves. Intelligent Diagnose System of Wheat Diseases Based on Android Phone by Y. Q. Xia, Y. Li, and C. Li , In 2015, Xia and Li have proposed the android design of intelligent wheat diseases diagnose system. In this process, users collect images of wheat diseases using Android phones and send the images across the network to the server for disease diagnosis. After receiving disease images, the server performs image segmentation by converting the images from RGB color space to HSI color space. The color and texture features of the diseases are to be determined by using colour moment matrix and the gray level co-occurrence matrix. The preferred features are input to the support vector machine for recognition and the identification results are fed back to the client. Implementation of RGB and Gray scale images in plant leaves disease detection –comparative study by Padmavathi and Thangadurai (2016) have given the comparative results of RGB and Gray scale images in leaf disease finding process. In detecting the infected leaves, color becomes an important feature to find the disease intensity. They have considered Grayscale and RGB images and used median filter for image enhancement and segmentation for extraction of the diseased portion which are used to identify the disease level. The plant disease recognition model, based on leaf image classification, by the use of deep convolution networks have developed. 13 kinds of diseases are identified from the healthy leaves with the capability to differentiate leaves from their surroundings.

Soil moisture determination using remote sensing data for the property protection and increase of agriculture production. To provide geospatial data that enables generation of adequate information related to floods and droughts, we applied the remote sensing method that relies on the use of soil-moisture index (SMI) which in its algorithm uses the data obtained from satellite sensors. As presented by Hunt, the index is based on the actual content of water (), water capacity and wilting point. Multispectral satellite images from visible (red band) and infrared bands (near infrared and thermal bands) are essential for the calculation of the index. A Brief Review on Plant Disease Detection using in Image Processing Digital image process is the use of computer algorithms to perform image process on digital pictures. It permits a far wider vary of algorithms to be applied to the computer file and might avoid issues like the build-up of noise and signal distortion throughout process. Digital image process has terribly important role in agriculture field. It's widely accustomed observe the crop disease with high accuracy. An IoT Based Soil Moisture Monitoring on Losant Platform The Internet of Things (IoT) is converting the agriculture industry and solving the immense problems or the major challenges faced by the farmers today in the field. India is one of the 13th countries in the world having scarcity of water resources. Due to ever increasing of world population, we are facing difficulties in the shortage of water resources, limited availability of land, difficult to manage the costs while meeting the demands of increasing consumption needs of a global population that is expected to grow by 70% by the year 2050. Smart Farming: IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring using Arduino, Cloud Computing and Solar Technology. The Agriculture stick being proposed via this paper is integrated with Arduino Technology, Breadboard mixed with various sensors and live data feed can be obtained online from Thingsspeak.com. The product being

proposed is tested on Live Agriculture Fields giving high accuracy over98 percent in data feeds.

EXISTING TECHNIQUE: Fig1: describes the whole process of the proposed method, which starts from image acquisition i.e collecting the images from the data base. These images get segmented by using K-means clustering algorithm and features are extracted from the clusters and which are given to the ANN classifier as input. Image Acquisition is the process of collecting the images from database. The images are loaded from plant village data base. Loaded images are tomato healthy, tomato leaf spot and cotton leaf healthy and leaf spot. Image segmentation is the process of dividing the images into different parts i.e. clusters and which is done by using k-means clustering algorithm.

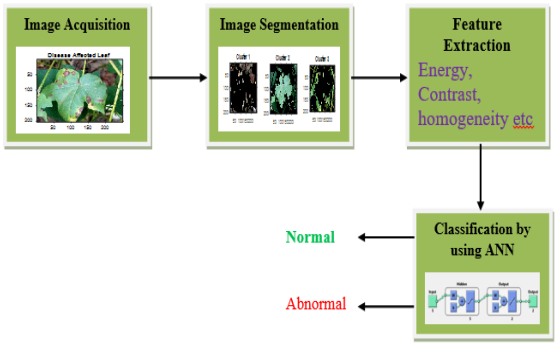


Fig.1. Proposed Method for Disease Detection

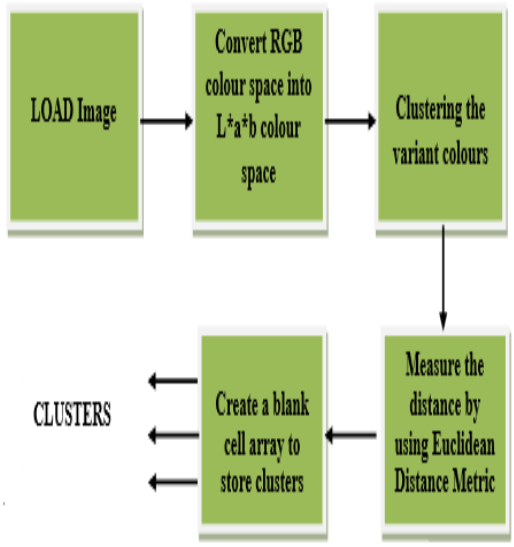


Fig 2. K-Means clustering Algorithm

K-means clustering algorithm is used to separate the stained part and healthy leaf region. In this, first step is- Load the image into MATLAB from the database, then convert the RGB image into L*a*b* colour space. L* represents the lightness, a* and b* represents the chromaticity layers. All of the colour information is in the a* and b* layers. And next step is clustering the variant colours. The Image gets partitioned into three regions by reallocating each pixel to its nearest clusters which reduces the sum of distances and recalculate the centroids of the clusters. Each cluster consists of different segments of leaf image. Three clusters have index values which are used to label the every pixel in the image using results from K-means. And the next step is creating a blank cell array to store the results of clustering.

K-MEANS CLUSTERING:

The k-means clustering [2] is one of the classical, well-studied unsupervised learning algorithms that solve the fundamental clustering problem. It attempts to discover possible categories in the given data through a process of organizing objects into groups whose members are similar in some way. A cluster corresponds therefore to a collection of objects which are “similar” to each other and are “dissimilar” to the objects belonging to other clusters. The k-means clustering can be considered to be the most important unsupervised learning approach. Section 2 provides more details about the k-means clustering. The k-means clustering method has the following potential advantages [26]: (1) dealing with different types of attributes; (2) discovering clusters with arbitrary shape; (3) minimal requirements for domain knowledge to determine input parameters; (4) dealing with noise and outliers; and (5) minimizing the dissimilarity between data. Thus, it finds applications in many fields such as marketing, biology and image recognition. However, for a successful application of the k-means clustering, we have to overcome its shortcomings: (1) the way of initializing means is not specified. One popular way to start is to randomly choose k of the samples; (2) the results produced depend on the initial values for the means, and it frequently happens that suboptimal partitions are found. The standard solution is to try a number of different starting points; (3) it can happen that the set of samples closest to some cluster centres is empty, so that they cannot be updated. This is an annoyance that must be handled in an implementation;(4) the results depend on the metric used to measure the dissimilarity between a given sample and a certain cluster centre. A popular solution is to normalize each variable by its standard deviation, though this is not always desirable; and (5) the results depend on the value of k.

CLASSIFICATION:

In this paper, Classification is done by using Neural Network tool. Seven Extracted features such as Contrast, Correlation, Energy, Homogeneity, Mean, Standard Deviation and Variance are given as input to the neural network and target data given to the neural network as class vector. In this back propagation neural network was used to classify the data. It gives the performance plot, confusion matrix and error histogram plot after the completion of training of the network.

NEURAL NETWORKS:

Neural networks are used for deep learning. And while they may look like black boxes, deep down (sorry, I will stop the terrible puns) they are trying to accomplish the same thing as any other model — to make good predictions.Neural networks are multi-layer networks of neurons (the blue and magenta nodes in the chart below) that we use to classify things, make predictions, etc. Below is the diagram of

PROPOSED TECHNIQUE:
CONVOLUTIONAL NEURAL NETWORKS

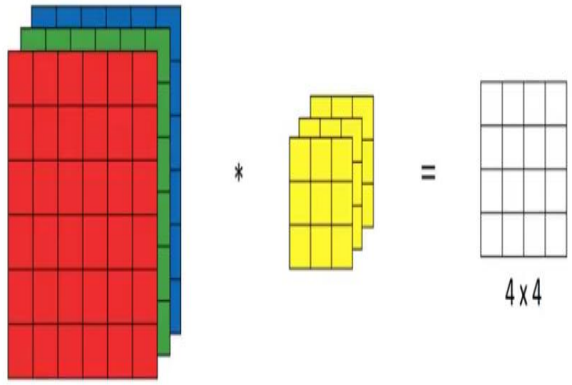
Convolutional neural networks. Sounds like a weird combination of biology and math with a little CS sprinkled in, but these networks have been some of the most influential innovations in the field of computer vision. 2012 was the first year that neural nets grew to prominence as Alex Krizhevsky used them to win that years imagenet competition (basically, the annual Olympics of computer vision), dropping the classification error record from 26% to 15%, an astounding improvement at the time. Ever since then, a host of companies have been using deep learning at the core of their services.facebook uses neural networks for their automatic tagging algorithms, Google for their photo search, Amazon for their product recommendations, Pinterest for their home feed personalization, and Instagram for their search infrastructure.

Convolutions Over Volume

Suppose, instead of a 2-D image, we have a 3-D input image of shape 6 X 6 X 3. How will we apply convolution on this image? We will use a 3 X 3 X 3 filter instead of a 3 X 3 filter. Let's look at an example:

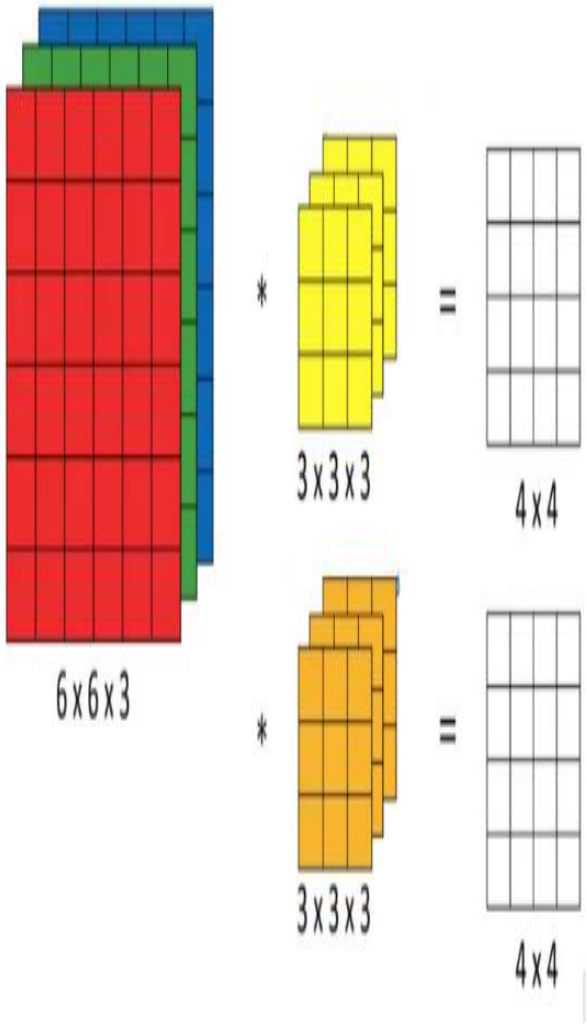
- **Input:** 6 X 6 X 3
- **Filter:** 3 X 3 X 3

The dimensions above represent the height, width and channels in the input and filter. **Keep in mind that the number of channels in the input and filter should be same.** This will result in an output of 4 X 4. Let's understand it visually:



Since there are three channels in the input, the filter will consequently also have three channels. After convolution, the output shape is a 4 X 4 matrix. So, the first element of the output is the sum of the element-wise product of the first 27 values from the input (9 values from each channel) and the 27 values from the filter. After that we convolve over the entire image.

Instead of using just a single filter, we can use multiple filters as well. How do we do that? Let's say the first filter will detect vertical edges and the second filter will detect horizontal edges from the image. If we use multiple filters, the output dimension will change. So, instead of having a 4 X 4 output as in the above example, we would have a 4 X 4 X 2 output (if we have used 2 filters):



Generalized dimensions can be given as:

- **Input:** n X n X n_c
- **Filter:** f X f X n_c
- **Padding:** p
- **Stride:** s
- **Output:** [(n+2p-f)/s+1] X [(n+2p-f)/s+1] X n_c'

Here, n_c is the number of channels in the input and filter, while n_c' is the number of filters.

RESULT:

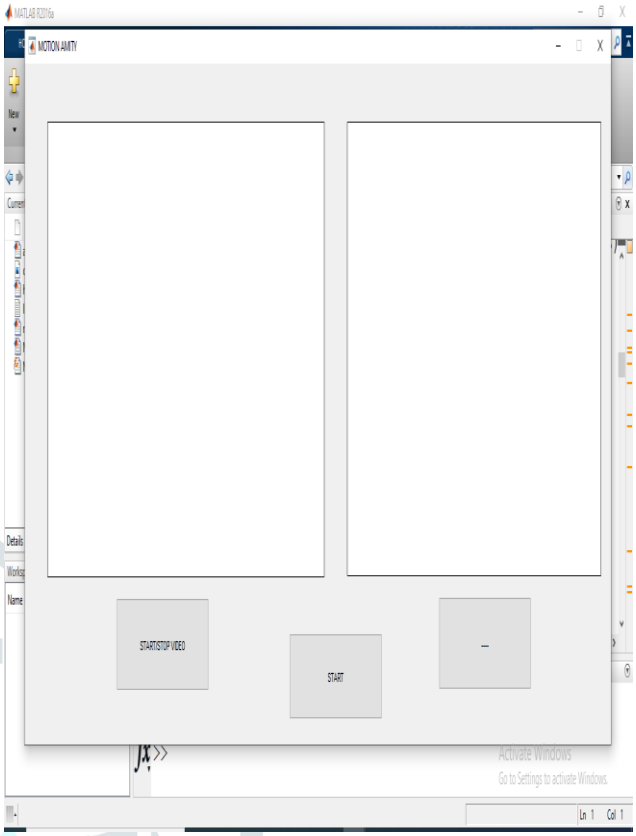


Fig3: GUI for entire code

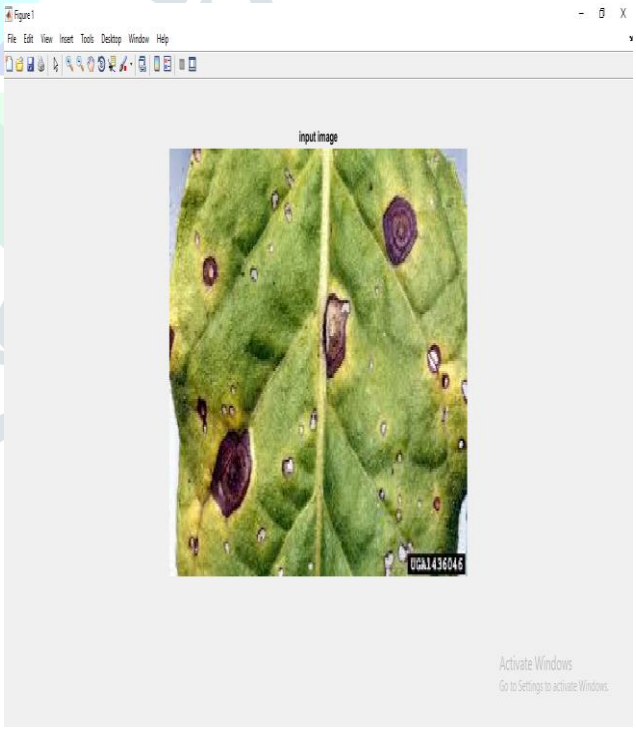


Fig4: Input image

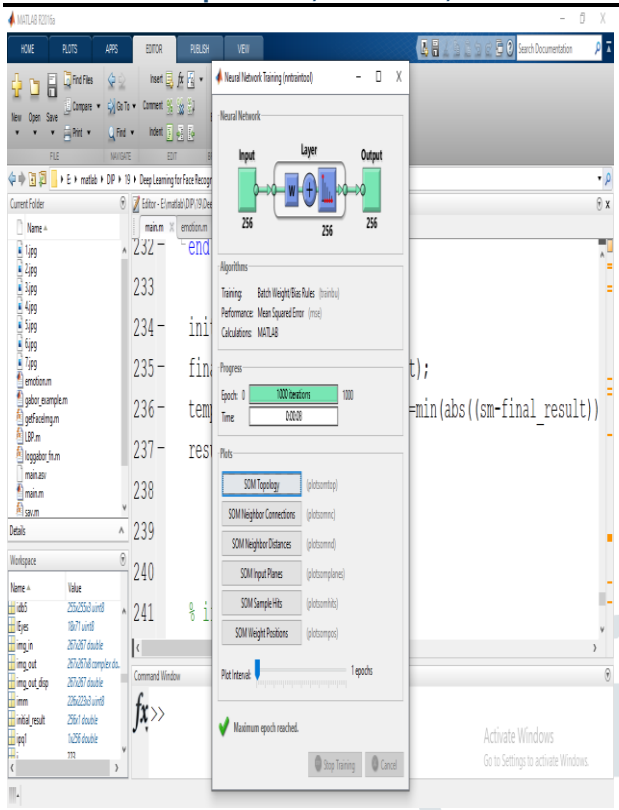


Fig5: Neural network

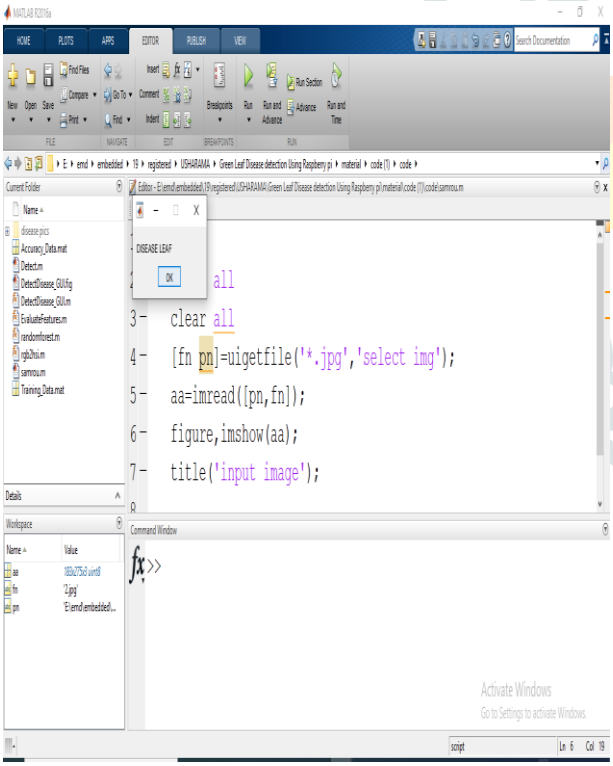


Fig6: Output classification

CONCLUSION:

This project implements an innovative idea to identify the affected crops and provide remedy measures to the agricultural industry. By the use of k-mean clustering algorithm, the infected region of the leaf is segmented and analyzed. The images are fed to our application for the identification of diseases. It provides a good choice for agriculture community particularly in remote villages. It acts as an efficient system in terms of reducing clustering time and the area of infected region. Feature extraction technique helps to extract the infected leaf and also to classify the plant diseases. CNN insertion yields excellent efficient to this concept for improvement in accuracy. The proposed approach is a valuable approach, which can significantly support an accurate detection of leaf diseases in a little computational effort.

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