An Efficient Approach for Identification of Multi-plant Disease Using Image Processing Technique

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Abstract Plant diseases must be identified to prevent loss of yields and quantities of agricultural products. Plant disease studies mean plant patterns are observable visually. Health monitoring and detection of plant diseases are very important for sustainable agriculture. Manually monitoring plant diseases is very difficult. It requires huge work, expertise in plant diseases and too long to deal with them. Image processing is therefore used to detect diseases of plants. Disease detection includes steps like image capture, image preparation, fragmentation of images, extraction of functions, segmentation and characteristic extraction. Farmers need automatic disease monitoring to improve crop growth and productivity. Manual Identification of plant diseases. Manual disease monitoring is not effective, because old naked eyes require a more time-limited process for expertise in disease recognition, and is therefore ineffective. This paper addresses plant disease detection using computer-aided method like image processing with MATLAB. Results show that 87% diseases identification has generated by proposed system.

Keywords Plant leaf features · Image disease detection · Image processing · Classification · Convolutional network

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1 Introduction

Plants are now susceptible to a variety of diseases as a result of the extensive use of pesticides and sprays; however, recognizing rotting sections of plants early on can help rescue them [1]. Examining plants for disease necessitates looking for a variety of patterns on them [2]. It can take a long time to manually identify disease in plants, thus image processing could be helpful [3]. Plant disease can affect the stem, root, shoot and even the fruit of the plant [4]. Automatic detection of plant sickness saves time and allows the plant to be protected from disease in its early stages [5]. The ancient and conventional method of identifying and distinguishing plant diseases relies on naked eye inspection, which is less thorough than slow methods [6]. Expert consultation to detect plant diseases is costly and time consuming in some nations since experts are available [7]. Plant diseases proliferate due to haphazard plant management, forcing the use of more pesticides to treat them, as well as chemicals that are hazardous to other farm animals, insects and birds. Automatic detection of plant conditions is required to detect disease symptoms in the early stages of plant and fruit growth [8]. Agriculture, or the art and science of raising livestock and plants, has grown increasingly important in the growth of human civilization. Many farmers are unable to identify plant diseases, leading to the loss of agricultural products [9]. Agro scientists can provide a better solution by using images and videos of crops that provide a clearer view. Plants can be infected with a variety of diseases that have no obvious signs at first, resulting in societal and economic losses [10]. To make things easier, image processing is used, which aids in the resolution of such situations by extracting leaf features that can be used to diagnosis ailments. Image acquisition, pre-processing, segmentation, feature extraction and classification are all processes in the image processing process [11]. A new photo identification system is developed based on multiple linear regressions [12]. A number of advancements have gone into the photo segmentation and recognition technology [13]. The recognition system is built using multiple linear regression and feature extraction [14]. The system has great precision, dependability and photo recognition capabilities, according to the findings [15]. The process is useful, according to the findings, because it aids in the detection of disorders with less effort.

2 Related Work

Plant diseases and pests have a substantial impact on productivity and quality. Digital image processing can be used to identify plant diseases and pests. In recent years, deep learning has achieved major advances in the field of digital image processing, far outperforming traditional methods. Deep learning has grabbed the curiosity of scientists interested in learning how to utilize it to identify plant diseases and pests [16].

Agriculture's economic importance cannot be overstated. This is one of the reasons why, because disease in plants is a natural occurrence, disease detection in plants is critical in the agricultural sector [17]. The quality, quantity and productivity of the plants may deteriorate if this area is not well kept. Small leaf disease, for example, is a devastating disease that affects pine trees in the USA [18]. In large agricultural farms, utilizing an automated method to identify plant disease decreases the amount of monitoring required and allows for early diagnosis of symptoms [19].

Crop diseases are a major threat to food security, yet early detection is difficult in many parts of the world due to a lack of infrastructure [20]. Thanks to a combination of increased global smartphone usage and recent breakthroughs in computer vision enabled by deep learning, smartphone-assisted disease detection is now a possibility [21].

3 Methodology

3.1 Image Processing

Researchers in current technology have been working to improve the growth of plants on a regular basis. Growing higher-breed seeds and plants has been a huge success for them. Crop diseases and pesticides, for example, are still major challenges in crop growing. As a result of these issues, crop yields are dropping, and plant cultivation is scarce in the country. The majority of diseases must be prevented early on, but if this is not done, significant harm can result. To reduce such losses, diseases must be identified early. Corn is farmed for a lengthy period of time, between ten and eighteen months, which could lead to disease outbreaks. Fungus, which shows as tiny patches on the leaves, is the most common disease in corn. Serious infections destroy the leaves to the point where they are entirely ruined and covered in patches. Regular pesticide use increases the amount of poisons in the products, posing a number of health risks and contributing to groundwater contamination. Pesticide prices have been steadily rising in recent months. As a result, contemporary technology allows crop yields to be increased while requiring less labour and time. Plant disease diagnosis and categorization are important aspects of plant production and agricultural yield decline. This study uses image processing to develop a system for detecting and classifying plant leaf diseases. Image pre-processing and analysis, feature extraction and plant disease recognition are the three main processes of the method. Because plant diseases are so little, a person's visual capacity limits their diagnosis. Because of the optical nature of the task, computer visualization technologies are applied in plant disease recognition (Fig. 1).

The goal is to accurately recognize the manifestations of an illness that has hurt leaves. After the caught picture has been pre-handled, the different properties of the plant leaf, like power, shading and size, are separated and shipped off a neural organization for characterization. Regardless of the way that numerous frameworks have

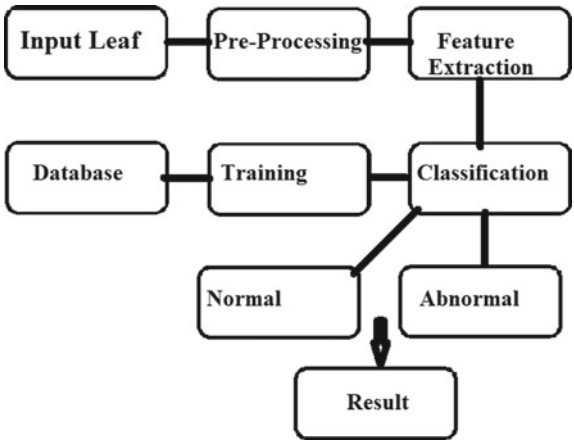

Fig. 1 Leaf image processing architecture

been created to date utilizing different AI calculations like arbitrary woods, innocent Bayes, and fake neural organizations, their exactness is low, and the work utilizing those arrangement methods is finished and determined to distinguish sickness in just one plant animal groups. These endeavours have just been utilized by a couple of ranchers in Karnataka. Ranchers keep on recognizing ailments with their unaided eyes, which is a significant issue on the grounds that the rancher has no agreement what sickness the plant is tainted with. Ranchers are as yet managing issues, and sickness location strategies are tedious (Figs. 2 and 3).

The proposed method includes the following:

1. Image acquisition
2. Image pre-processing
3. Segmentation
4. Feature extraction
5. Classification.

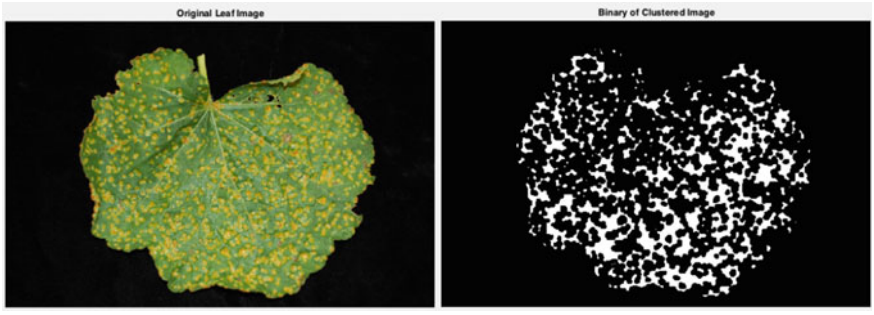

Fig. 2 Original and binary clustered image

Fig. 3 Multi-plant input leaf images

3.1.1 Image Acquisition

This stage entails uploading photos of plant leaves into our programme for disease analysis. Because categorization is easier on black and white photographs, which are 2D images, the photos in Fig. 4 are converted to grayscale images at this stage. The system will retrieve the plant snapshot and load it into the system at this point. The following are the steps that follow the acquisition of an image. As a data source (JPG format) for picture analysis, higher standard resolutions will be used, and JPEG is the most commonly used image format.

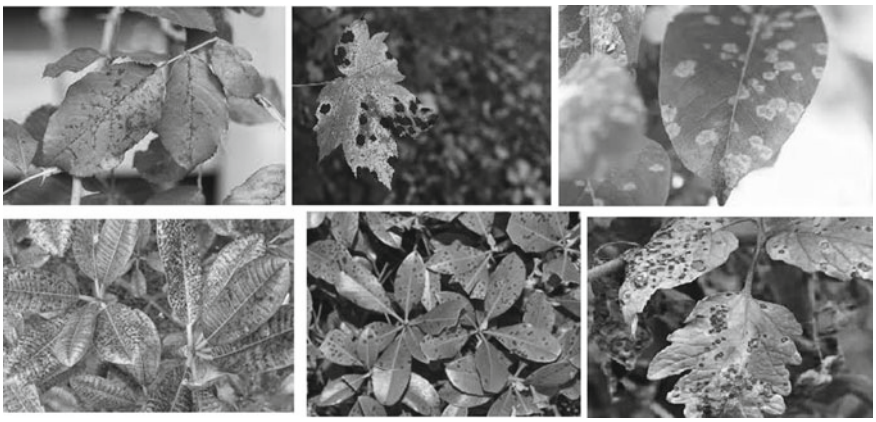

Fig. 4 Multi-plant input leaf images processing

3.1.2 Image Pre-processing

These strategies have only been employed by a few farmers in Karnataka. Farmers are still using their naked eyes to diagnose ailments, which is a serious worry, because the farmer has no knowledge what disease the plant is suffering from. Farmers are still facing difficulties, and disease detection methods are time consuming.

3.1.3 Feature Extraction

The shape highlights utilized in this paper to extricate shape highlights incorporate strength, degree, minor pivot length and unconventionality. The evil part of the leaf in issue is separated utilizing these models. Difference, connection and energy are a portion of the textural highlights utilized in the paper. The ill section of the leaf in issue is extracted using these criteria. The variation of pixels and their neighbours will be determined at the end. Colour feature extraction provides a unique way of exhibiting picture representation when it comes to translation, scaling and rotation. The mean, skewness and kurtosis all have a role in determining colour.

3.1.4 Classification

Arrangement incorporates isolating information into two sorts preparing and testing sets. The preparation put out has one objective worth and many provisions for each example or information. The most vital advance is to find the partition hyperplane, which will isolate these focuses into two gatherings: positive ("+1") and negative ("−") classes ("−1"). The final outcome is shown in Fig. 5.

4 Results and Experimental Evaluation

In plant leaf illness recognition and stage forecast framework, we have been carried out exceptionally prepared model that can precisely perceive infections. In this framework, we utilized Gaussian haze for dim scale change and Otsu's strategy for paired transformation of pictures after which we utilized raised body for edge recognition. Dark scale change in dim scale transformation shading picture is changed over into a dim structure utilizing Gaussian haze. Shading picture containing commotion and undesirable foundation is eliminated or obscured by utilizing this strategy.

Double change dim scale picture is given to include for Otsu's technique for parallel transformation. Twofold type of pictures changed over in 0 and 1 structure implies high contrast. In edge discovery, parallel picture gets measurements by counters utilizing curved frame calculation. In which, unconventionality discovers drawing edges around white part of paired picture. In our framework, we are utilizing tensor stream for removing components of preparing data set. In which, 12,000

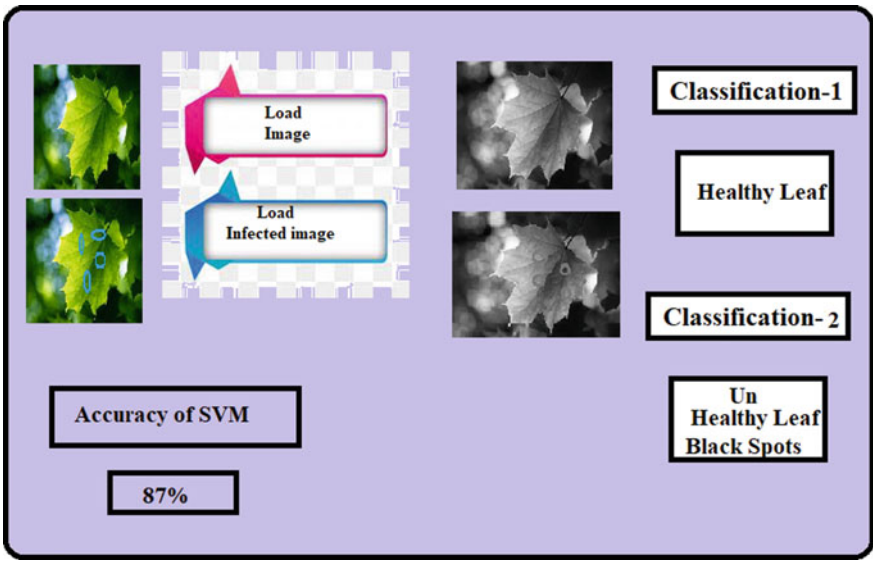

Fig. 5 System results generation

picture tests are prepared by utilizing preparing model. At last, plot records were created as a yield of our prepared model. Testing model in definite period of information testing in which leaf illness and typical leaf pictures were coordinated by our preparation model with higher per cent of exactness. In the wake of coordinating with all kind of sickness, pictures separate after-effects of stage and identification that are shown on console and put away in text record too.

The results show that the selected support vector machine classifier outperforms the extreme learning machine. The sensitivity of the support vector machine with a polynomial kernel is likewise higher than that of the other classifiers. Because the developed real-time hardware is capable of detecting a variety of plant illnesses, this work appears to be of considerable social importance (Fig. 6).

Fig. 6 Accuracy and graphs for results

5 Conclusion and Future Scope

The system designed the plant sickness recognition and expectation dependent on profound neural organization and machine acquiring information on techniques. It very well may be exceptionally fundamental for the hit development of yield, and this might be accomplished utilizing picture handling. This paper goes to concoct the various techniques to fragment the disease part of the plant. This paper moreover referenced a couple of element extraction and type techniques to extricate the provisions of excited leaf and the grouping of plant infections. Our future examination will be reached out for additional improvement in crop illness acknowledgement exactness and work for constant sickness acknowledgement.

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