

# Smart Solution on Leaf Disease Detection

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**Abstract:** Internet of Things (IoT) advances can be used in smart farming to enhance quality of agriculture. These days, most of the frameworks utilized for this are physically worked one. Here, IOT comes into picture to supply semi-automated or fully-automated frameworks to supply superior comes about. The survey includes several automated Irrigation and Diseases Detection techniques, which are proposed recently. Image processing for disease detection of visually seen symptoms of plant. Using an application the treatment is suggested to reduce the damage levels. The proposed system will thus improve in the productivity and benefit irrigation sector. Also user can search the disease by entering the leaf symptom only.

**Keywords:** Image Processing, Smart Agriculture, Disease Detection, Symptoms.

## 1. Introduction

Agriculture is the primary occupation of Indian villagers. From the advent of agriculture, there has been much mechanical and chemical advancement that has occurred to improve the yield and help farmers tackle issues like agriculture and crop diseases. But there has been little to less digitization done in this field. With the boom of IOT, there is a hope for creating a digital system for agriculture which will help the farmer make informed decisions about his farm and help him tackle some undesired situations in advance. So, it will help to improve the quality of crops and also it will be beneficial for farmers.

In traditional method there are no modern techniques for automatic detection and classification of plant diseases. It leads to reduction and loss of huge quantity and quality of agricultural production, if not recognized on the right time Continuous monitoring of farm is required which will require more labour and more experts in large farms. In remote areas, farmers may have to go long distances to seek expert advices. Automated irrigation system and automatic detection of plant disease is an important and cultural research domain as it may help the ceremony of developing countries such as India to gain profit without more manual intervention. In this work, an automated smart irrigation system along with plant disease detection by visually seen symptoms is done for removing the drawbacks of traditional system using the Internet of Things technology. Early Detection of Disease which is a great challenge in agriculture field. An earlier large team of experts are called by the farmers to chalk out the diseases or any harm which occurred to plants, even this practice is not known to every farmer and therefore the experts cost much and also it is time

consuming. Whereas Automatic detection is more beneficial than this long process of observations by the experts, Automation technique of the disease detection where the result comes out to just monitoring the change in plant leaves makes it cheaper and accurate. And thus, Image processing technology for early detection of diseases which occurred to plants and can aware farmer at the early stage and save other plants from diseases.

## 2. Related work

Ailments are hindrance to the ordinary condition of the plant that alters or intrudes on its basic capacities, for example, photosynthesis, transpiration, fertilization, preparation, germination and so on. These infections are created by pathogens viz., organisms, microscopic organisms and infections, and because of antagonistic natural conditions. Thusly, the early stage determination of plant sickness is an imperative errand. Its answering to the relating individual or rancher is likewise just as essential. For this reason web of Things idea is utilized here.

The term Internet of Things was initially authored by Kevin Ashton in 1999 in the connection of store network administration. The expansion of gadgets with communicating-actuating abilities is bringing closer the vision of an Internet of Things, where the detecting and incitation works flawlessly mix out of spotlight and new capacities are made conceivable through access of rich new data sources. The advancement of the cutting edge versatile framework will rely on upon the clients' innovativeness in planning new applications. IoT is a perfect providing so as to rise innovation to impact this area new advancing information and the required computational assets for making progressive applications. Our framework points mostly isolated into two sections viz. implanted framework for ecological parameter checking, picture handling and IoT. Among that leaf malady discovery is performed by taking leaf pictures by web camera i.e. image handling is ruined that. Ailment seriousness is the testing's territory unit or leaf demonstrating side effects of illness .It is frequently communicated as a rate or extent. The sickness seriousness of the plant leaves is measured by the injury region and leaf region proportion utilizing picture handling technique.

There are four main steps for image processing on leaf as shown below.

- *Image Capturing:* Spotted leaves are taken for this

study. Images are taken in controlled environment and are stored in the JPEG format.

- **Leaf Image Segmentation:** Image segmentation is the important step to separate the different regions with special significance in the image.
- **Actual Leaf region Segmentation:** Input image is first converted into gray scale image. Since image is taken in controlled environment placing diseased leaf on the white background, it makes large difference in gray values of two groups, object and background.
- **Leaf Disease region segmentation:** Segmentation of region with spots is done here. For success of experiment it is necessary to segment the disease region accurately. Disease management is a challenging task. Mostly diseases are seen on the leaves or stems of the plant. Precise quantification of these visually observed diseases, pests, traits has not studied yet because of the complexity of visual patterns. Hence there has been increasing demand for more specific and sophisticated image pattern understanding. We propose an image-processing-based solution for the automatic leaf diseases detection and classification according to the environmental factors.

### 3. System overview

In the farm, various sensors are deployed like soil moisture sensor, Temperature - Humidity sensor and camera for detecting diseases on a leaf. Data collected from sensors and send it to Raspberry PI through wired or wireless devices. In server-side data is verified and matched with ideal values of data like temperature value, humidity value, and soil moisture value. If difference occurred with respect to predefined threshold value then notification send to the farmer on his mobile or website. Output of sensors are generated in the webpage and farmer.

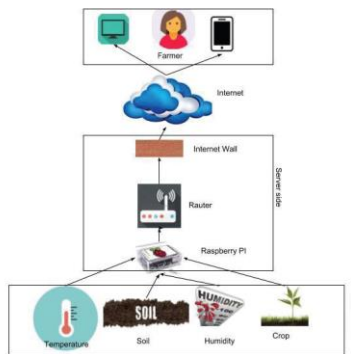


Fig. 1. Architecture of prototype

Get detailed information about his crop and atmosphere of his farm from anywhere. Crop disease detection is done by using Image Processing. The camera is placed near crop so that

image of a leaf is taken by the camera. Captured image is sent to the server and using Image processing techniques leaf disease is detected, Status of a leaf is sent back to the farmer on the web page & mobile phone on the app.



Fig. 2. Home Page

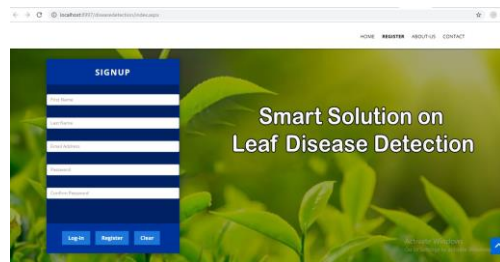


Fig. 3. User registration page

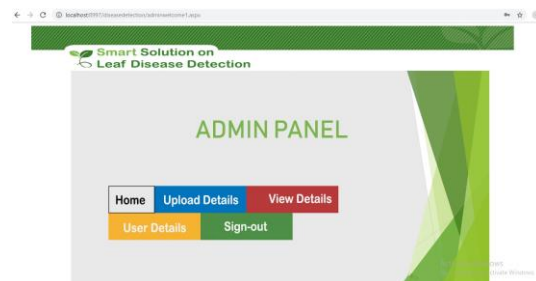


Fig. 4. Admin Panel Page

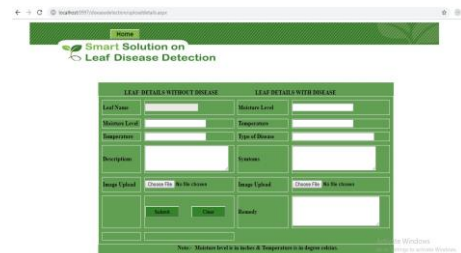


Fig. 5. Disease details uploading page



Disease Leaf	Current Temperature	Leaf Description	Original Leaf	Affected Moisture	Affected Temperature	Symptoms	Disease Type	Damage Leaf	Disease Remedy
2	24	Wilting is a leaf wilting process in a plant leading to temporary or permanent drooping of leaves, shriveling, or other growth back of disease due to plugging of plant tissue by an organism or, restriction of water, because of a decrease in soil moisture level.		0	10	Wilting	Structural and functional damage caused by water stress		
1	21	Spot is a visible, localized, round to irregular lesion, often with a border of a different color, characterized by a broken leaf edge. The spots and lesions develop over time. Symptoms of fungal diseases and other plant diseases include a large range of lesions or slight new lesions such as gray leaf spot of sorghum, black spot of rice, angular leaf spot of tomato, leaf spot with yellow halo, foot rot in rice.		0	20	Spot	Angular leaf spot of tomato caused by Phytophthora blight		
14	25	Slight to the surface of leaf blades and other parts of the plant are attacked by disease and in other tissues with the leaves of the plant and the plant attacked - disease slight, long slight, or slight.		12	10	Slight	Random slight of the plant caused by Phytophthora blight		

Fig. 6. Disease details page

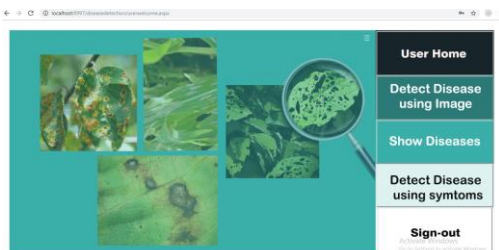


Fig. 7. User panel page

#### 4. Conclusion

In this paper, we described a smart solution on leaf disease detection which is very helpful application for Indian farmer. Leaf disease detection is successfully done by using Image processing techniques. All observations and tests are completed and this proves that this is the solution for smart agriculture. This system definitely improves the yield of the crops increases the overall income of the farmer.

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