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Survey Paper on IOT and Image Processing Based Crop Disease Identification System

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Abstract: - In this work, we explain a framework for early detection of diseases in wheat crops from visual symptoms. We target wheat crops owing to their extensive use in the Indian subcontinent. Existing literature lists several algorithms that can be used in detection, classification, and quantification of crop diseases by analysis images. However, the evaluation process is tedious, time consuming and more over very much subjective. Infrastructure for image acquisition, communication, and processing is lacking in rural areas owing to lesser technological penetration. In this work, we will develop a user-friendly IoT reference architecture to provide on-field disease detection and prediction using cloud analytics.

Keywords: - IOT, Image Processing, Wheat Crops, Disease

I. INTRODUCTION

About 70% of Indian population is dependent on agriculture. The rate of crop production has declined since 2010 due to various weather conditions, crop disease, rodents, fertilizer misuse or low soil fertility etc. It is very essential to take steps for growth of agriculture as Indian economy and livelihood is dependent on agriculture. It is very essential to change a way of advancement of agriculture, IoT based technology and its integration with image processing technology provides solution to it. It includes cameras which capture images at regular time period and image recognition techniques to recognize disease, rodents and growth of crops. The CCTV cameras are installed at various places in crop fields and grain reservoir. The exchange of information due to IoT (Internet of Things) can be achieved at reasonable cost. The sensors are also implemented at various places in the crop field and grain field they collect information about various things like moisture in soil, temperature, humidity and various agriculture parameters. The information transmission and analysis from various sensors and cameras are done by integration of internet of things. The crop loss due to crop disease, soil moisture or waste water before pre-harvest and loss due to rodents in grain store can be diminished. The image processing techniques include various mathematical and computer algorithms performed on images for image classification, extraction of patterns and feature extraction. It has allowed a vast domain of algorithms to be applied on input image and it includes techniques that can remove problems like image distortion and noise. It includes various fourier transformation techniques and filtering techniques on original images for identification of rodents and identification of disease in a crop. Internet of things include communication technology ,information to be transmitted, updated infrastructure and networks which is able to connect all the information collecting devices and is able to connect them for information transmission. In the agriculture field we know, we have an extensive area to analyze. So we need to have sensors to collect information and observe domain of agriculture field and pass analyzed information to farmers through internet.

II. LITERATURE REVIEW

The system that we need to develop needs first to collect data ,analyze data and carry information over network to remote location and intensity it by combining it with new technology .Today we have IP based cameras and we need to connect them to internet .So as to monitor continuously our remote agriculture field. We need to integrate them with computational ability like detecting crop disease, rodents ,monitor growth of crop in the field and notify information by activating electronic devices and raspberry pi and transmitting information to server , which in turn sends information to farmers. For implementing the system we can have either two or five layer architecture [1]. In three layer architecture, first layer is perception layer which is meant for collection of information from various sensors and cameras. Second layer is the network layer which is meant for information transmission over the network and it has computational capability. Third layer is the application layer

which has practical applications like sending sms to the end users. This system can be developed using python computer programming language and the scripts written in this language are used to control and monitor the information from cameras and sensors.

The advantages of the system are: it provides security from rodents. It can identify the rodents, mammals, humans. Cameras can be moved in various directions based on the commands. We also need to address factors that impact the health of a plant like humidity, moisture content of soil, intensity of light. The growth of a plant can be monitored by the cameras, morphological change of plant are continuously monitored [2]. The components needed here include soil moisture sensor, DHT11 which is moisture and humidity sensor, camera module for capturing images at regular intervals. First the sensors are activated then after images are captured.

So as to study how humidity, moisture content in soil, and intensity of light effect the plant growth. And it is the cost effect way of studying how various factors affect the plant growth. We can keep images and data in SD card for further analysis. Here the aim is to find the factors that affect the plant growth. It can help farmers as they can't monitor the field throughout the day. And the information collected can be used for further study. The crop disease can be identified by various image processing techniques and alerts can be sending to farmers [3] and it is possible control the field remotely. We can develop any time anywhere web and mobile application. The system can be divided into three modules namely client module, server module and farm module.

The farm module includes sensing information about agriculture parameters, location identification of sensors, transferring information to processing module for decision making and monitoring of agriculture field using cameras. The system can be supported with solar panels for energy source to sensors and server. Ubisense mote is sensor board including humidity, light intensity, barometric pressure and buzzers. The cameras an also be integrated, it produces alarms through buzzers. The system obtains weather related information from internet, so as to keep the appropriate amount of water in the field. Need of agriculture is going to increase because of increase in population; agriculture is the basic source of food to all humans.

And it gives employment opportunity to lot of people in the world [4] .We can use gps for message transmission to the farmers. CC3200 is a single chip with embedded microcontroller, Wi-Fi and network processing unit. It is a low cost computational device for connecting sensors and works asynchronously for transmission and reception of information. The power supply can be provided through small portable batteries. Internet of things is needed to implement in agriculture for modernization of our agriculture field as is known as Agro Tick [5].
It includes

1) IoT: it includes embedded hardware, FPGA based design, ASIC/SOCIP, broad level.
2) Big Data Analytics: NLP, predictive analysis, machine learning.
3) Software: Android app, multilayered firmware, cloud platform, secure API's.

In the current modern era our agriculture field is blessed with growth of technology in the field of Information technology, computers and electronics. Agriculture in combination with IoT, Big Data Analytics, cloud computing can lead to tremendous growth of agriculture in future. Based on the calculation of agricultural parameters, we can have precision agriculture. It has played a vital role in the growth of agriculture in developing countries. Previously, GPS (Global Packet Service) and GIS (Geographical Information System) were used for precision agriculture but they were costly [6]. So there was a need to develop a cost effective system. The introduction of wireless communication technology, sensors and CCTV cameras led to cost affective system. With the evolvement of graphical user interface the growth of the crop can be monitored remotely for a longer period of time. And this can be used for the potential growth of the new crop field. In the traditional system farmers used to monitor the agriculture field for deciding about when to irrigate, when to applying require fertilizers, pesticides. They used to follow a mental model which does not give always perfect results and they sometimes used to fail. We propose a wireless cameras and sensor based crop field monitoring and management system. The system need to be integrated with self-powered with solar panels or small batteries and long performance cameras. The advantages of the system include the lower cost of implementation of sensor nodes and IoT technology. The only thing we need to keep into consideration is to protect sensors from moisture, heat or any damage. With the development of Cyber-physical farm management cycle has played a vital role in socio-economic growth [7].

It includes Internet of things, cloud computing, big data and Artificial intelligence in our farming. The large volume of information can be captured through big data analytics and stored on cloud. The big data has recent development and it has a vast application as everything in IoT is in the form of data and needs to be managed for analysis and decision making.

III. WHEAT DISEASE IDENTIFICATION

Fusarium head blight

Symptoms of Fusarium head blight include tan or light brown lesions encompassing one or more spikelets. Some diseased spikelets may have a dark brown discoloration at the base and an orange fungal mass along the lower portion of the glume. Grain from plants infected by Fusarium head blight is often shriveled and has a white chalky appearance. Some kernels may have a pink discoloration.

Stagonospora Nodorum Blotch

This disease causes dark brown or purple lesions on heads. Lesions are often more intense at the top of the glume, with brown streaks or blotches extending down toward the base of the spikelet. The presence of tiny fungal reproductive structures embedded in the tissue can confirm the diagnosis but will require significant magnification. Management: Genetic resistance, foliar fungicides, crop rotation, fungicide seed treatment.

Bacterial streak

Early symptoms of bacterial streak include small, watersoaked areas between leaf veins. These water-soaked areas become tan streaks within a few days. When the disease is severe, streaks may merge to form large, irregular areas of dead tissue. When dew is present, the bacteria causing this disease may ooze from the lesions and dry to form a clear, thin film. This film flakes easily and is visible when the leaf is viewed from different perspectives. Management: Avoid highly susceptible varieties.

Powdery mildew

Powdery mildew causes white lesions on leaves and leaf sheaths. Glumes and awns also can be infected when disease is severe. Fungal growth is largely limited to outer plant surfaces and can be easily wiped away by rubbing a finger across affected areas. Mature lesions may have dark, reproductive structures mixed with the white, cottony growth of the fungus. Management: Genetic resistance, foliar fungicides.

IV. METHODOLOGY

In Image processing section, initially the image is captured from the camera and further the image is processed using k means clustering for segmenting the image. The processed

image is then edge detected using three different edge detection techniques. The edge detection techniques used are sobel, prewitt and canny algorithm. The diseased sample banana leaf has been taken for the edge detection analysis. Amongst the three edges detection methods used, canny edge detection algorithm gives the better and reliable detection. Owing to its optimality to meet with the three criteria for edge detection and the simplicity of process for implementation, it became one of the most popular algorithms for edge detection method.

As discussed earlier, IoT and Image processing are combined together in agricultural field in order to increase product yield and to reduce the crop failure. We focused on plant failure due to environmental factors through IoT technology. IoT system includes sensors, Arduino and a camera that regularly captures the plant. The color, texture, shape and area of the leaf are the parameters also considered in this work. After examine the conditions of the plants we go for image processing. The initial test is done by using MATLAB software. In addition to the environmental factors, the plant with a diseased leaf can also be identified using Image processing. Based on the output and constraints the pesticides will be sprayed for the crop/plant where the disease is identified. If there is any change that corresponds to the deterioration in the plants growth, the farmer is immediately informed. Early diagnosis will thus help in taking the necessary actions to increase the produce and reduce failure of crops.

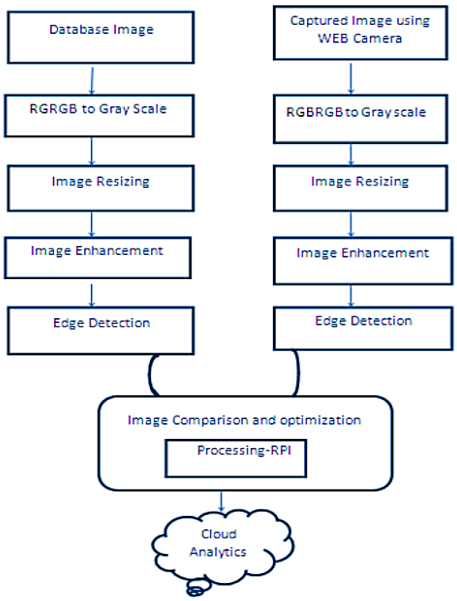

Figure 1: Block diagram

V. CONCLUSION

The main problems are discussed about the crop diseases for detection system. The research is very important in terms to increase the production of agriculture system in India. It is noted that development of the system will helps the farmers to save their crop loss from the diseases. Finally conclude that system will detect the diseases in the earlier time and classify above diseases and give information to the farmers to save their crops.

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