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SMART IRRIGATION SYSTEM AND PLANT DISEASE DETECTION

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Abstract - *Most of the population in India depends on agriculture and farming. Indian economy directly depends on agricultural production. The proper maintenance of plant growth includes various steps such as to examine the environmental factors and manage water supply for proper cultivation of plants. A traditional way of irrigation is not efficient and unreliable. Around 18% of crop yield is lost worldwide due to pest attack every year. Identification of plant disease is key to preventing the losses in the yield of agriculture product which is difficult to do manually. The project therefore involves a system architecture which allow user to achieve all above activities in real time so that farmers can view their farm details from remote location. It includes- 1.A module placed in a farm that contains various sensors and device for data conversion and transfer such that farm details and environmental factors are monitored and controlled correctly 2.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.*

Key Words: **Internet of Things, Image processing, Wireless Sensors, Disease Detection, Smart Irrigation System.**

1. INTRODUCTION

Internet of Things means Internetworking of physical devices which are embedded with electronic, software, sensors, actuators that make the data transfer possible. In 2013, he Global Standards of Initiative on IOT defined Internet of Things as "The Infrastructure of the information Society". It creates an opportunity about direct interaction of physical world with computer system world and in result its efficiency, accuracy helps in reducing human invention. Environmental monitoring application of IOT, as this application uses wireless sensors to protect the environment by monitoring various aspects of environment.

Agriculture is the backbone and one of important human activity of our nation. In agricultural sector, water is the most used resource. Irrigation helps to save large amount of water. Manual irrigation is the traditional method used in agricultural land and may require expert labours on larger farm. Manual or traditional irrigation has some disadvantages associated with it such as lack of proper maintenance of farm, inappropriate amount of water supply to the field.

In traditional method there are no modern techniques to 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.

The proposed system basically consists of automated irrigation system along with plant disease recognition by using visually seen symptoms of disease, i.e. stem and leaf. The irrigation system works on the inputs provided by wireless temperature and moisture sensor which will be deployed in the field using the Internet of Things technology communication and processing is done. In the second module visual identification of disease is done where images are captured through camera and processed and suggest the treatment for the corresponding identified disease. The treatment is suggested in Hindi and English on the android mobile application used by the farmer. In this work the limitation in traditional method of irrigation, the consumption of water resource, difficulty of identification of disease by the farmer is overcome.

The IOT allows objects to be detected /or controlled remotely across existing network infrastructure. When IOT

is increased with sensors and actuators, the technology becomes an instance of the IOT of general category of cyber-physical system, which additionally encompasses technologies such as sensible grids, smart homes, smart farming and smart cities.

2. BASIC DEFINITION

Smart irrigation software has the purpose to provide an irrigation system which is automated as well as autonomous. Various types of software are available which may include direct control of amount of water flow and irrigation methods which has automatic valves. Such software provide real time monitoring and functioning of irrigation systems. Suddenly, software may include various sensors, data from internet existing database, etc. sensors may monitor temperature of air, soil, moisture of soil, solar radiation, etc. This type uses various artificial algorithms and expert systems. Third type of software can be dependent on data which is available offline only. This kind of software include various scientific areas like chemistry, climate, etc.
IOT is nothing but a system which is related to computing devices, mechanical and digital machines that has ability to transfer data over a network without any human to human interaction. The IOT has evolved from the edge of wireless technologies. This edge helped to tear down the walls between operational and informational technology. Plant disease is nothing but the abnormal growth of a plant resulting in making some kind of disturbance in the normal life of plant.
There are both bacterial and fungal diseases for plants which can destroy the whole crop like bacterial leaf blight, mosaic, leaf spot and sooty molds and many more diseases. These viral diseases are the most dangerous diseases for crops as they can be transmitted through air and one of the viral diseases are like streak, wheat striate mosaic etc. There are various methods that can be used to detect plant disease.
Plant Diseases:-

1. Fire Blight:-
   This is a bacterial disease. It affects apples, pears, fruit trees, roses and small fruits. Infected shoots wilt and look blackened.

2. Alternaria Blight:-
   This is also called as fungal blight. It affects ornamental plants, vegetables, fruits and trees. Brown to black spots form and enlarge and concentric rings are developed on leaves.

3. Phytophthora Blight (Late Blight):-
   Symptoms seen are water soaked spots on the lower leaves. Plant infected by late blight are lilacs, rhododendrons, azaleas, and holly.

4. Bacterial Blight:-
   This is seen as legumes in eastern and southern North America. Symptoms are water soaked spots that dry and drop out on foliage and pods.

Disease name little leaf disease is found in pine tree can be detected. Image processing is used for detection of plant disease using genetic algorithm. Image segmentation-separation or grouping of image in different parts for detection.

Basic flow in plant disease detection using image processing.

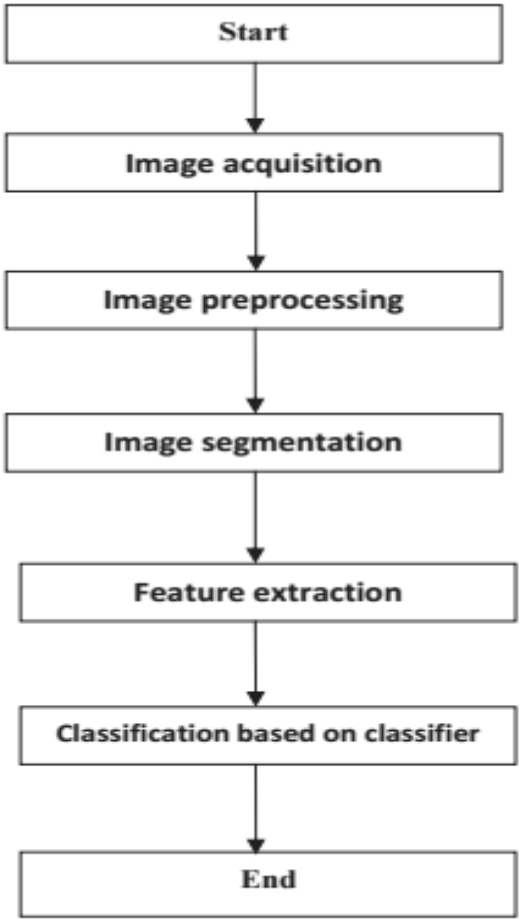

Image Acquisition:-
Images are given in digital form. It may involve preprocessing, scaling, etc.

Image enhancement:-
It brings out detail and highlight various features that are of interest in the given language. It may involve changing brightness, contrast, etc.

Image restoration:-
It is a method to improve appearance of an image. It is objective color image processing. It includes modeling of color and processing in digital domain.

Compression:-
It deals with reducing the storage space to save the image especially in the internet usage.

3. LITERATURE SURVEY

This section of Literature Survey eventually reveals some facts of Smart Irrigation System based on the analysis of many authors work as follows:

Chandan Kumar [1] in his work forthput a low cost system which can be affordable by Indian farmers and also to control the water motor automatically along with detection of where water is needed and in what quantity more using soil moisture sensor. Local Shortest Path (LSP) is the algorithm which the authors used for controlling the wireless multiple networks. they used Raspberry-Pi board, wireless network devices for sending mails and messages onto the famers mobile phone and registered mail address.

Lala Bhaskar [2] proposed an automatic crop irrigation system in this system there will be monitoring of various factors like humidity, temperature and indicating water level. Using GSM technique transfer of data takes place and messages will be sent on the mobile of the farmer. It is low budget system which can be further improvised using technology. It also uses temperature and soil moisture sensors.

S.Darshna and A.Soundharya [3], the author's goal is to govern the water system for gardens by way of the usage of sensor microcontroller system. on this device the temperature sensor and soil moisture sensors sends the information to the microcontroller which assessments the quantity of water needed by vegetation. For further this system may be used for vegetation and GSM module may be brought in order that the user can manipulate the machine through mobile phone.

Wenjiang Huang [4], have taken three different pests (Powdery mildew, yellow rust and aphids) in winter wheat for their observance. The most and the least specific wavelengths for different diseases have been extracted using RELIEF-F algorithm.

Maryam Hazman [5], designed a crop irrigation schedule expert system which helps to calculate various operations in detail in crop irrigation. It uses parameters from environment as input data and generates optimal irrigation schedule for the crop type. The only drawback of the system is that there is no easy interface developed to add new paramters of the crop.

R. Newlin Shebiah [6], the author aims to develop a solution for automatic plant leaf disease detection using analysis of texture tested on various species of plants with a little computational effort. Diseases are analysed at the initial stage. The identification rate is low which needs to be optimized to avoid the misclassification of the varying symptoms of the diseased plant.

Sateesh K.Peddoju [7], proposes a mobile vision based plant leaf recognition system which monitor crop diseases having various patterns. It identifies its appropriate class which can be used to help the botanical students in their research work. The feature factor used in the system proposed by the author in this work has a huge computation cost. Shadow and season affects the quality of the captured image and correct prediction of the leaf disease.

H. Al-Hiary [8], evaluated an improved solution for classification of leaf diseases which used algorithms like k-means and neural networks. In segmentation phase otsu's method is used to mark green pixels and the boundary pixels are removed. Clustering and classification of diseases is done in the proposed approach.

4. REPRESENTATIVE SOLUTIONS

In order to improve the process of irrigation, smart irrigation project and applications are developed by The Institute of Food And Agriculture Services (UF-IFAS), with the help of US department of agriculture. The applications are made available to provide real time irrigation schedule for selected crops.

They have used the trending smart phone technology for managing urban and agricultural irrigation. Various applications like Citrus app, Turf app, Strawberry app and Vegetable app, have been developed in which real-time weather data is given as input.

In the application, user can register their farms and receive push notification regarding expected changes in weather so that irrigation can be scheduled accordingly.

Analysis of data for the applications by comparison of water volumed using entered information to the suggestions provided by smartphone applications. Various irrigation characteristics like rooting depth, rain, depletion allowed etc. are considered.

Further improvements in the application is made by taking in the consideration of comments by stack holders. Also they are being tested throughout Honda and Georgia for experimental purpose. [9]

Mobile application- plantix developed by PEAT, Germany is used for plant disease diagnostics for gardeners and small holder farmers. It works as an automated process. As most of yield is lost due pathogens and pests, the applications supports small holder gardeners and farmers to detect and find the plant damages early and hence control them fast. The application only needs a simple smartphone picture that is sent to the server and recognized by image recognition software. Later, measures to control the pathogens and pest are sent back to the user using push messages. It uses artificial intelligence and helps farmers to treat diseases early. [10]

4. CONCLUSIONS

Smart irrigation environment helps to optimize the water usage in the field and provides a remote controlling and monitoring for the irrigation system. Using Internet of Things concepts, the system communicates and processes data from sensors and using android application as user interface, notification about humidity and moisture level is given to the farmer so as to control the water supplied to the farm. Digital capturing of visually observed symptoms on the stem and leaf of the plant and images processing on it is used for detecting the plant disease at an early stage. Treatment is suggested corresponding to the recognized ailment which will help farmers with low experience to prevent the vegetation.

REFERENCES

[1] Chandan Kumar, pramitee behera "A Low Cost Smart Irrigation Control System", International Conference on Electronics and Communication System (icecs 2015) ieee 1146.

[2] Lala Bhaskar, Barkha Koli, Punit Kumar, Vivek Gaur, "Automatic Crop Irrigation System" IEEE2015.

[3] S.Darshna, T.Sangavi, Sheena Mohan, A.Soundharya "Smart Irrigation System", IOSR journal of Electronic and Communication Engineering(IOSR-JECE) 2015.K. Elissa, "Title of paper if known," unpublished.

[4] Wenjiang Huang, Qingsong Guan, Juhua Luo, Jingcheng Zhang, Jinling Zhao, Dong Liang, Linsheng Huang, and Dongyan Zhang, "New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases".

[5] Maryam Hazman,"Crop Irrigation Schedule Expert System", 2015 Thirteenth International Conference on ICT and Knowledge Engineering.

[6] S. Arivazhagan, R. Newlin Shebiah*, S. Ananthi, S. Vishnu Varthini, " Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features", CIGR journal March-2013.

[7] Shitala Prasad • Sateesh K. Peddoju • Debashis Ghosh "Multi-resolution mobile vision system for plant leaf disease Diagnosis", Springer-Verlag London 2015

[8] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. ALRahamneh," Fast and Accurate Detection and classification of Plant Diseases" International Journal of Computer Applications (0975 – 8887) Volume 17– No.1, March 2011.

[9] Smart irrigation apps http://smartirrigationapps.org

[10] Plantix – an easy plant disease diagnostics tool plantix.net