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Smart Irrigation System and Plant Disease Detection

Lav Gupta, Krunal Intwala, Karishma Khetwani, Tanvi Hanamshet,
DIT, Pune - 18

Prof. Rachna Somkunwar,
Assistant Professor, DIT, Pune - 18

Abstract: *Most of the population in Asian country depends on agriculture and farming. Agriculture has become way more than merely a method to feed ever growing populations. Plants became a vital supply of energy, and square measure a basic piece within the puzzle to resolve the matter of worldwide warming. The right maintenance of plant growth includes varied steps like to look at the environmental factors and manage water for correct cultivation of plants. A standard manner of irrigation isn't economical and unreliable. Around eighteen of crop yield is lost worldwide thanks to blighter attack once a year. Identification of disease is vital to preventing the losses within the yield of agriculture product that is troublesome to try to to manually. There square measure many diseases that have an effect on plants with the potential to cause devastating economic, social and ecological losses. The project thus involves a system design that which permit user to realize all higher than activities in real time in order that farmers will read their farm details from remote location. It includes- one. A module placed during a farm that contains varied sensors and device for conversion and transfer specified farm details and environmental factors square measure monitored and controlled properly a pair of. Image process for disease detection of visually seen symptoms of plant. Employing an application the treatment is usually recommended to scale back the harm levels. The proposed system will thus improve in the productivity and benefit irrigation sector.*
Keywords: Internet of Things, Image processing, Wireless Sensors.

1. INTRODUCTION

Internet of Things means that web working of physical devices that are embedded with electronic, software, sensors, actuators that build the info transfer attainable. In 2013, he international Standards of Initiative on IOT outlined web of Things as "The Infrastructure of the data Society". It creates a chance concerning direct interaction of physical world with system world and in result its potency, accuracy helps in reducing human invention.

Environmental observation application of IOT, as this application uses wireless sensors to safeguard the setting by observation varied aspects of setting.

Agriculture is that the backbone and one among necessary act of our nation. In agricultural sector, water is that the most used resource. Irrigation helps to save lots of great amount of water. Manual irrigation is that the ancient methodology employed in agricultural land and will need skilled labours on larger farm. Manual or ancient irrigation has some disadvantages related to it like lack of correct maintenance of farm, inappropriate quantity of water system to the sphere.

In ancient methodology there are not any fashionable techniques to for automatic detection and classification of plant diseases. It results in reduction and loss of giant amount and quality of agricultural production, if not recognized on the correct time Continuous observation of farm is needed which is able to need additional labour and additional specialists in massive farms. In remote areas, farmers ought to go long distances to hunt skilled advices.

Automated irrigation system and automatic detection of disease is a vital and cultural analysis domain because it might facilitate the ceremony of developing countries like India to realize profit while not additional manual intervention.

In this work, an automatic good irrigation system beside disease detection by visually seen symptoms is finished for removing the drawbacks of ancient system victimisation the net of Things technology.

The planned system essentially consists of automatic irrigation system beside sickness disease recognition by victimisation visually seen symptoms of disease, i.e. stem and leaf. The irrigation system works on the inputs provided by wireless temperature and wet sensing element which is able to be deployed within the field victimisation the net of Things technology communication and process is finished. Within the second module visual identification of disease is finished wherever pictures are captured through camera and processed and recommend the treatment for the corresponding known disease. The treatment is recommended in Hindi and English on the automaton mobile application employed by the farmer. During this work the limitation in ancient methodology of irrigation, the consumption of water resource, problem of identification of disease by the farmer is overcome.

The IOT permits objects to be detected /or controlled remotely across existing network infrastructure. Once IOT is exaggerated with sensors and actuators, the technology becomes associate instance of the IOT of general class of cyber-physical system that in addition encompasses technologies like wise grids, good homes, good farming and good cities.

2. LITERATURE SURVEY

S. Darshna and A. Soundharya [1], the author puts forth the water system for use of gardens. They used tsystem consisting of sensors microcontroller. The information send by the temperature and humidity soil moisture sensor to the microcontroller is assessed. Depending on this, the approximate of water quantity required for the irrigation is done. Further work includes addition of GSM module for the manipulation of users.

Maryam Hazman [2] developed a system for scheduling the crop irrigation. It is used to calculate the irrigation operation details. There is no user interface so that the user can manipulate the various paramaters.

Wejzang Huang [3] worked on three species of pest for winter wheat. They have made use of Relief-F for different diseases.

H. Al-Hiary [4], using the k-means, neural networks and similar algorithms, the author come up with a better solution for identifying and classifying the diseases prevailing in plant leaves. The method of clustering and classification are used in their work.

Plantix [5] is mobile application which is developed by PEAT. It is helpful for diagnosing the plant diseases which can be used for small farms and also gardens. Photo clicked by smartphone is received by server and software for recognition of image is used. Various measures are sent by push messages to the user. It uses the concept of artificial intelligence.

Chandan Kumar [6] developed a system to automate the water motor's water supply to the Indian farms. Soil moisture sensor is used to detect the necessary quantity. Mails as well as messages are sent to the registered user on email address and mobile phone.

Lata Bhaskar [7] proposed an automatic crop irrigation system, this system monitor various aspects like humidity, temperature and water level. The system uses GSM technique to transfer data and messages on the mobile application. The budget is low and the system can be further improvised using technology.

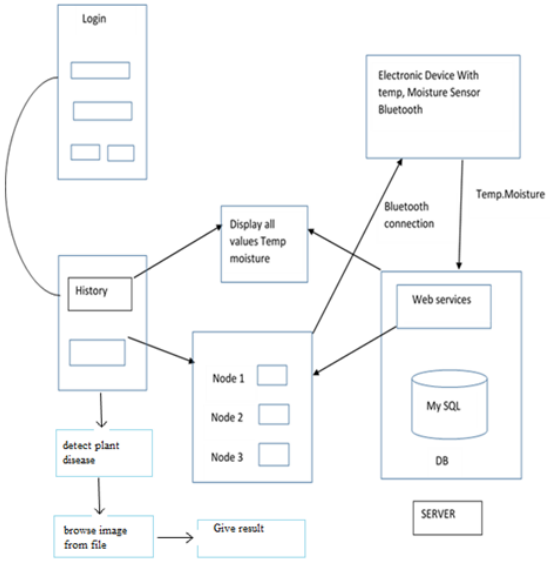
R.Newline Shebiah [8] design a solution for automatic plant leaf disease detection using analysis using texture tested on various species of plant. Identification of the disease is low which can be optimized to avoid the varing symptoms of the disease plants.

Satash K. Peddoju [9] proposed a mobile based plant leaf recogination system which monitor crop disease. Students can use the appropriate class in their research work. The computational cost is very high.

3. PROPOSED SYSTEM

The mobile application has the provision to login/register for the system. New user can sign up and the details will be saved on the database. Using this the user can login whenever required. The saved detail and information will be visible to user in his account such as sensor values, etc.

1. Internet connectivity is used for the performance of the all the activities in the proposed system as the system is based on internet of things concept.
2. Temperature sensor and soil moisture sensor (YL-69) is used to gain input to the Arduino UNO board. It is an electronic device connected with sensor nodes using Bluetooth connectivity in the system proposed.
3. The sensor data is updated every time to the application used by the user. It will also redirect to control the irrigation.
4. The user will be able to see the status and values of the node by checking the values on the application. User can turn on or off nodes using Bluetooth. This will control the water supply to the farm. Thereby it will lead to saving of water resources.
5. The temperature sensor will be deployed on the surface of the soil whereas the soil moisture sensor will be inside the soil surface which will depend on humidity level.



In the second module for detection of plant disease ffor visually observed symptoms that is, on item and leaves of the plant, image processing is used. The user can select option to use this feature.

1. The image or the photo of the affected part of he plant which can be visually seen is captured through the camera of the smartphone.
2. The image can be browsed and uploaded onto the application.
3. The system using the data sets of plant disease like rust, tar-spot which are stored in the database are queried and image processing is done on the image uploaded.
4. Image processing involves the basic steps of the algorithm.
5.

a) ImageProcessing

It is a common name for operations with images at lower level of abstraction. The aimaim of this is to improve the image data that decrease the unwanted distortions in the image which enhances the features of the image. In image processing transform the colors with the best highlighted the diseased regions in the image.

b) Image Enhancement

It is just a process which adjust digital images so that the result should be suitable for further analysis in the algorithm. Image enhancement develops the filter that will help the algorithm to highlight the diseased regions in the given image from the application.

c) Image Segmentation

Image segmentation is a process of process of partitioning a digital image from the application into multiple segments for frther analysis. In the algorithm image segmentation identifies the diseased regions in the image.

d) Image Postprocessing

Image postprocessing improves the quality of the given image and enhances the disease region for analysis and decreases the unwanted of the given image.

Blob algorithm is a fundamental techniques of machine vision based on analysis of consistent image regions. It is highly flexible and is best at its performance and its limitations are clear background-foreground relation requirement and pixel precision (1D edge detection).
The basic scenario of the blob analysis solution consists of

1. Extraction
2. Refinement
3. Analysis

1) Extraction
   It is the initial step of image thresholding techniques for obtain a region which is being inspected.
2) Refinement
   In the refinement step, the region is enhanced using region transformation techniques which helps in removing the flawed region in the image.
3) Analysis
   The refined region is subject to measurement and the final result ae completed.

Using image processing, the disease is recognized using the database based on the disease detected, treatment or measures to control the disease at early stage is suggested to user in Hindi and English languages as per user requirements.

This will control the disease at the early stage ass the modern farmers are unaware of the disease will get benefits without any major efforts. The system allows to increase the quantity and quality of the irrigation system giving economic benefits without human intervention.

- **Sample Datasets:**

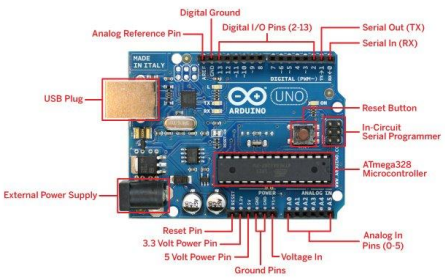
Linden Leaf Blotch


Phyllosticta


Rust


4. SPECIFICATIONS

- **Arduino**



It is an open source single board using microcontroller that is based on ATmega328P. The board is equipped with 6 analog inputs and 14 digital input output pins. It acts as a communication interface which can include USB interface used for programming. It consists of power jack, reset button, flash memory of 32 kb, SRAM and EEPROM, clockspeed (16MHz) and it operates on 7 to 12 V.

- Temperature Sensor

It is used to measure temperature as a function of resistence. As a temperature of the soil increases, resistence also increases. It is deployed on the surface of the soil.

- Soil Moisture Sensor

Soil moisture sensor is usually used to detect the humidity of the soil. The sensor has two parts, an electronic board and the probe with two pads. It has power LED, output LED and an inbuilt potentiometer. When the soil is wet, output voltage decreases and when the soil is dry output voltage increases.

5. RESULTS

The result involves the successful operation of the smart irrigation system which is unmanned and detection of plant diseases by visually observable symptoms on plants. The detection is done on diseases like Tar Spot, Rust, Phyllosticta, etc. the system is able to conserve water supply and control over irrigation hereby increasing the productivity.

6. CONCLUSION

This paper presents a smart irrigation system consisting of temperature and soil moisture sensor along with plant disease detection module for visually observable symptoms. This system uses sensors as input Arduino UNO and outputs are given on an Android mobile application to the user.
The android application is used to control the water supply as well as treatment measures are suggested in Hindi and English to the Indian farmers. The system saves energy and also automates the irrigation control which will further give a new impact to agriculture and farming.

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