Plant Disease Identification and Prevention using Image Processing and Internet of Things

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***Abstract*:- For over a decade, agriculture has been the key source of income inIndia. In a country like India, which is developing now, agriculture provides a huge number of employment opportunities. According to a study, a huge population of the country, around 60-70% of the country depends on agriculture. Most of the work related to farming in India is being done manually because most of the farmers lack the technical knowledge required to do it in a modern way. Pesticides are being sprayed presently on the plants by the farmers but it will have bad effects on the people who consume them. Farmers have no proper idea of what type of crop can be grown on the type of soil they are working on. When different types of diseases affect the plants, where the main part of the plant that gets affected is the leaf, they will suffer a huge loss economically. There will also be a significant decrease in the production of the plants. A leaf is one of the most important parts of the plants. The most challenging job for both the farmers and researchers is the identification of the disease that has affected the leaf. For identifying the plant diseases, farmers need to adapt to too many modern techniques. Through this paper, we will overview various plants and their illnesses and the different propelled procedures that can be utilized to identify these diseases.**

Keywords:- Analyzing, Ecological modernization, Insects, Internet of things, detectors

1) INTRODUCTION:

As the world is turning towards technological advances and modern applications, there is also a need for further growth in farming. A huge amount of work is being conducted in the area of irrigation. Many programs include the use of a wireless detector system, which gathers information from multiple detectors installed at different locations and sends it via a communication interface. The information obtained includes details along the various economic variables involved. Intercepting external factors may not be the comprehensive solution to improve agricultural productivity. There have been a multitude of things that reduce efficiency to a larger degree. Automation of cultivation should thus be carried out in order to resolve these issues.

In order to tackle all these issues, it is therefore necessary to establish an efficient system that will take better care among all factors that influence efficiency at each level. Moreover, because of certain problems, full modernization of cultivation was not accomplished. Although it is applied at the research level, it is still not offered to farmers as a commodity to gain from the raw materials. That is why this article deals with the growth of digital farming using IoT and provided to peasants.

2) LITERATURE SURVEY:

[1]Minoli et al proposed most of the technological benefits provided and the logistical challenges posed by the IoT in the modern construction environment.

[2]Sivaraman et al proposed challenges are first demonstrated by the use of actual products commercially available. We then claim that, as more these apps appear, the threat vectors escalate and the data protection / surveillance of the home will become more and more difficult. We also recommend that hardware-level defenses be improved by system-level security tools that can track internet activity to prevent unusual activity.

[3]Ntuli et al proposed “A Simple Security Architecture for Smart Water Management System”. Computer and system stability is essential to the functioning of the application. Even though many IT security requirements have evolved over the last several years, they should not be used explicitly with the kind of restriction systems. This is because of their resource constraints and special specifications. Nevertheless, many of these methods may be modified and can be used with such parameter systems. The report suggested governance structure for smart water monitoring systems, as well as the architecture utilizes current security technologies and layout trends.

[4]Suma et al proposed a wide range of technologies such as Bluetooth-based network connectivity, humidity &

weather sensing, scarring trespassers, protection, leaves wetness and adequate agricultural equipment. This allows constant use of cellular sensor networks to determine surface resources and external factors.

[5]Verdouw et al proposed centers on detecting and tracking, whereas operation and remote control are far less discussed. The results suggest how IoT was still in its beginnings in agricultural development. Frameworks are often difficult to interpret, lack of better integration and, in particular, more sophisticated approaches are at the conceptual stage of evolution.

[6]Baranwal et al proposed reflects on the approaches used to address issues including the detection of pests, the hazard to plants and the distribution of actual-time alerts on the basis of knowledge collection and retrieval avoiding human interference.

[7]Elijah et al proposed the IoT environment as well as how the integration of IoT & DA makes smart cultivation possible. These offer free emerging trends and prospects that are classified as technological developments, product situations, industry and brand recognition.

[8]Gondchawar et al proposed render farming efficient using optimization and IoT techniques. The highlights of this design provide a sophisticated GPS-based remote operated device to perform menial tasks such as sorting, watering, humidity detecting, bird and insect scarring, surveillance, etc. Secondly, efficient agriculture with predictive monitoring and wise decision-making centered on reliable actual-time existing data.

3) MODULES:

Below mentioned modules play an key role in monitoring the agricultural lands they are:

A)
rduino IDE
B)
iquid crystal display
C)
c motor

A) Arduino IDE

The arduino uno is an accessible-source printed circuit board that has been developed bycom- puter chip ATmega328P, Theboard has a set of electronic input/output (I/O) and analog joy- stick/output pins and can communicate with different extension frames (shields) as well as other connectors. Arduino could be used to construct interactive objects,to connect to a broad rangeofbuttonsordetectorsandtomonitoranumberofdisplays, motorsandothermechanical outputs. Arduino functions can be autonomous or can interact on your computer with both the software.youcanpickthetilesmanuallyorpurchasethembypre-assembling;youcanimport the accessible-source IDE foranything.

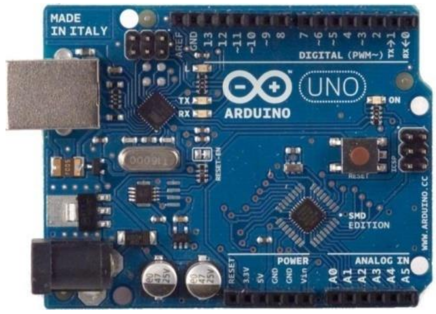

Figure 3.1: Arduino uno

B) Liquid Crystal Display

The lcd monitor contains a set of minute divisions known as pixels, which can be used to view data. This system uses many forms of monitors in appliances such as computers, watches andboards of note, clocks, appliances, machinery and many other tools. Many type of displays reflect, implying that perhaps the show is lit only with natural lights Even screen involving an external light source use considerably lower energy than CRT modelsLcd shows structured are inexpensive, easy to use, and it is even conceivable to create a readout utilizing the 8x80 pixels of show.

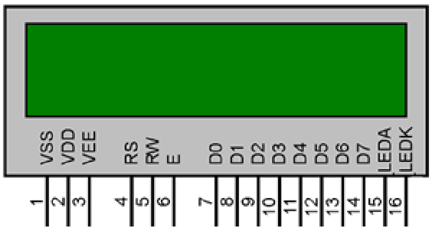

Figure 3.2: Liquid Crystal Display

C) DC Motor

“DC motors are persistent actuators that convert electrical vitality into mechanical vitality. The dc engine accomplishes this by creating a nonstop rakish turn that can be utilized to pivotsiphons, fans, blowers, wheels and so forth. Just as customary rotational DC engines, direct engines are likewise accessible which are equipped for delivering a constant liner development. The DC motor achieves this by producing a continuous angular rotation that can be used to rotatepumpaswellasconventionalrotaryDCmotorslinermotorsarealsoavailablewhicharecapable of producing a continuous linermovement.”

Figure 3.3:DC Motor

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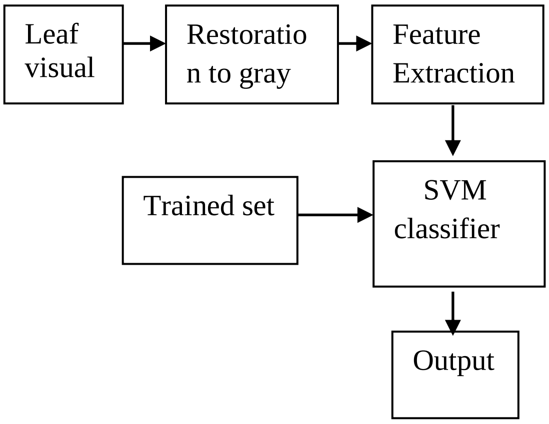
4) METHODOLOGY:



The above square graph clarifies the Step-by-Step process utilized in plant infection recognition. At the point when an ailment influenced plant, leaf picture is given as info the picture experiences following procedures.

A) IMAGE PROCESSING
B) IMAGE SEGMENTATION
C) IMAGE CLASSIFICATION
D) USAGE OF IOT

A) IMAGE PROCESSING

Picture handling change of RGB to Grayscale happens and clamors are evacuated by utilizing a Median filter. The Grayscale picture comprises of monochromatic shades of dark to white. Many pictures alters programs enable you to change over a shading picture too highly contrasting or grayscale. By changing over the Original picture into Grayscale picture all shading data is evacuated by leaving just the luminaries of every pixel. Median Filtering is a technique used to expel clamors in the pictures especially "salt and pepper" type commotion. The Median filtering works by supplanting each an incentive by the middle benefit of neighboring qualities.

Figure 4.1represents the conversion of RGB to Grayscale image.

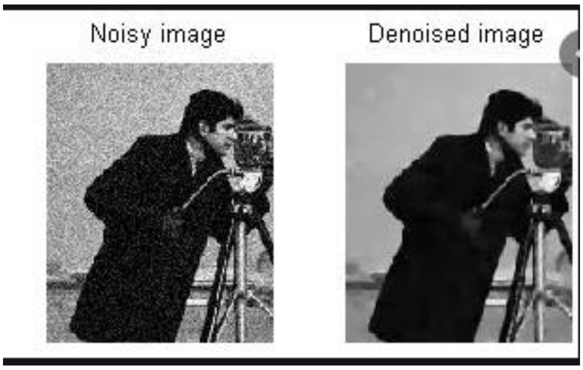


Figure 4.2 Represents the removal of noise using the median filter.

B) IMAGE SEGMENTATION

In this method, feature extraction is done by using a Haar wavelet transformation method and k-means clustering.

Haar Wavelet approach is utilized to perform both lossless and lossy picture pressure. Haar wavelet is a productive method for image compression. This approach relies upon averaging and differencing values and makes a meager lattice (Sparse matrix). This strategy is utilized in feature extraction.

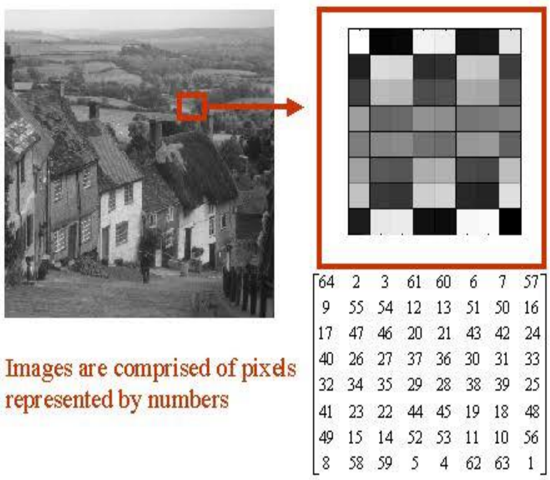


Figure 4.3 shows the pixel values of an image in a sparse matrix form.

Feature Extraction is used in representing the parts of the image. this method is mainly used when the images sizes are large and also used in feature representation of images which helps to complete the tasks faster. Different statistical features are found namely skewness, variance, kurtosis, Rms, entropy, standard deviation, mean, Energy, Correlation contract.

- **SKEWNESS:**

Measures how unsymmetrical the appropriation of pixel esteems is.

- **VARIANCE:** Measures how every pixel fluctuates from nearby pixels (or) center pixels and utilized in the grouping of various locales.

- **KURTOSIS:** kurtosis values are found in blend with noise and resolution. High kurtosis values should go inseparably with low noise and low resolution.

- **RMS:** RMS means Root mean square used to find image contrast

- **ENTROPY:** Used in Quantitative Analysis and also used in better comparison of image details.

- **ENERGY:** Used to calculate the information while performing the Operations on probability bases.

- **CORRELATION:** Used to extract information from the image.

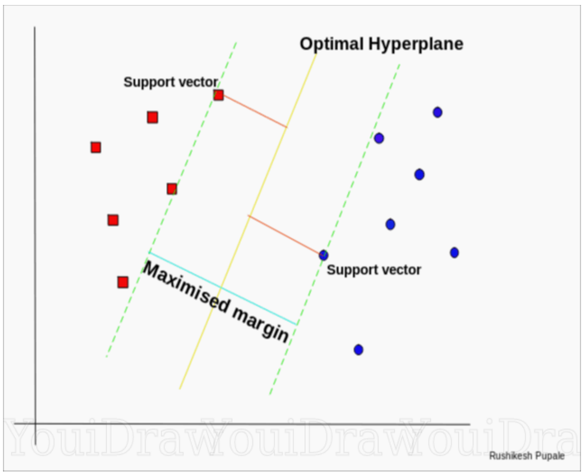
- **CONTRAST:** used to find the difference between the highest and lowest values of the adjacent set of pixels.

K-means clustering algorithm is an unsupervised algorithm and it is utilized to segment the particular part from the background. A specific group is being used to generate the first centers and this region unit for the optimization of the picture which is used in the k-mean law.

C) IMAGE CLASSIFICATION

Image classification is done by using the **support vector machine algorithm**. It comes under the umbrella of the machine learning support vector machine algorithm (SVM). Image processing on the other side focuses primarily on the manipulation of images.

For example, image filtering, where a selected image when passed through a median filter to be sharpened. If you want to compare the two, then SVM might be used for the image classification process.

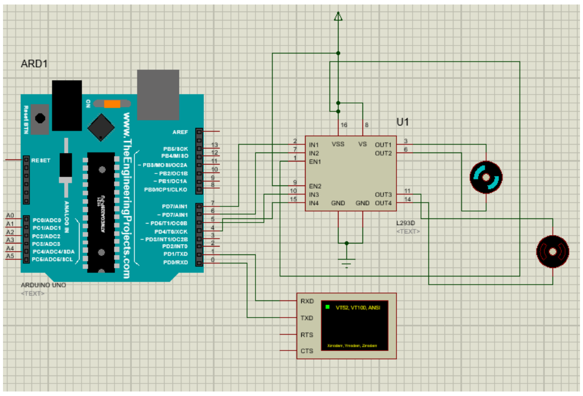


C(i)

D) USAGE OF IOT

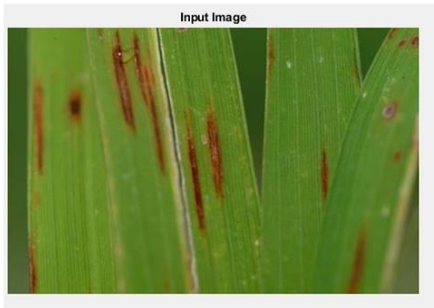
After Image Classification, the disease is identified by which the plant is affected. This is given as input to the Arduino so that the respective medicine is given to the plant through water by motors.

As soon as the disease is identified. Disease name acts as an input terminal to Arduino by which Motor operates and supplies medicine to the plant. IC L293D Motor Driver, Arduino and virtual terminal is used for carrying out the prevention process by running motors.



D(i)

5) RESULTS



5(i)

5(ii)

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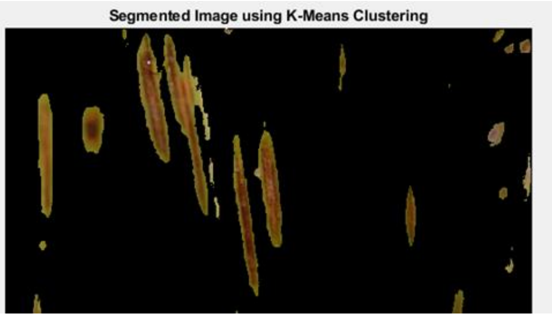
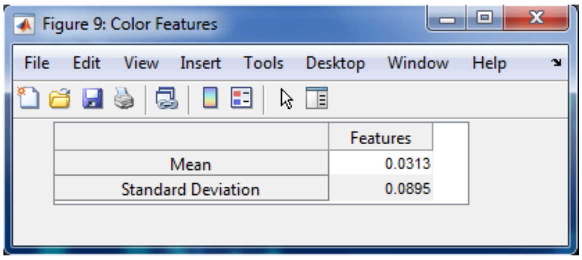
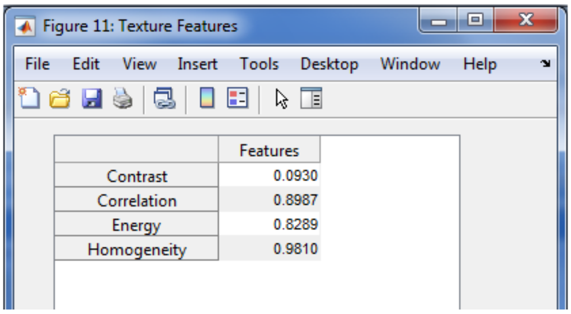


5(iii)



	Features
Mean	0.0313
Standard Deviation	0.0895

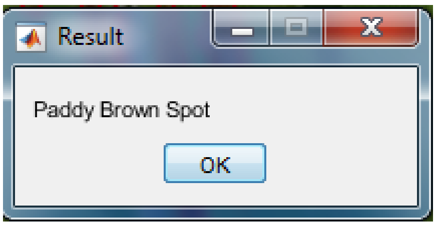
5(iv)



	Features
Contrast	0.0930
Correlation	0.8987
Energy	0.8289
Homogeneity	0.9810

5(v)

5(vi)



5(vii)

The above pictures shows theresults of Plant disease identification using image processing and Iot

6) CONCLUSION:

Through this paper, we surveyed various diseases that affect the plants used in the agricultural field, the symptoms that are observed in the plants for the respective diseases and the cause for that. Mainly, we conclude by saying that by automating the process by using image processing techniques, we can reduce the efforts, time and money that are spent in curing the disease. WSNs have the power to change agricultural protection in the farming sector of the any country. Incorporating WSNs with current services is indeed an opportunity for pioneering predictive cultivation. In this design, we suggest an agricultural farm surveillance and hedge system that relies on a detector. If an intruder is observed, an external warning is activated.

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