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IOT based Leaf Disease Detection and Fertilizer Recommendation

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Abstract – ***Our Eco System is getting smarter with the evolving growth of Internet of Things (IoT) technology. Internet of Things is integrated technique which combines the sensors into consistent items, and interconnecting them via the internet with the aid of IOT protocols for transformation of information and communication engineering fields. This proposed research deals with the idea of Internet of Things and examines the job of IOT in rural illness and creepy crawly worm control and contributes an idea regarding evaluation of dissimilar climatic thoughts of houseplant. The sensors integrated helps in detecting the moisture and humidity in soil and atmosphere. These factor helps in identifying the climatic conditions where the plant grows and the diseases that can be attacked for the plant. This proposed research work proposes an enhanced user-pleasant with Internet of Things Model for providing on-field disease identification and spraying of recommended pesticides.***

Keywords: IOT architecture system, disease detection, agriculture.

I. INTRODUCTION

Agriculture is the significant wellspring of each nation. The generation of farming will assume a significant job in the improvement of the nation. The farmers face parcel of issues in the yields because of the sicknesses. Serious issues in the horticulture incorporate water issue, climatic change, vermin and infections in the house plants. Because of vermin and infections along the harvest misfortunes up to 37% consistently. Earlier method for disease prediction and spraying fertilizers requires lot of labor and it is a time and energy consuming process. Manual spraying of pesticides is detrimental to health and work performance.

This proposed research work broadens an IOT based person friendly device to detect leaf diseases and to spray encouraged fertilizers.

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With regards to structuring a framework for computerizing these activities one needs to break down its thought into two contemplations which are agribusiness condition in which robot/framework is getting down to business and accuracy prerequisite in the assignment over conventional strategies. In view of this for showering process, contemplations which are considered regarding condition are: robot must most likely move in straightway appropriately on rough streets of ranch field, recognize the infected leaves and splash substance relying upon the ailment, sensors to be chosen for the framework must be picked by thinking about cultivating natural consequences for their working. Apart from these things other requirements are including sensors to the robot which will help in detecting moisture content. While thinking about the physical parts of the vehicle or automated framework, rancher's current condition specifically territory assumes a noteworthy job in planning these perspectives. Thinking about actualities of cultivating industry of India, framework to be created must have advantage over conventional techniques and tractors as far as cost, speed, precision in task for which it is planned, fuel utilization and physical vitality required by human for it. By focusing on these issues and contemplations legitimately the finished result will be genuine help for ranchers.

II. PROPOSED ARCHITECTURE

2.1 Software: The continuous pictures of different Lemon leaf sicknesses are gained utilizing camera and put away in the database. At that point distinct photo dealing with strategies are related to the acquired images to get beneficial things to see that are substantial for subsequent research method.
Features like contrast, correlation, Energy, Skewness, Entropy and so on, are calculated for the image and stored inside the database. The image comparison is completed by a few optimization techniques with the stored statistics. The picture of image processing is shown in the Figure 1.

2.2 Hardware: Hardware system is integrated with ARM 7 Microcontroller and multiple sensors. Sensor like moisture is attached to micro controller it's far used to discover the moisture content material of the soil wherein crop grows. By detecting the moisture content within the soil, if the moisture content is low compared to the desired moisture content material then the water pump attached to the machine will sprinkle water. System is connected to the software through MATLAB code. When the classification algorithms detect any disease in the leaf it will suggest the pesticides. Once the pesticides are suggested the pesticide pump attached to the system sprays the pesticides.

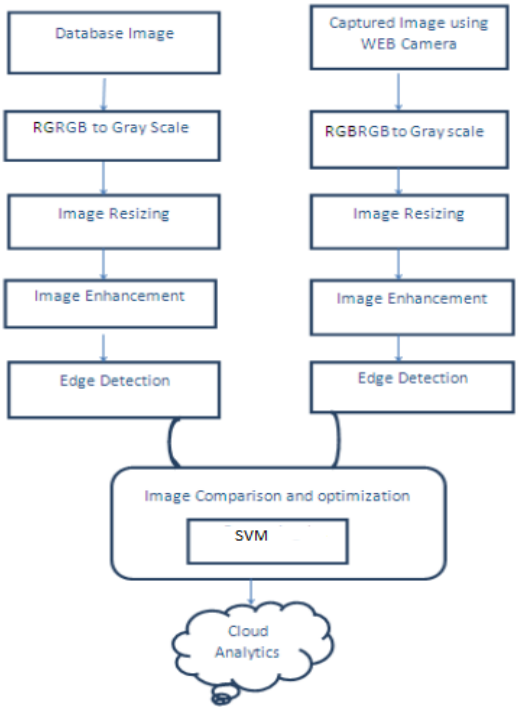


Fig 1: Image Processing

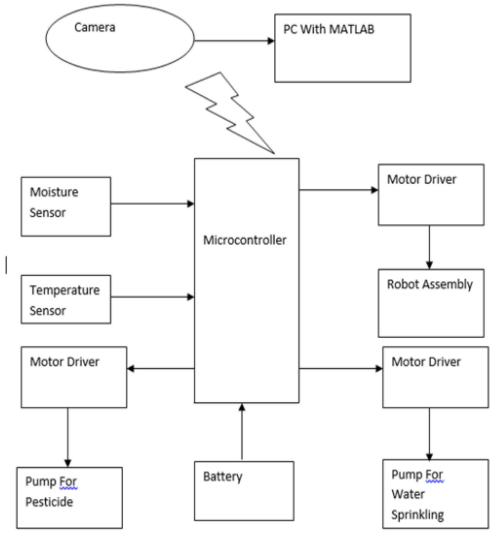


Fig 2 : Block diagram of Robot Assembly

2.3 ARM7 Microcontroller:

ARM7 is one of the broadly utilized smaller scale controller own family in inserted framework software. This section is inconspicuous exertion for clarifying critical highlights of ARM-7. ARM is a set of steerage set models for PC processors depending on a faded guidance set figuring (RISC) engineering created by using British organization ARM Holdings. A RISC-primarily based PC configuration method implies ARM processors require fundamentally much less transistors than normal processors in everyday PCs. This technique lessens costs, warmth and energy use. These are appealing qualities for light, compact, battery-controlled devices together with advanced cell telephones, PCs, pill and scratch pad PCs, and other inserted frameworks.

2.4 Two Channel Relay Module:

A Two Channel Relay is characterized as an electrically labored switch; their precept use is controlling circuits with the aid of a low-manipulate flag or while some circuits have to be limited through one flag. The number one changed into applied in extensive separation transmission circuits as audio system, basically they revised the flag they got from one circuit, and transmitted it into an exchange one, and they had been likewise applied in early PCs to carry out smart sports.

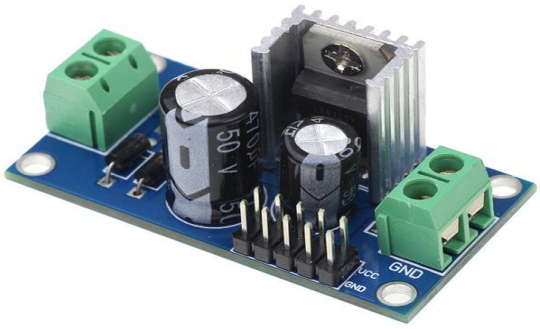
2.5 Soil-Moisture-Sensor:

These sensors measure the quantity of water content material available in the soil. Since the direct gravimetric assessment of loosened soil dampness calls for expelling, drying, and weighting of an example, soil dampness sensors measures the volumetric water content in a roundabout way by employing some other property of the dust, for example, electrical competition, dielectric constant, or cooperation with neutrons, as an intermediary for the dampness content.

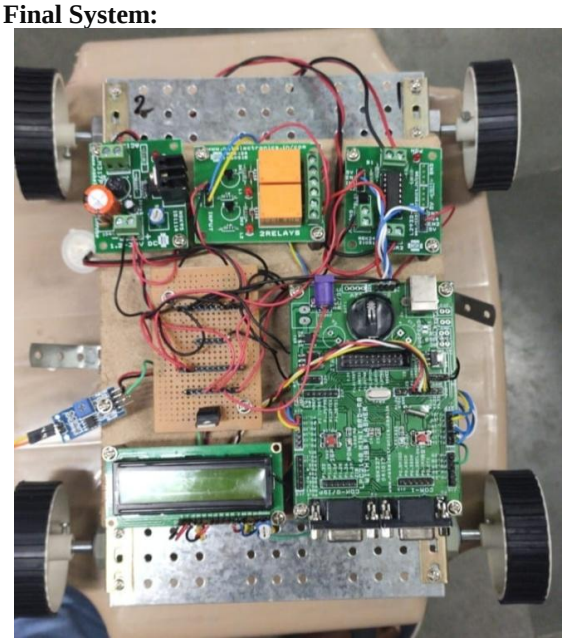
2.6 DC Voltage Regulator:

Electronic voltage controllers are located in gadgets, as an instance, The PC manage materials in which they stability out the DC voltages utilized by the processor and unique components.

In car alternators and focal strength station generator flora, voltage controllers control the yield of the plant. In an electric electricity appropriation framework, voltage controllers might be added at a substation or along dispersion strains with the purpose that everyone customers get enduring voltage unfastened of the way a great deal strength is drawn from the road.



2.7 Final System:



III. PROPOSED METHODOLOGY

The proposition manages IoT based framework utilizing Image handling methods. When the equipment set-up complete the assignment, the product part will be finished by the picture handling strategies. First the pictures are procured utilizing Web camera and processed by SVM algorithm and put away in the database. The image obtained from the digital-camera and from the database may be pre-processed. Next the trade of RGB to gray scale photo could be accomplished, as gray scale photo gives ideal exactness to abscond discovery, at that factor photo resizing, trailed by using photograph upgrade and aspect identity.

At that point numerous investigation system are done to arrange the pictures as indicated by the specific issue within reach. Finally using some optimization techniques image disease is compared with preprocessed images and type of disease and the fertilizers recommended will be displayed on the user interface. The robot assembly is built on pairs of wheels and it is integrated with the hardware parts. The system contains Arm7 Microcontroller which controls hardware, Battery which supplies power for microcontroller and other parts like Sensors. Motor driver is connected to a pump which is used for sprinkling of water and pesticides. Once the disease is detected by the software, it will suggest the fertilizers and send results to LCD display and the pump will sprinkle the fertilizers on the diseased leaves.

IV. IMPLEMENTATION

Initially fundamental pictures handling task is performed which includes, convert the RGB image to gray scale, and practice facet detection to recognize ill forms. By coordinating the above said steps with a present day database, application gives brief outcomes on possibly inflamed harvests. The thought about pictures will investigate the information, procedure and transmitted to a unified database, aside from the limited handling. The database stores a movement of pictures both spatially and transiently variation for further handling. If the leaf image is diseased then the image is stored in the database for further usage.

A.Leaf -Disease Classification:

The diseases can be classified as numerous kinds. Some infections are Citrus Canker, Anthracnose, Alternaria Alternata, etc. For investigational purpose we have taken the samples of Citrus Canker diseases affected Lemon crops from the database and image capture crop. Total of two samples were taken for attention work which includes database image and acquired image. It is differentiated as Leaf 1, and Leaf 2.

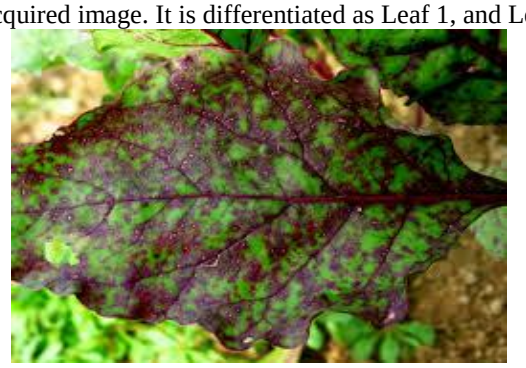


Fig 3: Leaf 1(Anthracnose)

B. Data Acquisition:

RGB images of the leaves are acquired from camera and stored in a jpg or png format. These images are then converted to gray scale image since it gives perfect accuracy. Then the gray scale images are resized and enhance the contrast to detect the disease of the image accurately.

Fig 4: Leaf 2(Diseased leaf acquired from Camera)

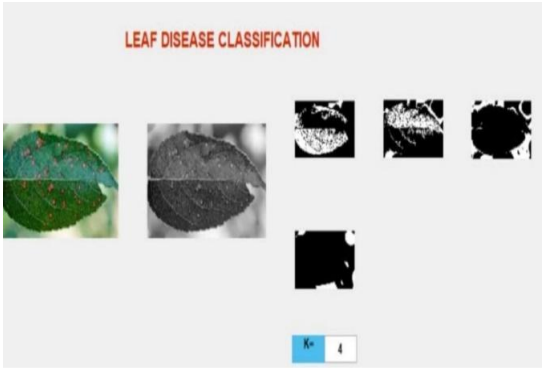
Fig 5: Gray Scale image

C. Images Edge-Detection:

Most of the form information of a picture is enclosed in edges. So, the grey scale of each photo is extracted by the use of edge detection algorithm.

D. Image optimization and comparison:

Once the image is converted to gray scale, some of the features like Energy, Kurtosis, Skewness, Entropy are acquired. Resizing is done and it is compared with the preprocessed images. And the result is given based on the category it falls in the preprocessed images. Once the disease is detected it will display on the user interface with the recommended fertilizers.



E. User Interface:

User interface will have options like forward, backward, Seeding, Sprinkling etc. These are used to control the robot assembly. Robot will function based on the option we choose on the user interface.

V. CONCLUSION

The fast improvement of IOT has a significant effect on acknowledging concentrated farming, high return and high caliber, and it will give strong establishment to the advancement of horticulture data advances. In this paper the principle issues are examined about the harvest sickness identification framework. Nearly the work has been begun to execute progressively and showed signs of improvement results. The examination is significant in wording to expand the generation of farming framework in India. It is noticed that advancement of the framework will encourages the ranchers to spare their harvests.

VI. FUTURE WORK

The work has been carried out for Lemon plant alone; in future the paintings may be achieved in all yields with the aid of a similar technique and genuinely it's going to get the exceptional outcomes. While considering specific yields take a look at the indications of the illnesses on my own.

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Tilak Shantaram Nayak completed his Bachelor Degree in Information Science and Engineering in CMR Institute of Technology ,

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Dr.R.Chinnaiyan working as Associate Professor in the department of Information Science and Engineering at CMR Institute of Technology, Bengaluru under VTU. He is having 19+ Years of Teaching and 13 years of Research Experiences. He published 50+ papers in referred international Journals and Conferences Currently he is guiding 4 research scholars in VTU. He is a life member of ISTE and CSI. His research interest includes Software Reliability, Internet of Things, Big Data , Cloud computing , Machine Learning, Wireless Sensor Networks and Security.