

PROJECT TITLE – TOMATO PLANT LEAF DISEASE IDENTIFICATION AND PREVENTION USING IMAGE PROCESSING AND IOT

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ABSTRACT

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. When different types of diseases affect the plants, where the main part of the plant that gets affected is the leaf, farmers will suffer a huge loss economically. This occurs due to a variety of significant reasons such as a lack of minerals, soil humidity, temperature changes. The aim of our project is to monitor the plant conditions and early diagnosis of plant diseases to increase the crop output, by using the image processing such as image resizing, grey scaling, background removal, image preprocessing, isolation. After Image Classification the disease is identified by which the plant is affected. Text message warnings and a notification on the application intended on the farmer's smartphone using Wi-Fi/3G/4G and the name of the disease. Disease name acts as an input terminal to esp32 by which Motor operates and supplies medicine to the plant finally detecting the image weather it is healthy or not, if unhealthy it will detect the disease of the leaf and then using an android mobile the message will be send to the farmer mobile phone which consist of the name of the disease and it will also ask whether to turn on or off or stop the motor. If the farmer sends ON through servo motor using pump will spray the fertilizer to the plant, if sends OFF the motor will not work and if given STOP the program will stop further.

INTRODUCTION

India is an agricultural country wherein most of the population depends on agriculture and agriculture is one of the major domains which decides economy of the nation. The quality and quantity of the agricultural production is affected by environmental parameters like rain, temperature and other weather parameters which are beyond the control of human beings. Another major biological parameter which affects productivity of the crop is the pests. The population of many countries in the world depends on its economy and the economy of most of the countries depends on agricultural production.

In country like India the farmers have wide diversity to select their crop for cultivation to produce maximum yield depending on environment available. However, there are certain issues with field crop. Each issue has an importance. Among them one is identification of pests in real field so that when symptoms of any pest take place on crops in fields, proper action should be taken to control it leading to minimize loss to farmer. For this farmer should have proper knowledge about pests so that correct action can be taken place, secondly to identify deficiency of nutrition in plants and to identify various diseases.

When any of such a condition occurs then farmers use his experience or knowledge and also refers some guide books. If they are aware about the pest, then they can take correct action to control the situation but, if a farmer doesn't have correct knowledge, then misidentification of any pests can be possible and incorrect controls measure like non- affecting pesticides can be used.

Which leads to wastage of work and money and most importantly it may lead to serious problem to crops. Otherwise, they may approach to any agricultural experts who give them suggestion regarding detection of infected pests and the treatment of incidence of pest for their crop/plant in order to prevent and control crop and increase the crop productivity. 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

Objective:

To design a prototype model on plant leaf disease identification and prevention using image processing which will detect the condition in early stage and warns the farmers at the same time.

LITERATURE SURVEY

A literature survey is an objective, critical summary of published research literature relevant to a topic under consideration for research. Its purpose is to create familiarity with current thinking and research on a particular topic, and may justify future research into a previously overlooked or understudied area.

2.1 Details of Literature Survey

Dr. C. Jothi Kumar Ph.D, Anudeep B ,Venkata Siv Anjaneyulu B[1] proposed Plant Disease Identification and Prevention using Image Processing and Internet of Things. In this paper it was surveyed various diseases that affects the plants used in the agricultural field, the symptoms that are observed in the plants for the respective diseases and the cause for that, and 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 centres and this region unit for the optimization of the picture which is used in the k-mean law with the efficiency of 86.5%. Image Classification is done using the support vector machine algorithm (SVM). Image processing on the other side focuses primarily on the manipulation of images.

Arathi Nair, Gouripriya J, Merry James, Sumi Mary Shibu[2] proposed Smart Farming and Plant Disease Detection using IoT. They proposed the technology that decreases farmers physical labor, increasing output in every conceivable way. Farmers can use an IoT-based system and a mobile application as part of the Smart Agriculture System. The Internet of things based system that measures numerous metrics such as soil moistures, temperature and humidity. An android app for farmers is included in the software section. The created android app that is connected to the hardware system via IoT and alerts the farmer so that he or she may monitor the live status of temperature, humidity, and other field factors at any time using the app. The goal of the concept is to reduce the human involvement and thus to increase farmer procurement in agricultural sector with the efficiency of 80.5%. The majority of the time, farmers are unable to get a good yield, resulting in a decrease in income. By utilizing three classes of tomato plants (two infected and one healthy), system for smart farming and plant disease detection using IoT and ML was developed.

METHODOLOGY

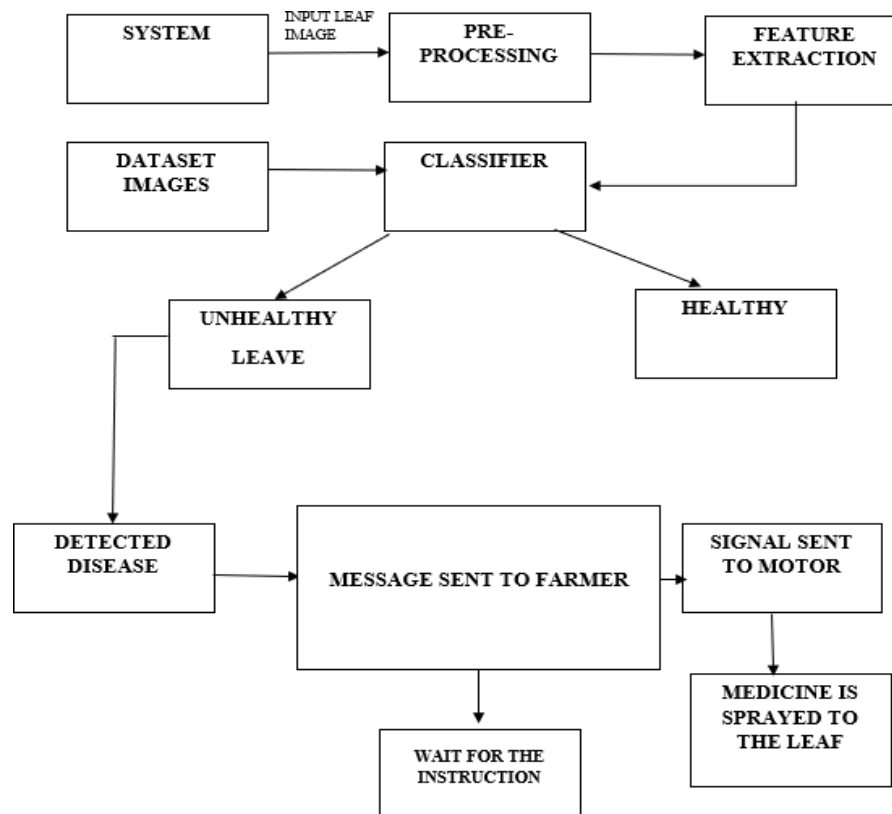


Fig: Layout structure of the proposed CNN-based tomato diseases detection approach

Imagine that the input image is that of -a leaf. This image with pixels, is first entered into the convolutional layers. If it is a black and white picture, the image is interpreted as a 2D layer, with every pixel assigned a value between '0' and '255', '0' being wholly black, and '255' completely white. If, on the other hand, it is a colour picture, this becomes a 3D array, with a blue, green, and red layer, with each colour value between 0 and 255. The reading of the matrix then begins, for which the software selects a smaller image, known as the 'filter' (or kernel).

The depth of the filter is the same as the depth of the input. The filter then produces a convolution movement along with the input image, moving right along the image by 1 unit. It then multiplies the values with the original picture values. All the multiplied figures are added up together, and a single number is generated. The process is repeated along with the entire image, and a matrix is obtained, smaller than the original input image. The final array is called the feature map of an activation map. Convolution of an image helps perform operations such as edge detection, sharpening, and blurring, by applying different filters.

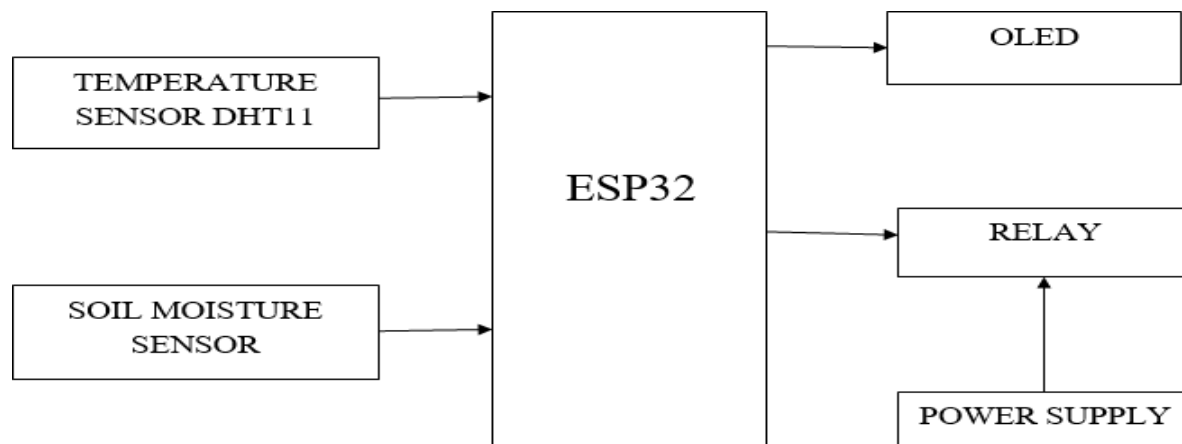


Fig: Block Diagram of soil moisture sensor and temperature sensor

Temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors.

Soil moisture sensors measure the water content in the soil and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way.

OLED is a solid-state device consisting of a thin, carbon-based semiconductor layer that emits light when electricity is applied by adjacent electrodes. In order for light to escape from the device, at least one of the electrodes must be transparent.

ESP32 can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces.

The relay permits a small amount of electrical current to control high current loads. When voltage is supplied to the coil, small current passes through the coil, resulting in a larger amount of current passing through the contacts to control the electrical load. Relays are the switches that aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit.

RESULT

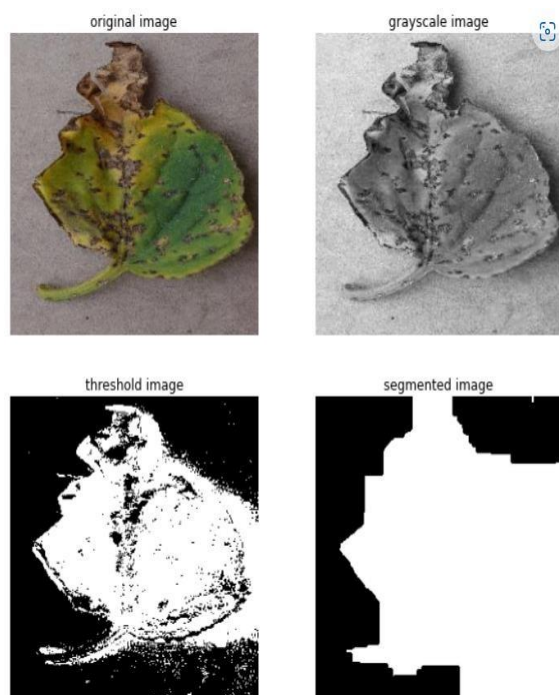


Fig: Obtained Result using Python Code



Fig: Message sent to farmer android mobile through Telegram

Image taken from dataset, gets converted to grayscale image which eliminates the complexities related to computational requirements, threshold image to separate the leaf(object) or foreground pixel from background pixels to aid in image processing, segmented image for partition an image into multiple parts or regions, often based on the characteristics of pixels in the image

As soon as the leaf is detected with the disease an message is sent to the farmers registered android mobile., through telegram which consist of name of the disease, and three conditions on the motor, off the motor, according to the respond message from the farmer the medicine will be supplied to part for a particular period of time.



Fig: Model setup