

# Autonomous Farming Robot for Plant Health Indication

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## ABSTRACT

Agriculture is very labour intensive field and only field where the robot is not used presently. Now-a- days many industries are trying to reduce this human labour by making machine in terms of robot. Vision based row guidance of robot is done by a technique named as pose (having combination of image and its angle) helps to guide a robot in a row field. So thus the platform which we have implemented helps the robot to use technique named as pose for its row guidance. Here we are designing autonomous intelligent farming robot which indicates the plant health by observing the colour of their leaves in terms of image processing which is done by raspberry pi and some limitation to plant height. The robot also notes the surrounding environmental conditions of the plant in terms of temperature and humidity so that the robot will decide about health of plant and will display on the LCD.

## Keywords

Raspberry Pi, PIC microcontroller, Agriculture image processing, Crop leaf.

## 1. INTRODUCTION

Leaf diseases on plant are the main element and having superior strength which appear as spots on the leaves. In case of severe infection, the leaf becomes completely covered by disease in terms of spots. Different type of leaf diseases on plant determines the quality, quantity, and stability of yield.



Fig1: Leaf miner disease

Leaf miners are the larval stage of an insect family that feeds between the upper as well as lower part of leaves. Heavily diseased and damaged due to insect on large amount in plants

it is common to find 6 or more maggots per leaf. So these heavily damage of leaf of plant can restrict plant growth, leads to reduced yields and loss of vigor, healthy plants can tolerate considerable injury [1].



Fig 2: Yellow Spot Disease

Pesticide use in plant diseases treatment increases the proportion of toxic level on agricultural products leads to a major contribution to ground water pollution or making water much more hazardous, also large amount of pesticide use leads to increase in production cost. This can be done by identifying the severity of disease and target the diseases places, with the diseases in plant not only reduce the yield but also making progressively worse condition of plant. Increase

in appropriate quantity and concentration of pesticide. The normal observation is generally used to decide diseases severity in the production practice but results are subjective and it's impossible to measure the disease severity. As one of the trends of development on automation in coming days is that all kinds of agricultural robots have been researched and developed to perform number of task like harvesting, weeding, pruning, planting, grafting, agricultural classification, etc. They gradually appear advantages in agricultural production. Thus the improved accuracy on

implementing this method in various sector and enhance handling safety. For disease detection and fertilizer spraying develop an autonomous farming robot, this robot take images of crop and by using image processing in raspberry pi find out the disease present or not on crop leaf. After that robot show the name of the disease and suitable fertilizer accordingly and at last spray the defined fertilizer on crop by using robot.

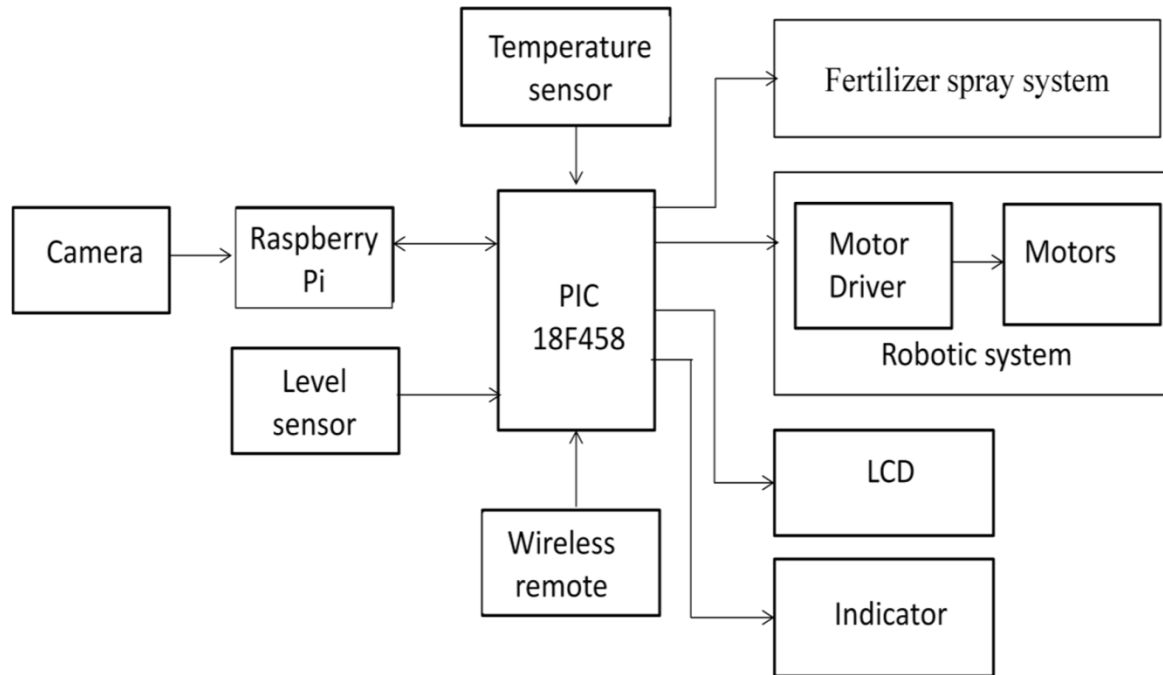


Fig 3: "Block Diagram of Autonomous Farming Robot system"

## 2. PRESENT SYSTEM

Automated farming robot required all system on robot, for that raspberry pi and PIC controller are used to perform robotic operation.

### A. Block Diagram Description

#### a. Camera

It is used to take an image of crops, it is directly connected to the raspberry Pi. There are two ways to connect camera to raspberry Pi first one is USB camera and second is camera module of raspberry Pi.

#### b. Temperature Sensor

Temperature sensor is used to detect the temperature of environment. Temperature sensor named as LM35 is used. This temperature sensor can sense and measure atmosphere temperature. The LM35 series square measure exactitude integrated-circuit temperature sensors, whose output in terms of voltage and linearly proportional to the Celsius (Centigrade) temperature. LM35 is associate degree analog detector and provides the output in terms of analog signal. This signal is feed to ADC leads the conversion into digital signal. Finally changing into digital signal, the microcontroller will method the digital temperature signal as per the appliance?

#### c. LCD Display

Lampex, 16\*2, Backlit facility LCD is used in a project to visualize the output. 16x2 LCD is used in project which indicates 16 columns and 2 rows. So, total 32 characters we

can display on 16x2 LCD. It can also use in a project to display the pesticide name to be spray on the crops. Thus LCD plays a vital role in a project to see the output and it also display the status of fertilizer tank that is tank is empty or not.

#### d. Motor Diver

An L293d motor driver IC is used to control motors in autonomous robotics. Motor driver act as an interface between controller and the motors in the robotics. Motor driver are primarily used in autonomous robotics only. Also the controller operates at low voltages and requires a small amount of current to operate while the motors require a relative higher voltages and current. Thus current cannot be supplied to the motors from the controller. This is the primary need for the motor driver.

#### e. Fertilizer spraying system

Fertilizer spraying system is used to spray the fertilizer on crop. By using this system we cover large area in less fertilizer. When the fertilizer tank is empty then led indicator is activated and leads to show the level of tank on 16\*2 LCD display.

#### f. Raspberry Pi

Raspberry Pi is used for image processing. Camera is connected to the raspberry pi, raspberry pi take image through that camera. After taking image of crop technique named as image processing is implemented on image. By using image processing we detect the disease on leaf. The Raspberry Pi is a credit card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of giving

basic computer knowledge in primary education. The Raspberry pi has system on chip(soc) named as BROADCOM BCM2835, having an ARM1176JZF-S 700 MHz processor, Video CoreIV GPU, and 256 megabytes of RAM, model b and b+ which are upgraded laterly has 512MB of RAM. It does not have inbuilt hard disk but it uses an SD card for booting and persistent storage, with the Model B+ using a Micro SD.

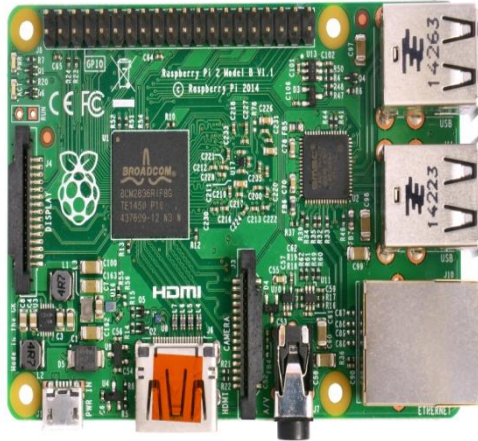


Fig 4.Raspberry Pi Image

**g. PIC18f458 Microcontroller**

PIC controller are used for control the all robotic operation, it give command to raspberrypi for image capturing and image processing. Autonomous robot system required more input and output pins for that PIC18f458 controller are selected. It has 40 pin controllers out of that 33pins are input output pins. It has 10bit ADC.

**h. Wireless Remote**

A wireless oftenest (RF) transmitter and receiver are often simply created exploitation HT12D decoder, HT12E encoder and raise RF Module. Wireless transmission are often done by using 433Mhz or 315MHz raise RF Transmitter and receiver modeules. In these modules digital knowledge is painted by totally different amplitudes of the carrier ,hence this modulation is throught as Amplitude shift Keying(ASK), Radio Frequency(RF) transmission is additional robust and reliable than Infrared(IR) transmission owing to following reasons:

1. Compared to infrared RF signal will travel additional distance.
2. Line of sight principal is employed by infrared however RF signal will travel through any obstacle.
3. Infrared signals can get discontinuous by other IR sources but the signal outlined on specific waveband in RF won't mix in another RF signal band.

**3. SYSTEM FLOW CHART**

**a. Disease Detection**

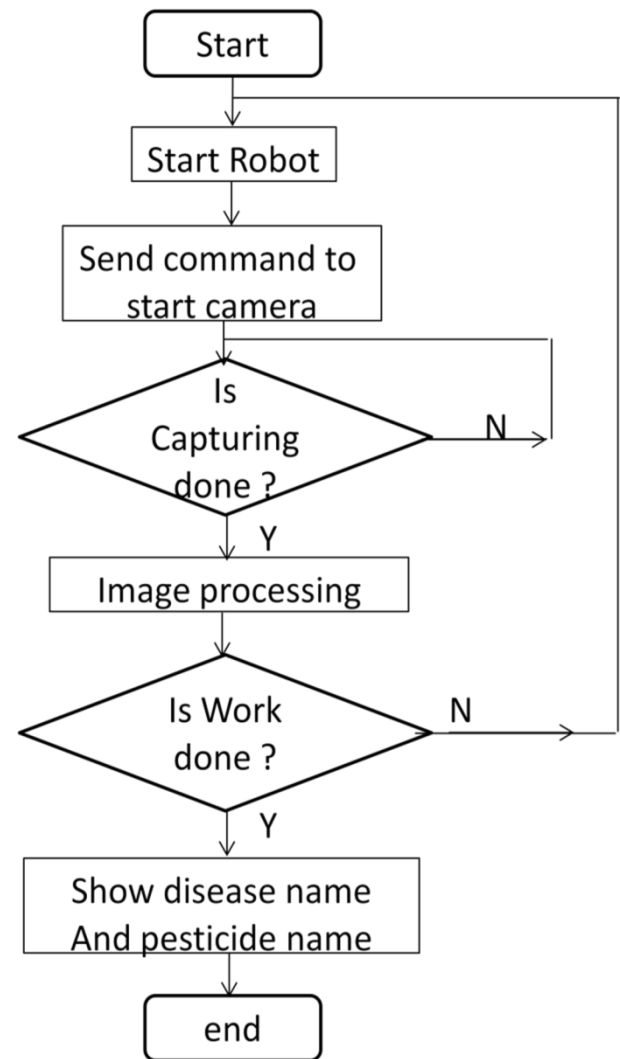


Fig 5: Disease detection

Fig 5 shows the flow chart for disease detection and fertilizer suggestion. First take the image of crop then make image processing on that image, after that check work done signal if it is high then show the disease name and fertilizer name on display else repeat the process of image capturing and image processing.

### b. Fertilizer Spray System

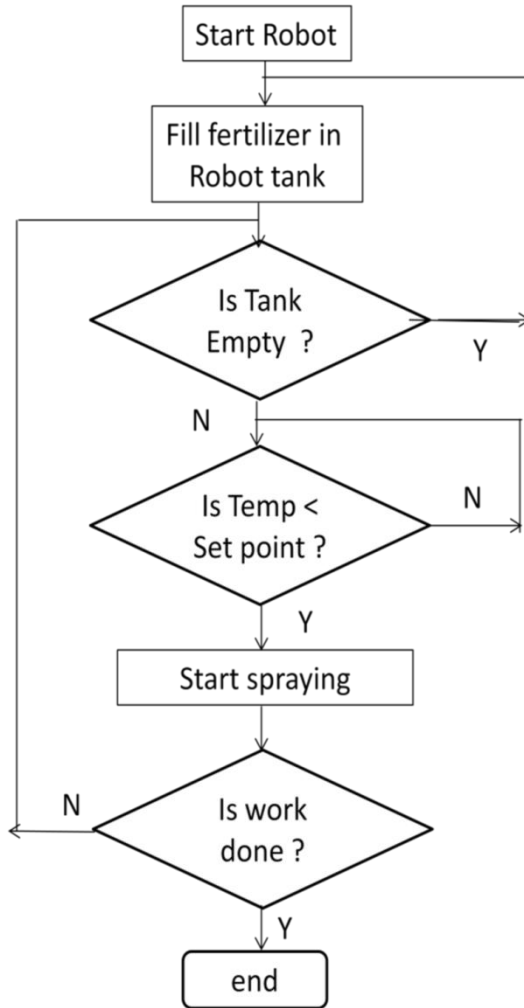


Fig 6: Fertilizer Spray System

Fig 6 shows the flow chart for fertilizer spraying system, first fill the fertilizer in robot tank after that check the status of temperature sensor if it is above set point then spraying system is stop else continue the spraying.

### 4. WORKING

As considering above block diagram robot structure is divided in to three section first is embedded section second is battery section and third is fertilizer tank section. Operation of robot is controlled by using PIC18f458 microcontroller, DC motors are used for robotic operation and that motors are drive through L293d IC. PIC give the signal to the L293d, according to that signal L293d IC give signal to the DC motor. 12vbattery are used for provide the supply voltage to the PIC controller, raspberry pi and DC motors.

As Fig 4. Showing raspberry pi which is the essential small personal computer (pc) used for capturing the images of crops. Raspberry pi require 5v DC supply for operation that supply is provided through the battery which is mounted on robot. Camera is connected to the USB port of raspberry pi.

### 5. CONCLUSION

Leaf diseases in plant square measure the foremost predominant diseases that seem as spots on the leaves. Though plant disease will prohibit plant growth, leading to reduced yields and loss of vigor, healthy plants will tolerate goodly injury. By victimization image process decide the sort of illness and per that illness spraying the chemical on crop through autonomous farming mechanism. By victimization farming mechanism we tend to offer the correct treatment to the crop and maintain the crop healthy and increase the assembly. Main advantage of farming mechanism is to save lots of the chemical price, labor price and avoid the direct contact of farmer with chemical.

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