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An IoT Instrumented Smart Irrigation System Using Raspberry Pi

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ABSTRACT
Where technology is concerned, agriculture is introducing modern irrigation technologies. Previously, in agriculture, farmers faced over- and under-irrigation, resulting in crop damage. This the development detection device the Internet of Things. In this article, an IoT framework based on Raspberry Pi is demonstrated, which will enable the farmer to regulate irrigation from anywhere and at any time using a PC or smartphone, as well as track moisture and temperature parameters. To minimise his or her efforts while still maximising the use of water. A message is sent to the user through the Blynk app, prompting them to take appropriate action.
Key words: IoT, Raspberry pi, PIR sensor, DHT 22 sensors, soil sensor, LDR and Blynk app.

INTRODUCTION
Using far more freshwater than any other region. Agriculture uses a disproportionate volume of water compared to the domestic and manufacturing sectors. Groundwater contributes about 3/4 of total water. Water is now one of the most important resources on the planet, with the majority of it being used in agriculture. The device will relay this information across the wireless network since the Raspberry Pi is at the center of the device, the webcam is connected to it by a can be used by the device. The irrigation system is automatic if either the soil moisture or temperature parameters exceed a predefined intensity, as the raspberry pi model is designed to do, i.e. the relay attached to the raspberry pi will activate or deactivate the motor. This paper describes an automatic irrigation system that is efficient, inexpensive, and simple to use. When built, this machine needs less maintenance and is simple to operate. We can conveniently online track the specific condition of the sector by using a webcam with a suitable smartphone application. Experimented metrics for approaches, and some have used analytics as well. In addition, I've worked on a variety systems. Let's look at some of the relevant work that the researcher has done in order to create a method that is both effective and accurate.

LITERATURE REVIEW:
"A Low Cost Smart Irrigation Control System" was suggested by Chandankumar Sahu et al. It consists of a number of wireless sensors positioned in the farm field in various directions. The information obtained by the "ATMEGA318" microcontroller on the "ARDUINO-UNO" development board comes from each sensor, which is connected to a wireless networking computer. The Raspberry Pi is used to transfer data to the microcontroller phase through internet communication, such as text messages and pictures. K. S. Nemali and colleagues proposed irrigation systems that are also automatic using data from dielectric moisture sensors to determine the volumetric water content of the soil. " Instead of irrigation schedules at a certain time of day, for a certain period, and aligned with soil moisture, it is used to monitor actuators and conserve water. The "Sensor based automated irrigation

system with IoT" suggested by Karan Kansara et al. uses a raingun pipe with one end attached to the pump and the other to the plant's foundation. It does not have water in the same way as a sprinkler does, because it only uses a soil moisture sensor.

"Ms. Deweshvree Rane et al. proposed "Review paper assisted Automatic Irrigation System supported RF Module." This interface is used to relay or receive radio waves between two systems. The architecture is complicated.

RELATED WORK

Many researchers discovered that agriculture's region and production are dwindling by the day after conducting intensive research in the field. We can increase productivity while reducing manual labour by using various technologies in the field of agriculture. This paper demonstrates how IoT and Raspberry Pi are being used in the agriculture industry. A scheme called "A Low Cost Smart Irrigation Control System" was suggested by Chandan kumar Sahu. It consists of a number of wireless sensors positioned in the farm field in various directions. "ARDUINO-UNO" which is integrated with each sensor via a wireless networking interface. The Raspberry Pi is used to transmit different types of data, such as text messages and images, to the microcontroller process through internet communication [1]. Supraha Jadhv suggested an integrated irrigation system that controls operations effectively using a wireless sensor network and a Raspberry Pi [2]. Instead of the Raspberry Pi, Joauin Gutierrez attempted to study an automatic irrigation system using a wireless sensor network and GPRS module [4]. Deweshvree Rane, Ms. Deweshvree Rane, Ms. Deweshvre The"Review Paper Based on Automatic Irrigation System Based on RF Module" that was proposed is based on the RF module, which is a mechanism that transmits or receives radio signals between two devices. it has a complicated nature [5]. Karan Kansara suggested a "sensor-based automatic irrigation system with IoT," which uses with one end attached to the water pump and the other. It does not have water in the same way as a sprinkler does, because it only uses a soil G. Parameswaran introduced an "Arduino-based smart irrigation method using the Internet of Things." Instead of using a Raspberry Pi, the researcher used an Arduino controller and did not use soil moisture sensors.

PROPOSED SYSTEM

BLOCK DIAGRAM:

This chapter briefly discusses figure 1, the project's proposed block diagram. It outlines the proposed system's architecture and operation. This architecture is divided into software and hardware components that aid in the detection of irregular leaves, soil moisture, temperature, a buzzer-based warning system, and data tracking in the application.

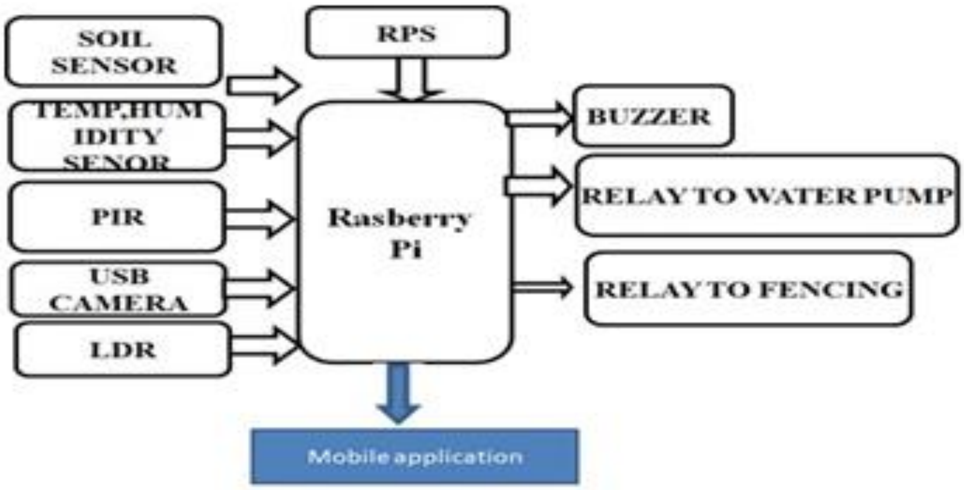

Figure 1 Proposed Block Diagram

Raspberry pi module

Model 3 B+ of the Raspberry Pi production board. It's a 40-pin CPU that's the size of a credit card. It's an ARM cortex A53 processor with four cores. It has a clock speed of 1200 mHz. It is popular due to its simple networking capabilities, which include five separate ports. Pi serves as the machine's heart of our proposed system. PIR sensor, DHT 22 sensors, soil sensor, LDR, and Blynk app are among the remaining modules. Figure 2 is a diagram of the panels.

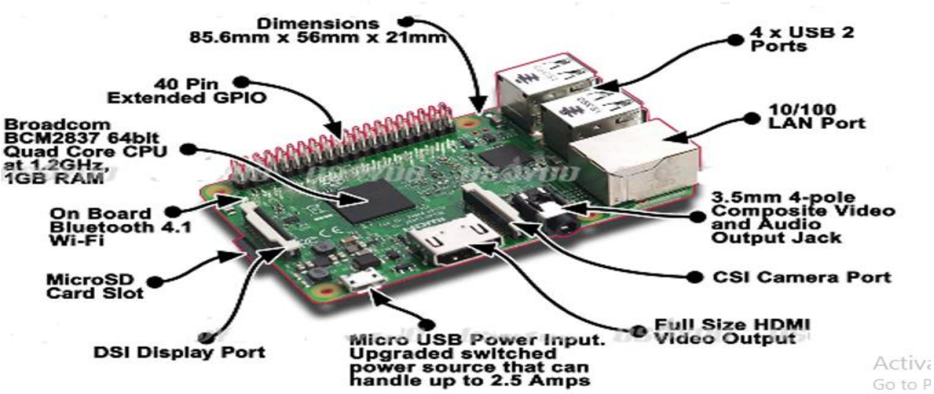

Figure 2 Raspberry pi Module

Soil Moisture Sensor

Figure 3 shows a soil moisture sensor that is used to measure the amount of moisture present in the soil, which is a critical parameter in this method. This sensor's working voltage ranges from 3.3 to 5 volts. Because of the microcontroller's 10 bit ADC, the analogue value range is 0- 1023.

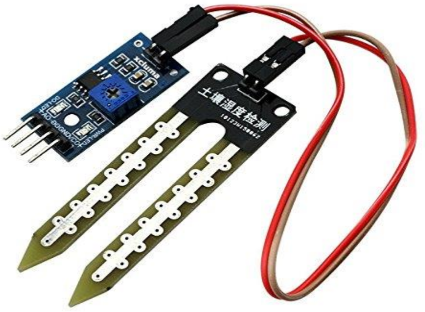

Figure 3 Soil Moisture Sensor

DHT22

Figure 4 shows a sensor that measures the temperature and humidity of the environment. The working voltage ranges from 3.3 to 6 volts. This sensor has a sensing time of every two seconds and a working temperature range of -40oC to 80oC.

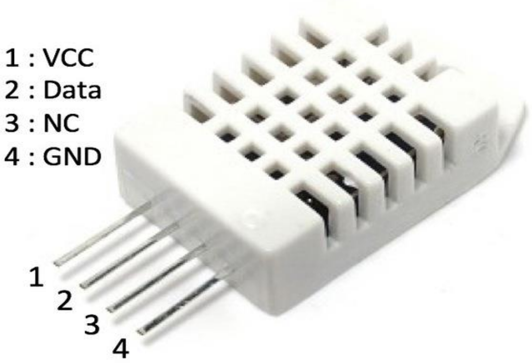

Figure 4 DHT 22 with pin configurations

HC-SR501PIR SENSOR

This sensor, seen in Figure 5, detects the movement of a warm body. The sensor's working voltage ranges from 3.3 to 20 volts. The PIR sensor has a greater than 110o tilt. The sensor has a length of up to 6 meters.

Figure 5 HC-SR501 PIR Sensor

CAMERA

A high-resolution camera is used to take the photographs. With so many cameras on the market, we choose a low-cost, high-resolution USB camera. Since the photographs are simple to pass to the computer. As a tracker, the camera was used. The wellbeing of a leaf can be measured using a detection system from a camera.

IoT (Internet of Things)

Thingspeak is used in the proposed scheme (IoT). It's an open source IoT framework and API for storing and retrieving data from items over the internet or over a local area network using MQTP and HTTP protocols (LAN). Using this protocol is a good way to go. The recorded picture is saved and sent by email. In irregular conditions, a "URL" is often retrieved and sent to a mobile number via the Pi module.

Workflow Chart

The proposed smart irrigation system is depicted in the flowchart figure 6 below. This flow begins with system activation and a review of the LED on state before performing real-time data with the Raspberry Pi and soil moisture condition to drive the engine. The identification of leaves and their state is carried out. A water level is continuously tracked through a mobile app, which aids in the irrigation flow process.

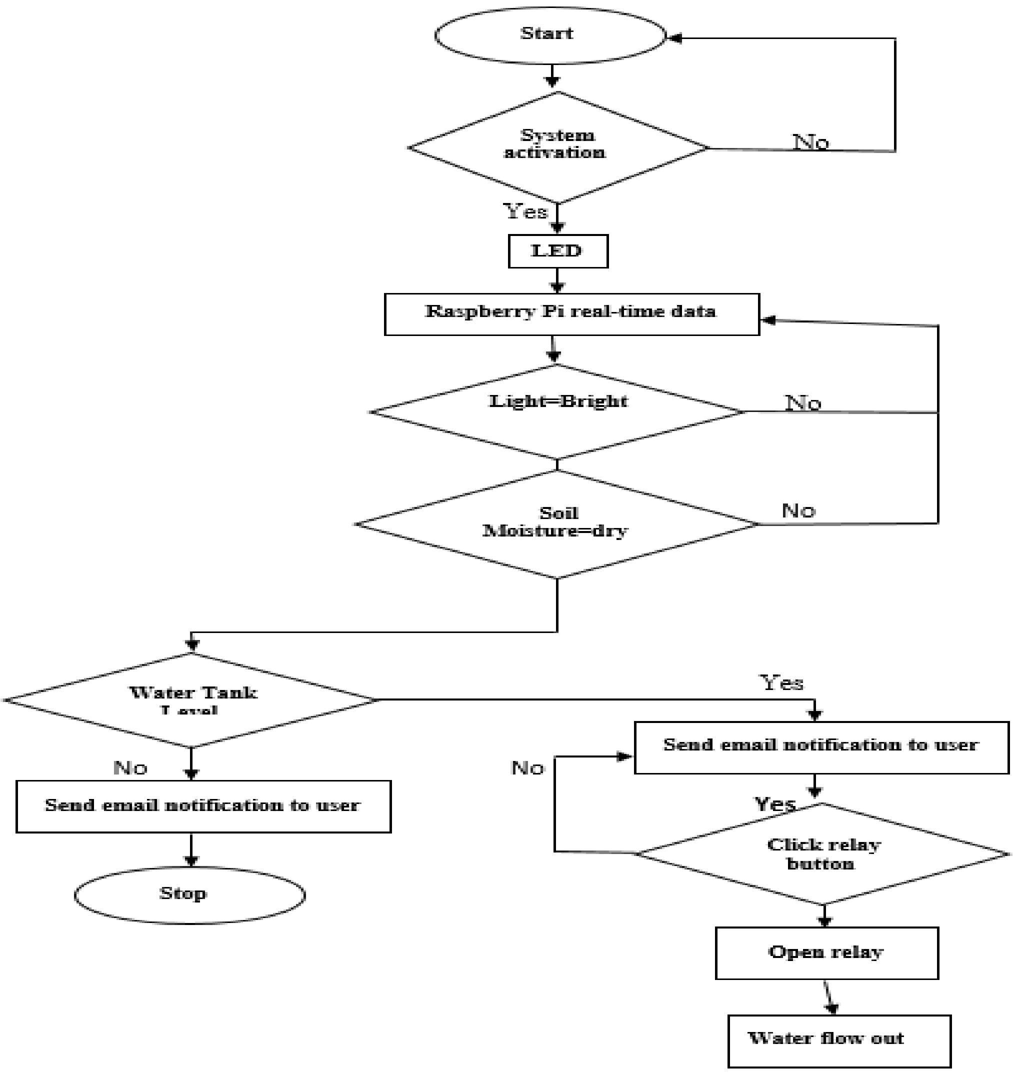

Figure 6 Smart irrigation system flow map

IMPLEMENTATION AND RESULTS

To verify the proposed system's outcome. Hardware must be installed before the device can be used. The programme must then be run through the machine in a structured manner. This system is divided into two categories: real-time and remote.

If you've completed the internal linking configuration (see Figures 7&8), you're ready to go. Power is supplied to the device from the Raspberry Pi to the water tank, as well as from sensors such as the camera and DTH22. Checking different consequences of the prototype's odds. The outputs can be seen in the pi window and on the mobile screen.

Figure 7 Setup for the proposed scheme, including a tank and leaf detection.

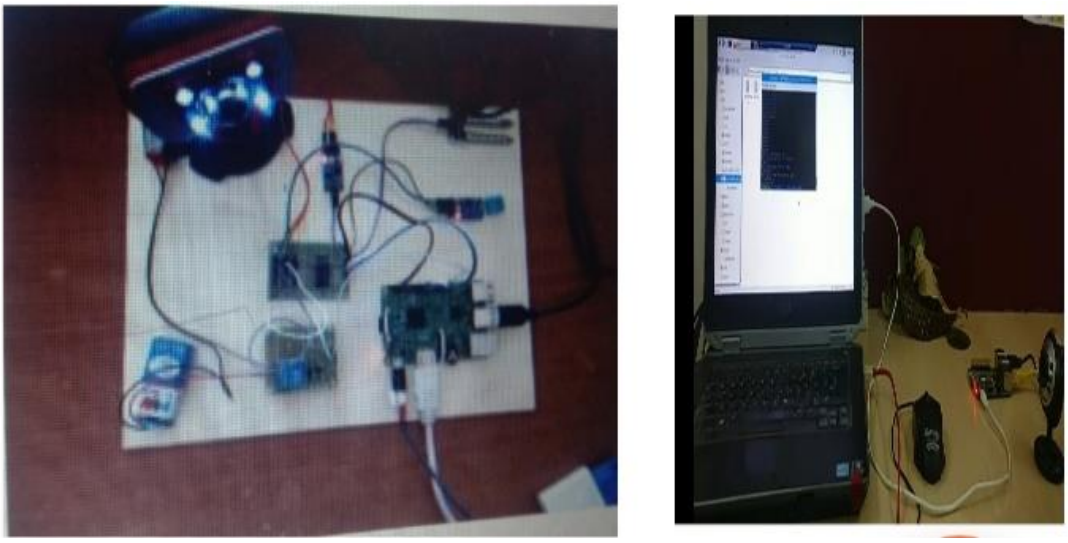

Figure 8 Pioutput window based project configuration proposed by raspbarry.

After a project has been successfully set up, raspberry pi specifications such as verifying the IP address must be listed (EG:192.168.0.x). It varies by router model, because any time a new address is entered, the link must be checked and established. By using VNC or some other method to log into the Raspberry Pi device. Sign in to Pi with a user-defined username and password until you've connected with an IP address.

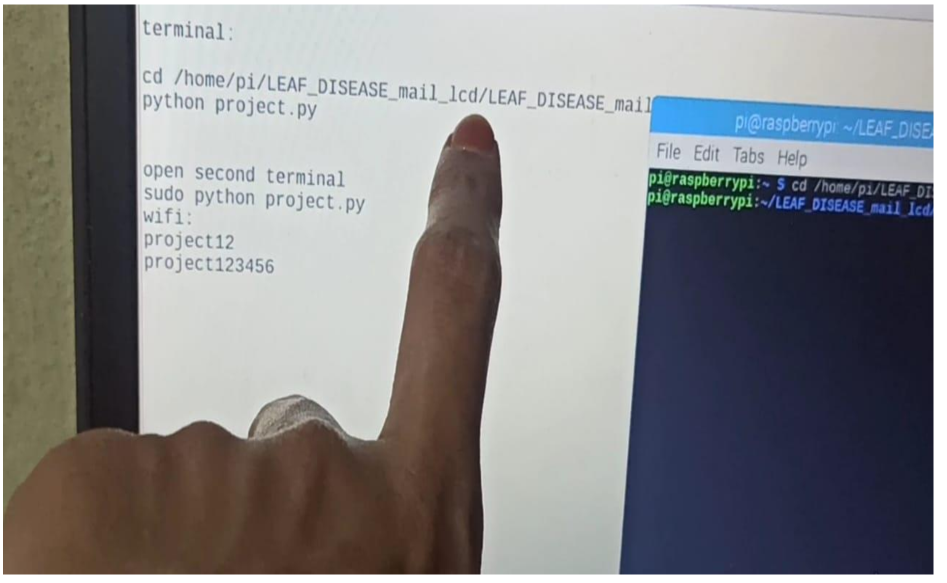

Figure 9 Getting into the Raspberry Pi and locating the secret

To compile and run the algorithm in pi.by (command/file name /extension), check the files (file location) in memory. When the prototype is completed, it displays "Well Leaf Detected" and "Unhealthy Leaf Detected" if the leaf is not in good condition.

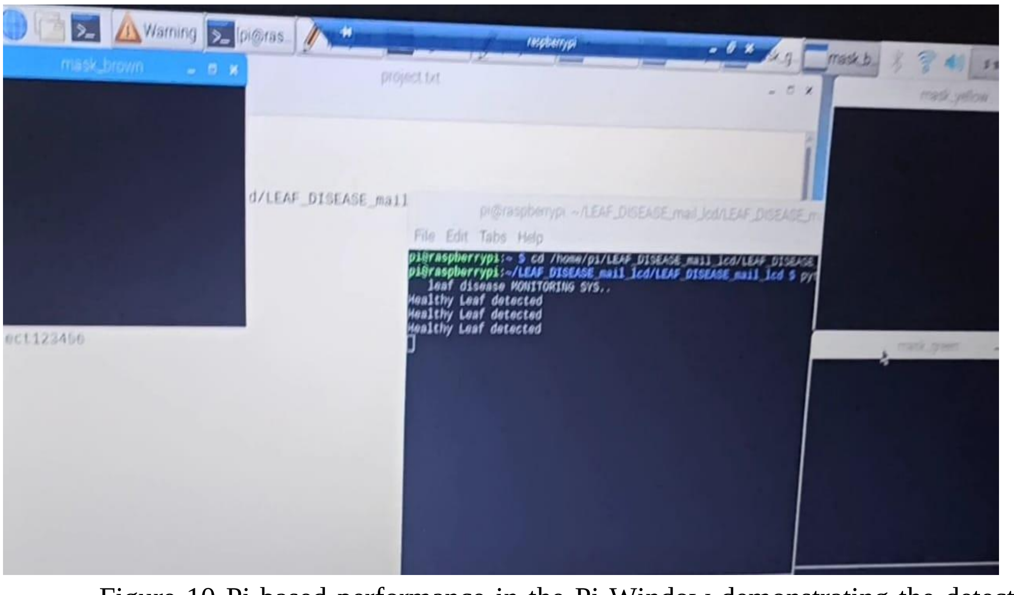

Figure 10 Pi-based performance in the Pi Window demonstrating the detection of a stable leaf.

To diagnose the disease, an automated testing system is used, and the results indicate the form of infection and the range of infection on the leaf.

Figure 11 Form of disease and percentage of leaf affected

A Mobile device is a remote control method that is used to track and track weather, water in the reservoir, temperature and humidity, and other variables (Blynk app).

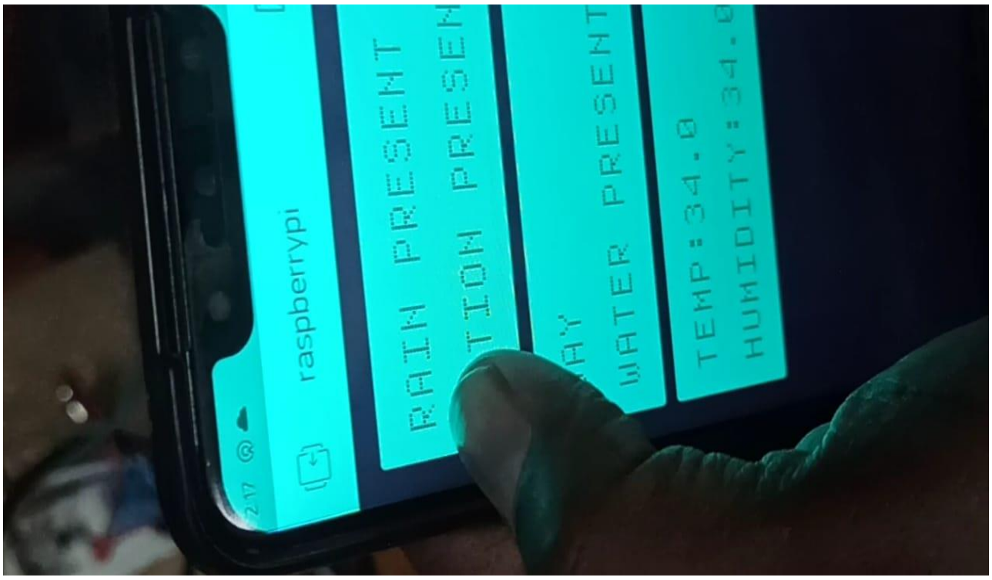

Figure 12 Monitoring of the Blynk application in a remote location.

CONCLUSION

For advanced water supplies for agricultural development, the smart irrigation system is appropriate and cost efficient. The system would have a feedback management system that would effectively track and control both plant growth and irrigation system operations. If a rain gun sensor could be fitted, flooding could be avoided when it rains. Rainwater collection is possible, and the water collected will be used to irrigate crops. We may also add a lot of water quality sensors that have an effect on the crops.

FUTURE SCOPE

Bacterial, Fungal, and Viral Leaf Ailments are the three main types of Leaf Ailment. Plant ailment identification must be precise in order to locate the disease, but the process must be quick in the meantime. Work can be spread out by taking photos of the leaves of the various plants on the farm using a quad copter at field level. It is possible to obtain human-free outcomes by evolving into an Artificial Intelligence.

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