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# Automatic Irrigation and Worm Detection for Crops using Raspberry Pi with OpenCV

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**Abstract:** *The Internet of Things (IoT) is a network of interconnected gadgets that can communicate with one another and operate autonomously. For data analysis, agriculture offers a wealth of indicators that contribute to higher crop yields. The usage of IoT devices in agriculture advances information and communication in intelligent farming. The main factors that should be taken into account for optimal crop growth are soil types, soil moisture, mineral nutrients, temperature, light, and oxygen, among others. These parameters can now be sensed by a variety of sensors and sent to the cloud. In order to suggest to the users better agricultural decisions utilising IoT, this study takes into consideration a few of these parameters for data analysis.The Internet of Things (IoT) is a network of interconnected gadgets that can communicate with one another and operate autonomously. For data analysis, agriculture offers a wealth of indicators that contribute to higher crop yields. The usage of IoT devices in agriculture advances information and communication in intelligent farming. The main factors that should be taken into account for optimal crop growth are soil types, soil moisture, mineral nutrients, temperature, light, and oxygen, among others. These parameters can now be sensed by a variety of sensors and sent to the cloud. In order to suggest to the users better agricultural decisions utilising IoT, this study takes into consideration a few of these parameters for data analysis.*

**Keywords:** Machine Learning, DTH 11, Raspberry-Pi, CNN(Convolutional Neural Network)

## I. INTRODUCTION

IoT refers to the network of connected electronic devices that transmit data to the cloud. IoT data is processed to carry out the required activities. Agriculture is the primary industry in developing nations like India. Almost 70% of Indians depend [directly or indirectly] on agriculture. The GDP [Gross Domestic Product] of the country is derived from 15–16% of agriculture. Many short-term variables, such as the weather, soil erosion from flooding, and repeatedly producing the same crop without using scientific agricultural methods, have an impact on agriculture. Using smart farming techniques leads in less water waste, higher-quality crops, and less resource consumption. This aids in obtaining a good crop yield more quickly than with earlier agricultural techniques. Today's agriculture needs to take into account a number of factors, including the type of crop that will grow best in the soil's current state, the type of irrigation needed, the amount of fertiliser needed, etc. A novel system that uses variables like moisture, temperature, humidity, ground temperature, soil PH, etc. is the soil monitoring system for agriculture.

India is fortunate to have a sizable area of arable land, but the amount of yield does not match the potential of the nation. According to data from the World Bank, 60% of the land is used for agriculture. Although technology is increasingly being used in agriculture, many tasks, particularly irrigation, are still done by hand. It is well known that a plant's output depends on a number of variables. In this aspect, having the right amount of water available is crucial. The existing computerised irrigation facilities are expensive and, to some extent, inaccurate, according to farmers from Kerala Rice Station and agricultural enthusiasts. The production of the plant will be permanently impacted by the automation of the irrigation system and by the provision of a platform for monitoring irrigation conditions utilising readings of soil moisture, temperature, and humidity. Even with all of these solutions, there are still some issues that affect agriculture fields, such as crop disease infestations and abrupt weather changes. This was the motivating element behind our project's theme of automated irrigation combined with disease detection.

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## II. OVERVIEW

For a very long time, it has been believed that the primary source of supplies for supplying people's basic needs has been agriculture. It is regarded as a basic employment as well as one of India's important industrial sectors. Farmers should practise traditional naked eye observation and produce healthy crops without applying chemicals to their cultivation field or to the animals who eat those crops in order to maintain a healthy diversity. But in today's world, the weather is changing quickly in opposition to the natural resources, reducing the availability of food and boosting security.Farmers are located in rural areas, and if crop production revenue declines, farms at an industry level will have an impact on their way of life. The GDP in the agricultural sector was approximately 17.211.1 in 2005, and it was only about 52020 in 2018. The main portion of India's population depends mostly on agriculture, which also contributes significantly to the country's economy. Yet, India's agro sector still has to develop and promote technological engagement and usability.. Farmers physically spray their fields with a rotten egg solution since it has been discovered that the scent deters wild pigs and deer from eating the crops, while firecrackers are used to scare away wild elephants. Low crop yield and significant financial loss are the results for owners of farmland. Because to the frequent attacks on livestock caused by this issue, farmers frequently choose to leave the areas desolate. This device gives us flexibility for surveillance and enables us to keep these wild animals out of the farmlands. India is a nation where agriculture and industries associated with it are the main sources of income for the populace.The country's economy primarily depends on agriculture. It is also one of the nations that experience severe natural disasters like floods or droughts, which ruin the crops. The farmers suffer significant financial losses as a result, which drives them to commit suicide. Prior to harvest, accurate crop output predictions can assist farmers and government agencies in making the necessary preparations, such as storing, selling, setting a minimum support price, importing/exporting, etc.

### 2.1 Motivation

- It's crucial to quickly advance food production technology due to the steadily rising demand and declining availability of dietary essentials.
- Agriculture is the only source that can supply this. causes insurance claims to be delayed. Create the tool This is a crucial component of human cultures that supports a rising and active demand for food production.
- In countries like India, agriculture is crucial to the economy and prosperity.
- Farmers employ irrigation because of the shrinking amount of water on Earth as a result of water shortages and land water scarcity.
- According to the type of soil present, irrigation is the science of distributing water artificially to land or soil so that plants can accept it.
- The primary motivation is to reduce the amount of time needed for the surveying process.

## III. RELATED WORK

Literature survey is the most important step in any kind of research. Before start developing we need to study the previous papers of our domain which we are working and on the basis of study we can predict or generate the drawback and start working with the reference of previous papers.

In this section, we briefly review the related work on AUTOMATIC SMARTIRRIGATION AND WORM DETECTION IN PEANUT FIELD USING RASPBERRY PI WITH OPENCV.

The goal is to create a system utilising a Raspberry Pi 4 that analyses data on soil moisture and automatically waters plants.

Rapid assessment of crop damage and increased record accuracy.

To give farmers a more interactive platform.

Many studies have been conducted to boost agriculture's effectiveness. The system in [1] employs Arduino technology to regulate the green house's roofing and watering.

For decision-making, it compares statistical information from sensors (such as temperature, humidity, moisture, and light intensity sensors) with the weather forecast. The sensors' noise is eliminated using a Kalman filter. Temperature, pH, and humidity sensors are used along with fuzzy inference to input data into the Agricultural System (AgriSys) [2]. The system keeps track of the sensor data on the LCD and Computer.. In [3], a wireless sensing network using ZigBee

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technology aids in regulating temperature, soil moisture, and air humidity. The system's implementation includes sensors for soil moisture, humidity, temperature, ZigBee, the 18F458 PIC microcontroller, a water pump, a fan, a relay, and a buzzer. In paper [4], ZigBee is combined with a wireless sensor network to communicate data on soil temperature and moisture content. GPRS is used to send the data to a web server over a cellular network. Graphitic applications can be used to monitor data over the internet. [5] describes a wireless sensor network for measuring relative humidity, temperature, and soil moisture levels. The node's network lifetime is lengthened by utilising a sleep-wake strategy. Clustering of nodes is implemented by the system in this study. In MATLAB, a graphical user interface (GUI) is created for data handling. According to [6], remote farm automation consists of sensors and actuators coupled to an IoT gateway that is running an OPC UA server. Without upgrading the firmware of remote sensors or actuators, cloud services (installing or configuring process controllers) are utilised to update the control rules. [7] describes how WSNs integrate with cloud computing. It offers performance comparison guidelines for combining cloud computing with WSN to boost performance and get beyond WSN's storage and energy limitations. In the context of a wireless sensor node, all the systems mentioned above are comparable. The distinction is in the storage of data gathered from the nodes and the communication technology. In most cases, systems store the gathered data on one or more servers. As the number of nodes rises, servers will require more storage space, raising their price. In order to achieve system performance and data storage, this study presents an irrigation system that explains the integration of a wireless sensor network, Internet of Things communication technology, and cloud server. Using real-time sensing of atmospheric and soil parameters such air temperature, humidity, and soil moisture, the suggested system enables remote monitoring and control of irrigation. IoT-based irrigation increases farm output without the need for human intervention.

## IV. PROPOSED SYSTEM

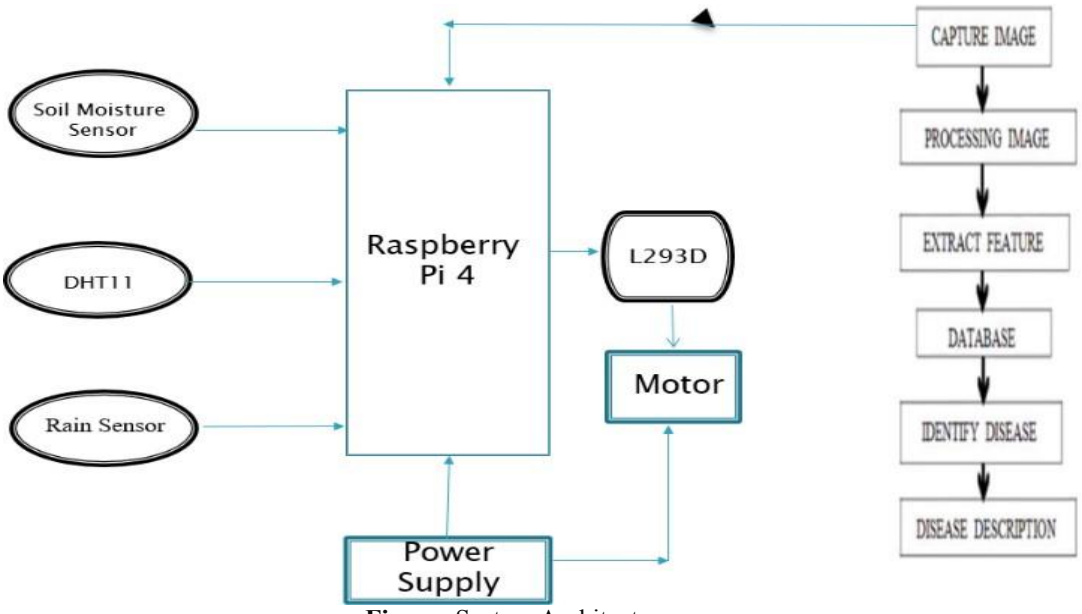


**Figure:** System Architecture

The goal is to create a system utilising a Raspberry Pi 4 that analyses data on soil moisture and automatically waters plants.

rapid assessment of crop damage and increased record accuracy.

To give farmers a more interactive platform

A predetermined threshold level is crossed by either the temperature or soil moisture parameter in the Raspberry Pi model. There is an automated irrigation system. i.e., the motor will be turned ON or OFF by the relay attached to the Raspberry Pi.

Importing the image using image acquisition tools; analysing and altering the image; and producing a report based on the analysis of the image.

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## V. FUTURE SCOPE

This device can be upgraded to a real-time image processing machine by adding a webcam or pycam. We may also add a PIR sensor to this model, which currently has three sensors, to detect animal attacks. Before turning on the motor, we may connect a water level sensor to the tank to know how much water is there. This will enable us to determine how much water should be sprayed on the field as needed.

## VI. CONCLUSION

Our nation's economy benefits from the field of agriculture. Yet, this lags behind in utilising current machine learning technology. Hence, all of the latest machine learning technologies and other new methods should be familiar to our farmers. These methods assist in maximising agricultural productivity. Many sensors and a Raspberry Pi 4 were used to build this field. The system is a smart irrigation solution built on IOT and artificial intelligence that uses the moisture content of the soil and the crop's needs for moisture to fully automate irrigation. Its effectiveness and economic viability are its main advantages.

## VII. ACKNOWLEDGMENT

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