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Abstract- Agriculture is the backbone of our country 60.43% of land is used for the agriculture our farmers are facing more issues and loss so our project helps farmers to choose the crop wisely for the suitable condition and gain more profits for the farmers it can also instruct the farmers to water the plant when it is needed A feasible monitoring or controlling system can be of great use to overcome this problem. And our project is based on IoT and Machine learning Plants play a vital role in maintaining the ecological cycle, and thus, to maintain the plant's proper growth and health, adequate monitoring is required. Hence, the aim of the project is to create a smart plant monitoring system using automation and internet of things (IOT) technology. For this purpose, sensors like soil moisture sensor, DHT11 sensor, level sensor, etc.are used. This project is mainly help full for farmers to maintain and monitor their crop in a healthy way.

Keywords: *Agriculture, Machine Learning, IoT, Plant Monitoring.*

I. INTRODUCTION

In India, Agriculture is the backbone of our country; most of the people depend on agriculture. The main issue in agriculture is water scarcity. The water resources is not employed in the good manner, so that the water is wasted. Proper irrigation is still a challenge in most of the agriculture practices. Improper supply of water can affect both the soil and the crops. A feasible monitoring or controlling system can be of great use to overcome this problem. Agriculture around the world plays important role in the development of agricultural nations. In India almost 68% of people depend upon farming and 1/3 of the national capital comes from agricultural. Problems related agriculture have been always preventing the progress of the nation. The solution to this problem can be solved by smart agriculture and modernizing the present traditional methods of farming. Hence the aim of the project is to implement hydroponic system using IoT technologies using Node MCU. The major features of this project include water driven agriculture system that will eliminate need for soil. With this hydroponic automated system, the crops area unit provided with water and nutrients reckoning on the sensors feedback like temperature and humidity sensor and electrical physical phenomenon circuits. The computerized water system framework with IOT is practically and financially sufficient for planning water resources for plantation (group of a plant). Adopting the automatic water system framework we can demonstrate that the utilization of water can be decreased for various plantations (group of plants) usages. The system framework has an appropriated microwaves (wireless) chain of moisture content in the soil through soil moisture sensor, humidity and temperature sensor set in the root zone of the plants and level of water (ultrasonic) sensor is set in tank for checking the water level in tank. The data will gather from the sensors and send to the web server (cloud). The background of chapter highlights the study of IOT in the field of agriculture. This shows how we can implement the IOT technology to make our planting smart and reliable with the real time updated data. This chapter also helps the beginners to implement the IOT technology and learn the basics of this technology. The major driving force behind consumer habits —Convenience. People who find it convenient to shop online and cut the hassle of driving to the market, parking, carry around the shopping bags, etc. Because of their busy schedules, some of them don't have time to visit a retail store. Fresh Vegetables and Fruits are delivered faster, so storing vegetables and fruits is prevented. In addition, we could grow the customer base by providing a variety of products at their doorsteps with the long-term goal of expanding the customer base and increasing profitability by optimizing costs. Customers find it very difficult to get fresh Vegetables & Fruits. Vegetable & Fruits shops are not available near by their homes. Identifying Varity of Vegetables is difficult. Working people could not find time to purchase vegetables in shops. From using the design thinking ,we find the solutions for problem quickly and Better than others.

II. LITERATURE SURVEY

Pravin, et al developed a module which enhanced the plant monitoring using IOT(3). They mainly focus on collecting the information from the field. The sensors devices can be used for collecting the information. The type of sensors that can be used are soil monitoring sensor, light sensor and temperature sensor. The temperature sensor will give the temperature details, the water content in the soil can be measured by using the soil monitor sensor and the light sensor is used to measure the field light intensity

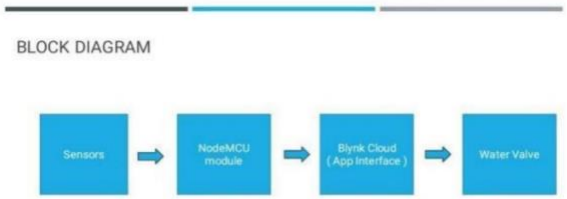
Monirul Islam Pavel et al propose IOT enable device which sends environment data in real-time to the database along with image of plant leaf to classify diseases using image processing and multiclass support vector machine(9). Figure 1 describes our proposed model. Image processing has been implemented to detect and classify the affected plant disease. In this process, the work is divided into four portion which are image acquisition and preprocessing, segmentation of affected region, feature extraction, classification using multi-class support vector machine algorithm. All data of sensors are obtained by Arduino and stored in a string format. Arduino then sides the whole string to Raspberry Pi 3, and it split all data based on coma and again stored in array. Afterward, a Uniform Resource Locator (URL) is created with our data server's IP address with corresponding database column name of each sensor and the obtained values of sensor.

Nivesh Patil et al have explained about Computers or mobile applications to control the system. In their system, every node is integrated with various devices(10), sensors and they are interconnected to one central server via wireless communication modules. Server 8 mode. In auto mode system takes decisions automatic and controls the devices installed whereas in manual mode user has freedom to control the operations of system using PC commands or android app. Mentioning the trends and chances for development for IOT in farming rural and sector development. Analyzing the knowledge obtained and proposing right steps of confirmation by establishing correct prototypes of model solution for hardware parts and software of IOT.

III. PROPOSED METHODOLOGY

A. Problem Definition:

In the block diagram, we can see that two sensors are used namely DHT11 for temperature and humidity, Soil moisture sensor, a relay circuit to control the water pump. Single bus data format is used for synchronization between DHT11 and MCU sensor. One communication process is takes about 4ms. Data consists of integral and decimal parts. A complete data transmission is of 32bit, and the sensor sends higher data bit first. Data format: 8bit integral humidity data + 8bit decimal humidity data + 8bit decimal temperature data + 8bit check sum (Error bits). If the data transmission is right, the check-sum should be the last 8bit of "8bit integral humidity data + 8bit decimal humidity data + 8bit integral temperature data + 8-bit decimal temperature data". All these sensors are interfaced to an open source NodeMCU (ESP8266) which will act as a microcontroller. This microcontroller is also interfaced with 5V power supply. Valves and solenoid Pumps are being controlled by the Node-MCU for efficient working of system. All this information is being send to a Blynk app. The controlling of whole system is automated using NodeMCU and IoT system. The water containing nutrients is passed to the pipes with facilitate to submersible pumps. The water that is not absorbed by the crops is reused by adding nutrients in keeping with the reading from sensor and once more passed to the pipes.



B. Overview Of the Project:

Plants play a vital role in maintaining the ecological cycle, and thus, to maintain the plant's proper growth and health, adequate monitoring is required. Hence, the aim of the project is to create a smart plant monitoring system using automation and internet of things (IOT) technology. For this purpose, sensors like soil moisture sensor, DHT11 sensor, level sensor, etc.are used. This project is mainly help full for farmers to maintain and monitor their crop in a healthy way.

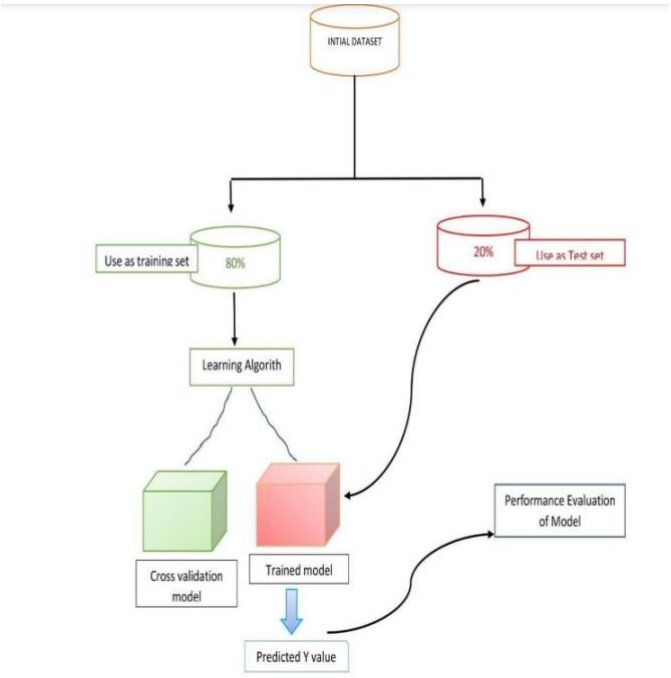
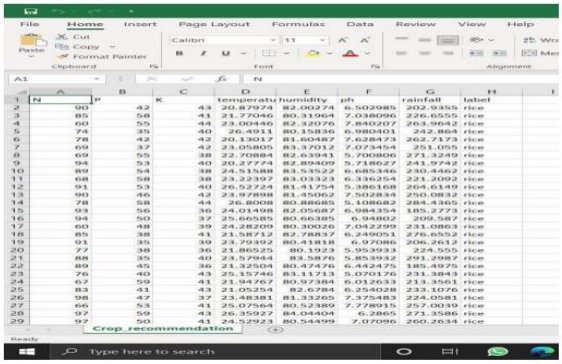


Figure 1. Functioning of the Modules

C. Module Description:

This project consist of four modules and those modules are Listed below

- Data Gathering
- Applying Machine Learning Algorithm
- Hardware Output
- Software Output.



DATA GATHERING:

Crop predicted Data set collected from Kaggle and it consist of six attributes and it consist of 1200 data namely Nitrogen, Phosphorous, Potassium, rainfall, soil moisture, temperature.

1. Nitrogen,
2. Phosphorous,
3. Potassium,
4. Rainfall,
5. Soil Moisture,
6. Temperature.

MACHINE LEARNING ALGORITHM:

KNN works by finding the distances between a query and all the examples in the data, selecting the specified number examples (K) closest to the query, then votes for the most frequent label (in the case of classification) or averages the labels (in the case of regression)

Crop Prediction Accuracy using KNN:

Heat map of the various crop. Heat map is a data visualization technique that shows magnitude of a phenomenon as in two dimensions. The variation in color may be by hue or intensity, giving obvious visual cues to the reader about how the phenomenon is clustered or various over space. There are two fundamental different categories of heat map: the cluster heat map and magnitudes are laid out into a matrix of fixed cell size

Crop Count:

The crop count of the various crop like coffee, jute, cotton ...etc. in this Figure y axis denotes this label and x axis denotes the count of the crop.by this we can identify the number of crops present in the data set and identify the crop count.

Rainfall:

The regional crop prediction of the various in the graph x axis denotes the rainfall and y axis denotes the humidity and this graph represents different crops in the different colors for e.g. blue represents the rice and the green represents the pigeon peas.

Levels of N & P:

The level of N & P of the various crops in the data set where N represents the Nitrogen and the P represents the potassium y axis denotes the Nitrogen and x axis denotes the potassium of the various crops.

Humidity:

The graph of humidity and potassium level of the various crop y axis denotes the humidity level and the x axis denotes potassium of the crops in the different colors. show that we can identify the crops humidity level of the crops in the easier way.

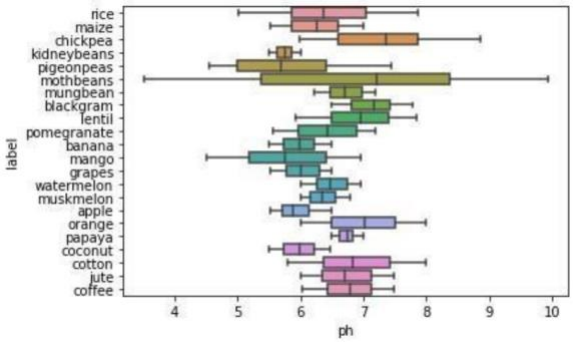
Ph level:

The ph scale of the various crop.ph is defined as the power of hydrogen is the scale used to specify the acidity or basicity.in this graph y denotes the crops and the x axis denotes the ph value and it shows in the different colors to identify the value in simple method.

Accuracy:

the rainfall prediction for the various crops in the data set. With this we can choose the crop according to the climatic condition .and in the graph y axis represents the rainfall and the x axis represents the K-potassium of the various crop in the data set.

The accuracy of dataset is 97.8The application installed in the android smartphone displays the parameters like soil moisture, temperature and humidity. This helps in monitoring the current condition of the plant. A button is displayed with which the solenoid water valve can be controlled. When the moisture level falls below 600 or when the temperature rises beyond normal room temperature, say 30 degrees the water valve is turned on by clicking the button.



IV. CONCLUSION AND FUTURE WORK

This whole project mainly focuses on two results. The first result is to help farmers to upgrade their agriculture – technical knowledge, act in accordingly with minimum requirements on environmental issues and mostly the basic function being prevented by major disasters and protect plants and nature from being ruptured. And the second result of our project is to use technology to measure the humidity, temperature and moisture of the plant root and make the plant grow in a well suitable environment with out the use of soil as per the concept of hydroponics. The farmer or user receives the message regarding the status and thus helps in avoiding delay of plant watering and protect the plant to live in a suitable environment.

In the future we have planned to execute the same plan for more crops in the same way and we have also planned to collect leaf samples and use image sensor to know about the growth details of the plant.

"Plant Monitoring" is not limited to current usage, it can be extended to many features as discussed below":

1. It currently supports 11 crops. Later on, can add other crops.
2. Ordering of fertilizers can also be done through the link given in website.
3. In future we can also add the feature about the Pest Control.

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