

AUTOMATION BY IOT & MACHINE LEARNING IN IRRIGATION

Yashika Mahajan¹, Mrunalini Pachpande², Ruchita Sonje³, Swati Yelapure⁴, Manisha Navale⁵

¹ Student, Computer Engineering, NBN Sinhgad School Of Engineering, Maharashtra, India

² Student, Computer Engineering, NBN Sinhgad School Of Engineering, Maharashtra, India

³ Student, Computer Engineering, NBN Sinhgad School Of Engineering, Maharashtra, India

⁴ Student, Computer Engineering, NBN Sinhgad School Of Engineering, Maharashtra, India

⁵ Professor, Computer Engineering, NBN Sinhgad School Of Engineering, Maharashtra, India

ABSTRACT

The traditional agriculture field consume lot of man power and water resources. In this paper we intend to enhance water system works on utilizing the idea of machine learning with web of thing which can upgrade water effectiveness, picking up a financial favorable position while likewise lessening monetary weight. Ranchers for the most part need satisfactory means and impetuses to know crops, water utilize. In this examination we initially set up an informational index containing data on reasonable traits We at that point apply a choice tree system to figure future water necessity. We moreover build up an electronic choice emotionally supportive network for the chiefs, agriculturists and scientists with a specific end goal to get to different information including the forecast of conceivable water prerequisite in future.

Keyword: - Irrigation, Internet of things (IoT), Wireless Sensor Network, Mobile and cloud computing

1. INTRODUCTION

In the approach of innovations such as IOT and machine learning, there is pace of change from conventional farming to present day agriculture will keep on being quickened. There are enormous issues regarding to farming such as low use of water to farm and in reverse in administration level, Joining of water and manure water system shrewd huge data is set up to advance IOT, cloud computing, machine learning etc. Current view of advances in remote sensor organize applications are used to utilize system and distinguished horticulture as potential territory organization together with an audit of elements impacting the outline of sensor systems for this application. At the end when large number of these small sensors either connected haphazardly or in general they should act connectively to perform detection of landscapes are out of scope or not. The ebb and flow advancements will water the farm depending upon need. Various factors are considered such that on the off chance that is program to switch on by 10 am it will switch on not standing when rain happens, It will amid that time. Afterward dampness sensor came into picture which will check water is present or not. Depending upon that factor water framework gets naturally on. If any case, if climate office does prediction of rain sooner, watering the plants can be postponed.

2. LITERATURE REVIEW

After studying different methodologies claimed that each methodology has its own benefits. Major domains are introduced in following sections.

2.1 Crop Water Requirement in Wireless Sensor Network

For gaining precision Data aggregation method is used to gain precision of water usage in irrigation. It results in improvement of precision of emission signals to reduce energy consumption.

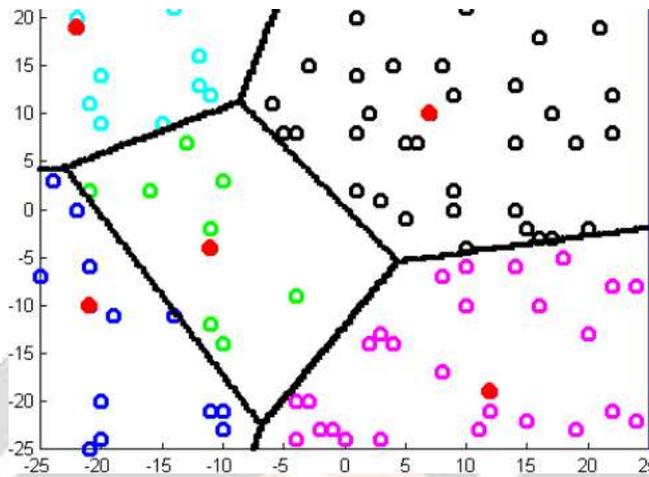


Fig -1: Data transfer model based on cluster structure

2.2 GSM and Soil Sensors

Soil Sensor provide information about moisture or water level in soil. Depending on that the water will be given to plant. Sensor is used and GSM to collect information related to weather data. Wastage of water has been decreased by collecting climate information into framework

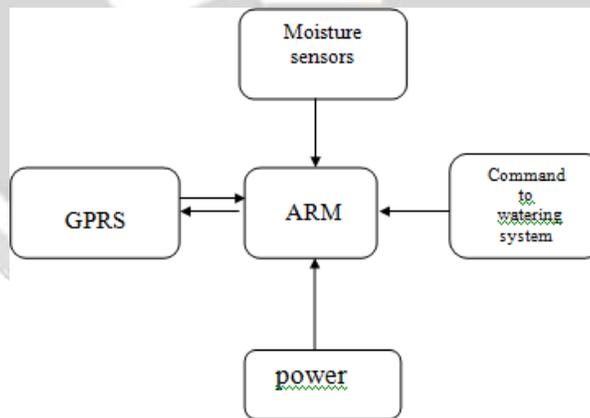


Fig -2: Block Diagram of watering System

2.3 Using cloud Data Mining and Android

Cloud gives the information related to growth of crop fields and information related to weather, fertilization etc. Based on data prediction and forecast of water requirement for crops were done. Overall process was automated as follows:

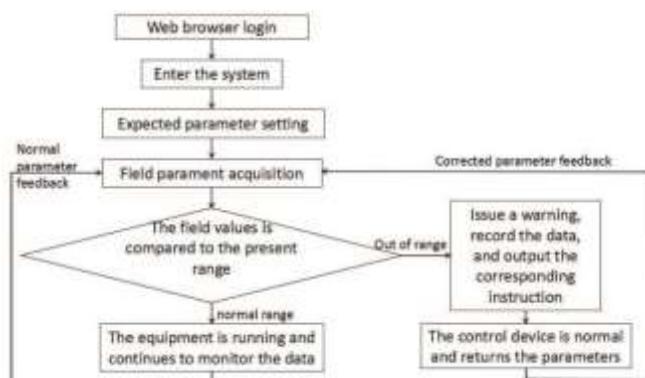


Fig- 3: Overall Software Flow

3. PROPOSED SYSTEM

In our paper we are trying to develop the irrigation system which is automated that is we will automate the watering system for the plant. The technologies such as IOT will used. IOT will help to robotize the system and machine learning will decide the amount of water required by the plant. The water needed by the plant can be decided using different factors such as moisture, temperature, age of the plant, type of the plant, soil of the plant. Scheduling parameter require for irrigation are to be display by the developing system. Scheduling parameter such as temperature, soil CO₂ and humidity sensor value.

Hence our system will provide the water to the plant automatically as per the plant requirement and to as per the farmer or user requirement our development system focuses on crop growth which will be monitored. The temperature value humidity of soil is processed using IOT technology. These values will provide the amount of water required. Our system is not the farmer based system. Even though the farmer is not available system will function on its own. The flow of the system is as follows. Firstly we need to create the user application where registration process can be done by the farmer. In this the threshold values is set by the farmer. Threshold value is related to the sensors. The server receives the sensor value read by the sensor. Threshold values are compared with the sensor value. If water supply is needed, server will notify the farmer. The sprinklers will be turned on to supply the water.

3.1 ESP8266 Module

We need Wi-Fi supply to get the sensor value therefore this module is used.ESP8266 has built in Wi-Fi network and TCP/IP protocol stack. All the function used by the networking from another application server is offloaded and application hosting id done.

3.2 IOT System Monitoring

IOT and wireless sensor will identify the quality of the water. To develop this area the above information is important as sharing of different aquatic organism between different breeders and organizations. The better plant development is shown by using the IOT system. Over more it also shows worst development, what conditions are harmful etc. and provide the optimized resources to develop the plant in proper way.

3.3 Multifractal Downscaling Model

The performance of the downscaling model of coarse satellite product is affected because of the anthropogenic nature of the irrigation. This create heterogeneity in the distribution of soil moisture to filter out the crop plant effect and analyze the scale in variance in quantitative manner, we use theta datasets. The natural system is mimicked because downscaling model attenuate effect of irrigation by theta fields.

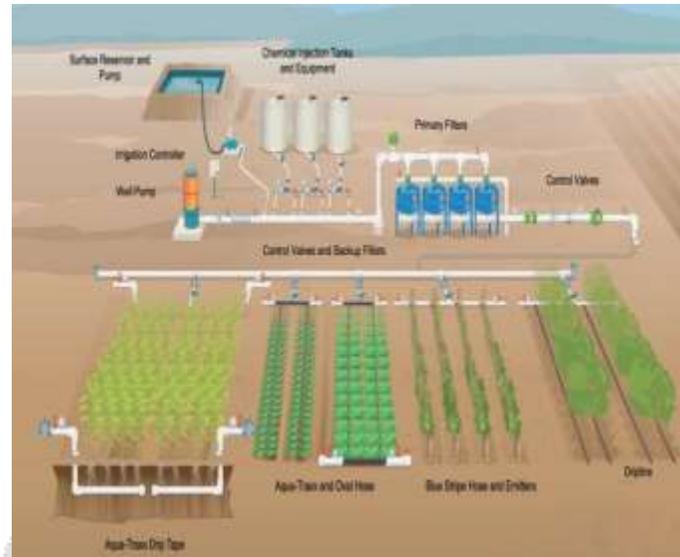


Fig- 4: Architecture Diagram

4. IMPLEMENTATION RESULT

To effectively use water in irrigation system the system development involves Arduino and ESP8266 We-mos module as microcontroller and processing unit. Also temperature and humidity sensor (DHT11) and soil moisture sensor are deployed in the soil to measure the water level in the soil. These sensors are attached to We-mos microcontroller so that the sensor value is sent through microcontroller to take specific action on farm field. The microcontroller sends the data that collected from sensor to server depending upon sensor value are machine learning algorithm using decision tree works. Initially training data sets are given to the algorithm and the data sets are made using data preprocessing technique. These data sets pertaining to soil moisture and temperature humidity sensor at different condition such as dry, wet, little wet, high temperature, low temperature and accordingly predictions are done. The output of prediction is then given to the Arduino controller so as to watering the field. Finally the information on the field in which irrigation is done is stored in webpage so that farmer can access it. The farmer receives notification on its Android app as soon as the system starts providing the water to field. Fig. 5 shows the hardware architecture system which consist of soil moisture sensor and temperature humidity sensor. The decision tree algorithm on which we are working is C4.5 algorithm. In this algorithm the training datasets are classified first so as to classify the new sensor value. Each time when it finds the value in training dataset it segregates the various instances of that set as the data is collected at runtime huge amount of data is gathered. We need to classify somehow. Therefore we are using attribute selection method which will provide the information gain for selecting the attribute. The formula for classification is as follows:

$$Info(D) = -\sum_{i=1}^m p_i \log_2(p_i)$$

$$Info_A(D) = \sum_{j=1}^v \frac{|D_j|}{|D|} \times Info(D_j)$$

- The term $\frac{|D_j|}{|D|}$ is the weight of the jth partition.
- $Info_A(D)$ Is the expected information required.

The Complete Gain (A) will tell us how much we gain by branching on A.

$$Gain(A) = Info(D) - Info(D_j)$$

Attribute having highest gain ratio is then selected for attribute splitting. This process will be continued until we get a particular target value and clear decision tree. Using the algorithm of C4.5, the crops are classified based on their performance attributes. Information gain of each and every attribute is calculated and a decision tree is developed. The attribute with highest process continues till a leaf node is obtained.

Following table shows some of the test we have conducted. As shown the first record for crop sugarcane, water requirement is checked by considering six values i.e. temperature, humidity, soil moisture, crop type, soil type, crop age and weather conditions. C4.5 algorithm will first create a decision tree as if the temperature is less than 30 and humidity is approx. 47 and the soil moisture level is good then it will check the crop type and water needed for that particular crop along with that it will check age of the crop and finally it will check the weather conditions if the weather is sunny but moisture level is good then water is not needed this is In case of our first record. Consider the last record where moisture level is high i.e. quantity of water in soil is less so water is needed but after checking the weather conditions, here its rainy so the motor will not start because it will rain according to weather report hence we do not need to provide water.

Temperature	Humidity	Soil moisture	Crop type	Soil type	Crop age	weather	Water needed?
30	47	344	sugarcane	black	2 months	sunny	no
27	65	650	groundnuts	red	1 month	sunny	no
30	43	999	sugarcane	black	2 months	sunny	yes
29	55	999	wheat	black	4 months	rainy	no

Table- 1: Result Set

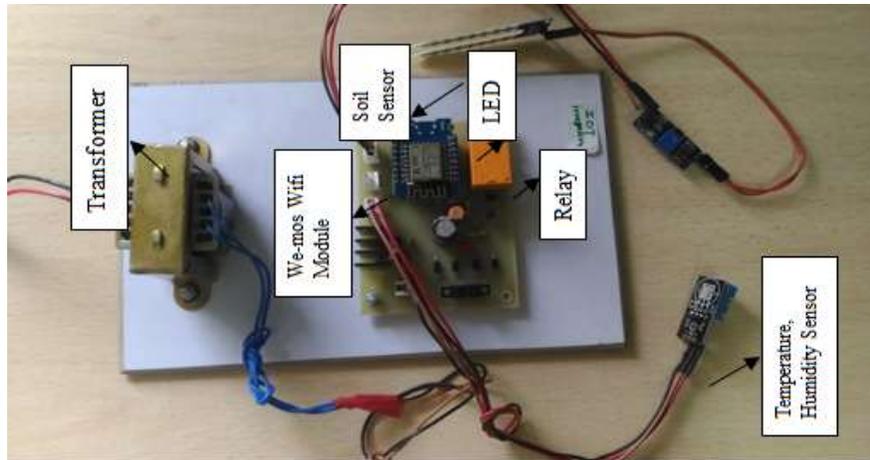


Fig- 5: Hardware Architecture

5. CONCLUSION

A novel method is introduced which is simple in terms of algorithm and will give more accuracy compared to existing methods. We have tried to collaborate two domains i.e. Machine learning With IOT which will give us an advantage to automate the irrigation system with properly distributing the adequate amount of water required by the plant.

6. REFERENCES

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