Environment Monitoring System for Agricultural Application using IoT and Predicting Crop Yield

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ABSTRACT

Nowadays, Internet is facing an exponential increase in the number of electronic devices interfaced through it. Previously, there is a limit of connecting only mobile and PCs (personal computer) with the internet but now millions of devices can be connected using the concept of IoT (internet of things). Hence, IoT can communicate data between machine to machine and the data that is previously available to private server now easily available to the internet so that it can be accessed efficiently. This system shows the increase in the usage of IoT in monitoring like applications. Smart farming is the technique which intend to provide all the necessary resources for the specified amount of time. These resources required are light intensity, ambient temperature required, relative humidity, soil moisture content, pH reading of the soil. The central idea is to sense all these parameters one by one and take the final decision accordingly. A sensor node should be developed for sensing all the required resources parameters and subsequently send the data to the cloud for further processing. After getting all the required resources values our final aim is to predict the crop production using various data mining techniques. As the human lives are primarily depended on the food resources, the agricultural process needs to be efficient, and this efficiency can be enhanced if there is an accurate number of resources. By getting the accurate number of resources, Data mining techniques such as Random Forest, KNN, SVM are used to analyze the crop production in advance such that farmer always have an upper hand on it and by comparing with the previous trend he will be able to detect which kind of parameter is accurate and which is not. A User defined site is designed to monitor all these values of agricultural process.

Keywords: *Internet of Things, Wi-Fi, ESP32 Wi-Fi module, sensor node, Data Mining.*

I. INTRODUCTION

Agriculture is the foremost only field industry where the recent improvement in technology has not been welcomed in huge number. One of the main reasons regarding this issue is poor lethargic condition of the farmers in developing countries say India. The scarcity of agricultural products is also increasing day by day due to two main reasons, first one is overpopulation and the second one is urbanization. Considering the case of overpopulation, it increases the demand of agricultural resources and with the case of increasing population it emphasis the better growth of farming products but due to globalization the most of agricultural land is taken by big industries and they convert these land into non-agricultural land. Basically, the rural area for farming is decreasing day by day and with that decrease the agricultural resources are also decreasing. Therefore, the need of an hour is to look at the situation carefully and emphasis is given to improve the crop production by consuming the resources conservatively without wasting the existing resources. Smart farming is one such methodology to do it. In this type of farming the crop is fed up with the enough quantity of resources required for it to grow and by taking the calculated amount of time. In normal Traditional farming method, there is a time-based irrigation system i.e., farmer know exactly that after certain limited time (few days) he needs to irrigate his crop. But due to the lack of knowledge farmer is not capable of irrigating his/her field at the exact duration of time which significantly lead to a wastage of water. Hence to overcome such issue smart farming method is employed.

II. LITERATURE SURVEY

To overcome the issue of traditional farming, a soil moisture detection sensor is implanted at the observation site to get the soil moisture content and with this the crop is irrigated accordingly. Similarly, soil moisture sensor,

temperature sensor, Humidity sensor and pH sensor are used around the plant to get the desired value, which helps in reducing the exploitation of extra resources used initially in traditional farming. Soil moisture is important in determining the physical structure of the plant whereas all the other sensors play a major role in photosynthesis.

This system basically suggests an idea to generate the sensor node which can send the data to the central node i.e. to the Microsoft AZURE cloud. This system consists of methodology used in smart farming and after visualizing the exact percentage of resources required for crop to appropriately predict the crop yield using various data mining techniques. Data Mining is a procedure to retrieve useful information from very enormous datasets. This technique is used to predict the crop production in advance so that the farmers could take an immediate measure accordingly as the crop demands. It also helps government to get the value of exact MSP (minimum selling price) for farmers. It aims to predict the crop prediction by using various regression and classification methods like multiple linear regression, SVM, Random Forest, KNN etc. With these techniques of data mining, the effect of various parameters (sensor node parameters in general) on the prediction of crop production has been studied.

III. PROPOSED ARCHITECTURE

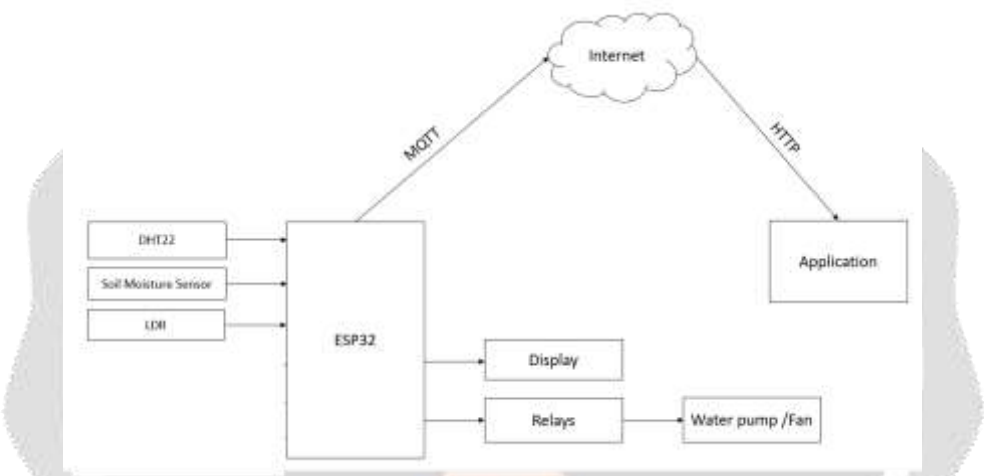

Figure 1 - System Architecture

The basic building blocks of this System are Sensors, Controller, and applications. So, the block diagram above is the proposed model of our project which shows the interconnection of these blocks. The sensors are interfaced with Microcontroller, data from the sensor is displayed on the mobile app of the user. Mobile app provides an access to the continuous data from sensors and accordingly helps farmer to take action to fulfil the requirements of the soil.

- Sensor layer- One of the challenges of the sensor layer is to obtain automated and real time transformations of the figures of actual world agricultural manufacturing into digital transformation or information which could be processed in virtual world through different or various means.

- Transport layer- This layer's task is to acquire and summarize the data of agriculture acquired from the above layer for processing. It is believed as the nerve center of the system. This layer includes the combination of telecommunication management center and internet network, information center, smart processing centers.

- Application layer- The function of this layer is to analyze and process the information collected for the cultivation of digital awareness of actual world. It is considered as a fusion of technology and agricultural market intelligence.

IV. CONCLUSION

This system showed the transformation of system which can collect the data from senor node with the help of IoT in the field of agriculture. This system successfully able to sense the data and sending the data locally to cloud which is

further access by user in his/her custom-made website. Data mining techniques are used to predict the crop production in advance so that farmer always got to know the extent of accuracy of their farming techniques. Various methods of regression and classification to get the output and their plot are plotted successfully. In future whether showing the data in custom made website can show the data in mobile app. Further, it detects the disease of the crop by using the concept of image detection.

V. REFERENCES

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