Research Article

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An IOT based Smart Irrigation System using Soil Moisture and Weather Prediction

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Abstract :-

Internet of Things (IoT) solutions, based on the application specific sensors' data gaining and intelligent processing .

IoT based smart irrigation systems can help in achieving optimum water-resource utilization in the precision farming landscape.

This paper presents an open-source technology based smart system to predict the irrigation requirements of a field using the sensing of ground parameter like soil moisture, soil temperature, and environmental conditions along with the weather forecast data from the Internet.

The intelligence of the proposed system is based on a smart algorithm, which considers sensed data along with the weather forecast parameters like precipitation, air temperature, humidity, and UV for the near future.

The complete system has been developed and deployed on a pilot scale, where the sensor node data is wirelessly collected over the cloud using web services and a web-based information visualization and decision support system provides the real-time information insights based on the analysis of sensors data and weather forecast data.

Keywords : Internet of Things (IoT), sensors, prediction algorithm, Irrigation Management, Precision agriculture.

1. INTRODUCTION :-

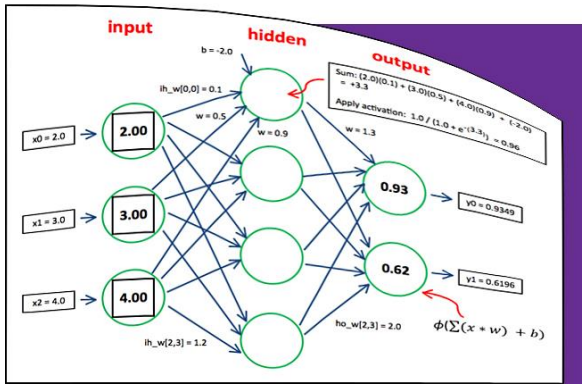
In India, where 60-70% economy depends on agriculture, there is a great need to modernize the conventional agricultural practices for the better productivity. Due to unplanned use of water the ground water level is decreasing day by day, lack of rains and scarcity of land water also results in decrement in volume of water on earth. Every time excess of water is give to the fields. There are many techniques to save or to control wastage of water in agriculture. The objective of the system includes conserve energy and water resources, handles the system manually and automatically, detects the level of water. Due to the climatic changes and lack of precision; agriculture has resulted in poor yield as compared to population growth. Irrigation is mostly done using canal systems in which water is pumped into fields after regular interval of time without any feedback of water level in field. This type of irrigation affects crop health and produces poor yield because some crops are too sensitive to water content in soil. For effective and optimum utilization of fresh water in irrigation, it becomes essential to develop the smart irrigation systems based on dynamic prediction of soil moisture pattern of the field and precipitation information of upcoming days. This paper presents an intelligent system that predicts soil moisture based on the information collected from the sensors deployed at the field and the weather forecast in- formation available on the Internet. The field data has been collected through a self designed sensor node.

2. LITERATURE REVIEW :-

The system monitors the sensors information on LCD and PC. Proposed a simple approach to "Automatic Irrigation control problem using Artificial Neural Network Controller". The proposed system is compared with ON/OFF controller and it is shown that ON/OFF Controller based System fails miserably because of its limitations .

(ANN) : Artificial neural network

- has resulted in possible performance of better and more efficient control.
- These controllers do not require a prior knowledge of system and have inherent ability to ANN based systems can save lot of resources (energy and water)
- and can provide optimized results to all type of agriculture areas.



ON/OFF controller

- Has a weak performance
- it cost a lot of money to buy for each parametrs .
- do not save energy
- possible to power disable

3. PROPOSED SYSTEM

- Irrigation can be automated by using sensors, microcontroller, WIFI module, android application as shown in Fig.1. The sensors are connected to Arduino board . The sensor data obtained are transmitted through wireless transmission and are reached to the user so that he can control irrigation . decision can be made either by the application automatically without user interruption or manually through application with user interruption. If soil moisture is less than the threshold value the motor is switched ON and if the soil moisture exceeds the threshold value the motor is switched OFF. The sensors are connected to the Arduino. This hardware communicates through WIFI module so that user can access the data through his mobile that has an android application which can get the sensor data from the Arduino via WIFI Module.

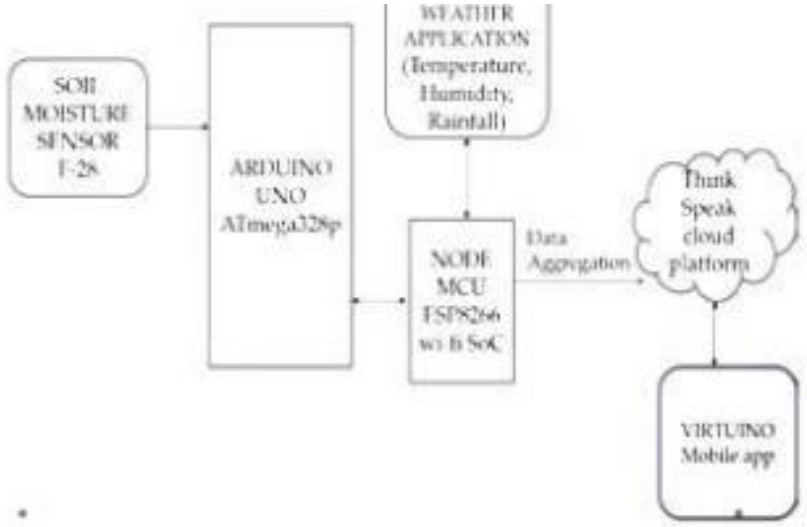
The node

is controlled by the web service through a trigger from the

responsive web based interface for real-time monitoring.

Using this web based interface the water pump can be

managed remotely in manual and auto modes.



4. SMART IRRIGATION SYSTEM :-

Automated Irrigation system using WSN and GPRS Module having main goal is that optimize use of water for agriculture crops . This system is composed of distributed wireless sensor network with soil moisture and temperature sensor in WSN. Gateway units are used to transfer data from sensor unit to base station, send command to actuator for irrigation control and manage data of sensor unit . Algorithm used in system for controlling water quantity as per requirement and condition of filed. It is programmed in microcontroller and it sends command through actuator to control water quantity through valve unit . Web application manages the irrigation through continuous monitoring and irrigation scheduling programming. Web application manages the irrigation through continuous monitoring and irrigation scheduling programming. Wireless Sensor network crop monitoring application is useful to farmer for precision agriculture The main working principle behind this system is in connecting the soil moisture sensor,which was previously embedded into the plant, to the Arduino microcontroller, which is also connected to other electronic components listed above as shown in Fig.1. Measurement of soil moisture is done by the sensor which forwards the information and parameters regarding the soil moisture to the microcontroller, which controls the pump. If the level of soil moisture drops below a certain value, the microcontroller sends the signal to the relay module which then runs a pump and certain amount of water is delivered to the plant . Once the enough water is delivered, the pump stops doing its work. Power supply has a task to power the complete system and the recommended voltage should respect the input supply range for the microcontroller, that is, from 7V to 12V.

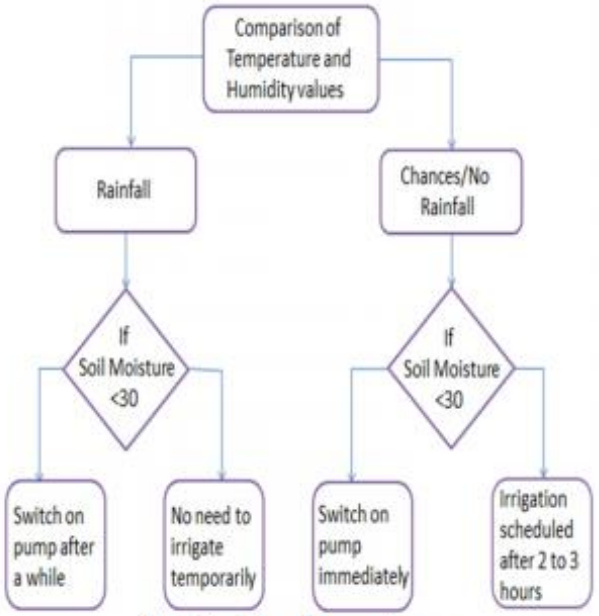


Fig.2 Algorithm of proposed system

Table: 1 Test Case Analysis

Soil Condition	Moisture Content	Relay Status	Water Pump Status	Test Case Status
Dry	<1000 >600	ON	ON	TRUE
Damp	<600 >400	OFF	ON	TRUE
Wet	<400	OFF	OFF	TRUE

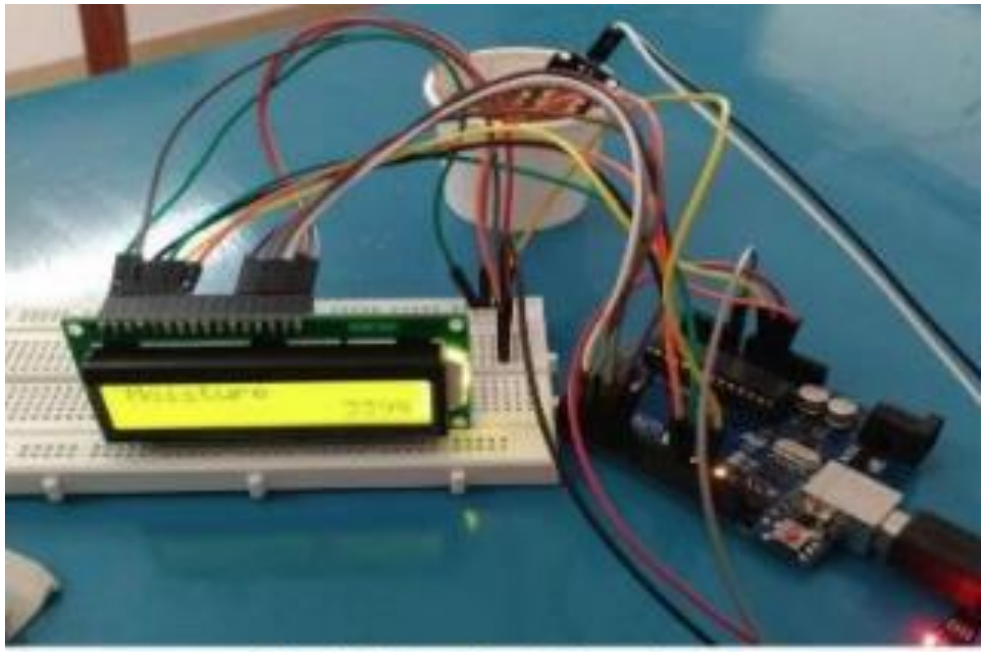


Fig.3 Moisture Level Measuring

5.CONCLUSION

The soil moisture is a critical parameter for developing a smart irrigation system.

The soil moisture is affected by a number of environmental variables, e.g., air temperature, air humidity, UV, soil temperature, etc. With advancement in technologies, the weather forecasting accuracy has improved significantly and the weather fore- casted data can be used for prediction of changes in the soil moisture

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