Automated Irrigation System for monitoring the Soil Moisture Content via Automatic Watering by using Microcontroller Node MCA ESP8266

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Abstract: Automation of farm activities can transform agricultural domain from being manual and static to intelligent and dynamic leading to higher production with lesser human supervision. In this paper we propose an automated irrigation system which monitors and maintains the desired soil moisture content via automatic watering. Microcontroller Node MCU ESP8266 platform is used to implement the control unit. The setup uses soil moisture sensors which measure the exact moisture level in soil. This value enables the system to use appropriate quantity of water which avoids over/under irrigation. IOT is used to keep the farmers updated about the status of sprinklers. Information from the sensors is regularly updated on BLYNK APP through which a farmer can check whether the water sprinklers are ON/OFF at any given time. Also, the sensor readings are transmitted to a Thing BLYNK channel to generate graphs for analysis. Our system is connected to the weather forecasting and by seeing all the conditions it will perform all the functions.

IndexTerms **- IOT, BLYNK Platform, Soil Moisture Sensor, NODE MCU ESP8266**

I. INTRODUCTION

Aim is to develop a wireless three level controlled smart irrigation system to provide irrigation system which is automatic for the plants which help in saving water and money. The main objective is to apply the system for improvement of health of the soil and hence the plant via multiple sensors. Appropriate soil water level is a necessary pre-requisite for optimum plant growth. Also, water being an essential element for life sustenance, there is the necessity to avoid its undue usage. Irrigation is a dominant consumer of water. With the help of this system crops of the farmers will not get destroy (in raining season). This calls for the need to regulate water supply for irrigation purposes. Fields should neither be over-irrigated nor under-irrigated. The objective of this thesis is to design a simple, easy to install methodology to monitor and indicate the level of soil moisture that is continuously controlled in order to achieve maximum plant growth and simultaneously optimize the available irrigation resources on monitoring software BLYNK APP and the sensor data can be seen on Internet.

In order to replace expensive controllers in current available systems, the Node MCU ESP8266 will be used in this project as it is an affordable microcontroller. The Node MCU ESP8266 can be programmed to analyze some signals from sensors such as moisture, temperature, and rain. A motor pump is used to pump the water into the irrigation system. The use of easily available components reduces the manufacturing and maintenance costs. This makes the proposed system to be an economical, appropriate and a low maintenance solution for applications, especially in rural areas and for small scale agriculturists. This research work enhanced to help the small-scale cultivators and will be increase the yield of the crops then will increase government economy.

II. LITERATURE REVIEW

Ashwini B.V focused on smart irrigation system IOT for Surveillance of Crop field, which presented conservation of water by monitoring soil moister condition, temperature and air moister through different sensors used by driving microcontroller. It's not even work out just for an automatic irrigation but instead it workout like a smart by watering the plant automatically through their soil moister condition and by sending whatever work it operation on work field all the data is to sanded out to the user through Bluetooth module [1]. Dr. Jegathesh Amalraj, et al. discussed on Economic development of country's GDP. We all know that agriculture is a imperative for human life survives so, according to this the project was prepare for ramp up of food production through smart irrigation system by conserving wastage of water by using technology. So, the entire project would work out smartly based on IOT [2]. M.Sowmiya Manoj and B.Hemalatha presented human intervention system which provides enough water without wasting it. To restrict the entire project, an 8051 series microcontroller was used, which was programmed to take input signals of varying moister conditions from the soil moister sensor, which is how the complete project works on Automatic

Irrigation [3]. Dr. V. Berlin Hency described a smart irrigation system that uses several sensors. The goal of this article is to construct an automated irrigation system utilising sensors that are connected to the microcontroller DHT11 sensor and the soil moisture VH400 sensor[4]. These sensors are connected to the microcontroller, and their main sensor unit is positioned beneath the root zone of the plant to collect soil data and send it to the controller, allowing for smart irrigation [5]. The SIM900A module, which is also connected to the microcontroller, is used to send SMS [6].

III. PROPOSED SYSTEM

The project uses an ESP8266 microcontroller which is programmed to receive the input signal of varying moisture condition of the soil through the sensing arrangement. The sensor data are stored in database. The web application is designed in such a way to analyze the data received and to check with the threshold values of moisture, humidity, rain prediction and temperature. The decision making is done at server to automate irrigation. If soil moisture and rain probability is less than the threshold value the motor is switched ON and if the soil moisture and rain probability exceeds the threshold value the motor is switched off.
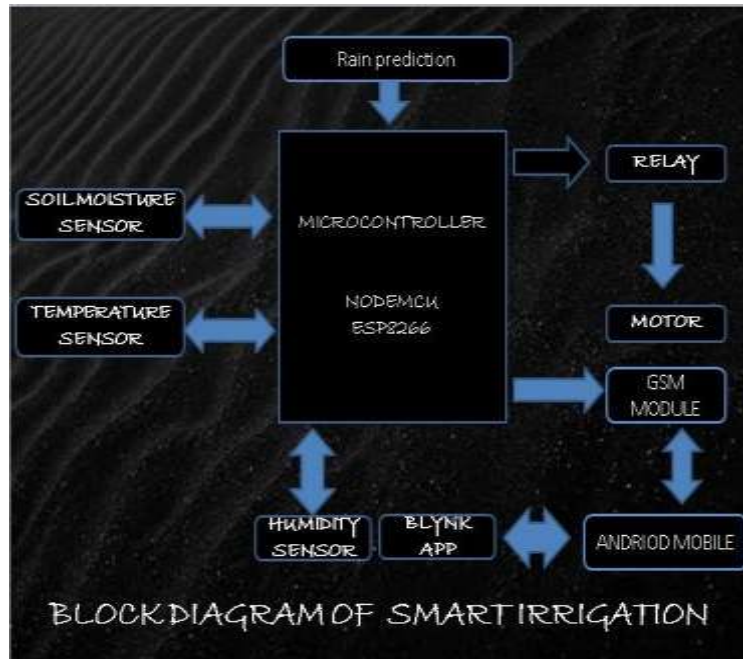

Fig.1: Smart Irrigation System

In the agriculture field sensor are used like soil moisture sensor, humidity sensor and temperature sensor. The information is send by the sensors to the NODEMCU ESP8266 and then NODEMCU send the signals to the user for information about irrigation, it is an automated system when the rain probability is high then Motor gets OFF and if rain probability is low then sensors conditions are checked, if then condition are in a favor, then motor gets ON/OFF.
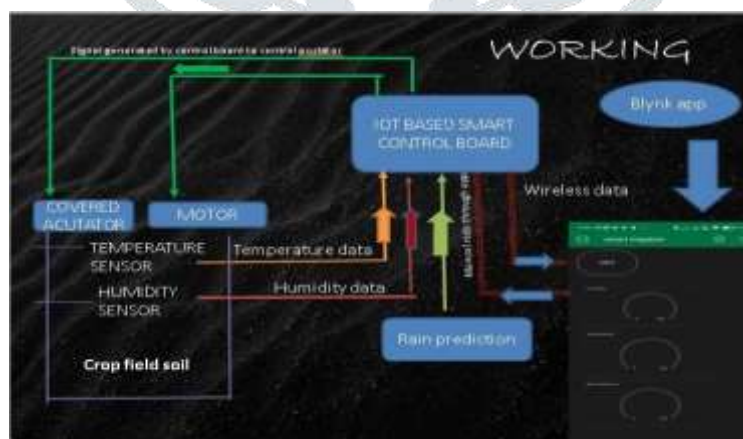

Fig.2: Working Process of Smart Irrigation System

IV. TOOLS & TECHNIQUES

    a. **NODE MCU ESP8266:** NodeMCU is an open source LUA based firmware developed for ESP8266 Wi-Fi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board.

    b. **Soil Moisture Sensor:** Soil moisture sensor measure the Volumetric water content in soil. Since the Direct gravimetric measurement of the soil.

    c. **Relay:** A standard and generally used relay is made up of electromagnets which in general used as a switch. Dictionary says that relay means the act of passing something from one thing to another, the same meaning can be applied to this

device because the signal received from one side of the device controls the switching operation on the other side.

d. **Water Motor Pump:** This is a low cost mini submersible type water pump that works on 3-6V DC. It is extremely simple and easy to use. Just immerse the pump in water, connect a suitable pipe to the outlet and power the motor with 3-6V to start pumping water. Great for building science projects, fire- extinguishers, fire fighting robots, fountains, waterfalls, plant watering systems etc.

e. **BLYNK Platform:** Paval Baiborodin is a founder of Blynk application. The main aim of this application is to help businesses and Innovators to build their own connected products and provide faster along with it an easier services to their clients. Around five lakhs of people use Blynk application, the most user-friendly IOT platform. Blynk app is not only user- friendly, but also flexible for people who wants to different innovations in IOT platform.

f. **Jumper Wire:** Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires [7].

V. BENEFITS OF PROPOSED SMART IRRIGATION SYSTEM

a. To save water
b. Automatic Irrigation
c. Increase crop productivity
d. Over irrigation/Under irrigation
e. Best quality production

VI. CONCLUSION

Agriculture is one of the most water- consuming activities. The system uses information from soil moisture sensors to irrigate soil which helps to prevent over irrigation or under irrigation of soil thereby avoiding crop damage. The farm owner can monitor the process online through BLYNK platform. Through this project it can be concluded that there can be considerable development in farming with the use of IOT and automation. Thus, the system is a potential solution to the problems faced in the existing manual and cumbersome process of irrigation by enabling efficient utilization of water resources. The System has high efficiency and accuracy in fetching the live data of fields such as soil moisture level and temperature including the ground water level. This system has also improved the normal agricultural irrigation process.

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