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Smart Irrigation System Based on NodeMCU

Aadithyan V, T Sai Samrat Goud, G Karthik Reddy, P Naga Chaitanya,
V Jaya Surya, Dr K Prabhakara Rao
Department of ECE, B V Raju Institute of Technology, NARSAPUR, Medak District

Abstract: *This paper is about automating the irrigation process in agriculture field. This is achieved by using smart system based on NodeMCU, Moisture sensor, Humidity sensor. The NodeMCU is a microcontroller unit with an inbuilt Wi-Fi communication module. The Moisture sensor collects the moisture level from the soil and sends the data to the NodeMCU similarly the humidity sensor also collects the humidity level of the atmosphere and sends the data to the NodeMCU Once the NodeMCU) receives all the data, depending on the data it has received and the inbuilt data it sends a pulse to the relay module which in-turn switches on the pump. This way the process of manual irrigation is eliminated and helps the farmers to concentrate their workforce on other major areas.*

Keywords:*Irrigation system, NodeMCU, Humidity Sensor, Moisture Sensor.*

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I. Introduction

Agriculture plays an important role in the development and economy of a country especially for a country of the scale such as India. Irrigation is defined as the application of controlled amounts of water to plants at necessary intervals, the amount water provided to plants depend on the soil type and the plant's nature. This process usually takes a lot of time and it is mostly if not always operated manually. If this process can be automated then the farmers can use that workforce and time to manage other important areas in the field, this way they get more productivity out of their day. By automating this process plants and crops alike are provided with just the right amount of water needed for their growth, this saves water and increases the efficiency of the farm.

The need for automating the process of irrigation comes from the following causes:

- Motors/pumps being manually switched on/off, this can easily be automated and no labor will be used.
- It is time saving and eliminates the human error factor from irrigation.
- Workforce allocated to irrigation can be used elsewhere and increase the overall productivity.
- By monitoring soil moisture level the crops can be watered as per their needs and not more or not less.

II. Literature Survey

[1] In this paper, the automation is done by using wireless sensor units (WSUs) and a wireless information unit (WIU), connected by radio transceivers that transfer the soil moisture and temperature data. This is done by implementing a wireless sensor network (WSN) that uses Zigbee technology. The WIU has a GPRS module to transmit the data to the web services. This system while does achieve its aim at automating irrigation makes it a costly choice because of the usage of Zigbee module.

[2] In sensor based automated irrigation system with IOT, the irrigation process will take place whenever there is a change in temperature and humidity of the surroundings, the flow of water is managed by a solenoid valve and the opening and closing signal is given using a microcontroller. The plant is watered when the moisture level is low and once the moisture level becomes normal the watering stops. The GSM and microcontroller are connected using MAX232. This system while achieving its goal to automate irrigation takes on a more complex system to achieve it.

[3] In Wireless sensor Network based Automated Irrigation and Crop Field Monitoring System, it was using wireless sensor network based automated system for optimizing water use for agricultural purpose. This system consists of wireless network of soil moisture and temperature sensors placed in the field. For transfer of data from sensors to the microcontroller, the Zigbee protocol was used. Using a GSM modem with GPRS facility, the information is provided to the farmers and PIC 18F77 microcontroller. Due to PIC microcontroller the length of the program will be big because of using RISC.

[4] The Smart drip irrigation system mentioned about using fully automated drip irrigation system which is controlled and monitored using ARM9 processor. In this system the pH and nitrogen content of the soil is frequently monitored. Monitoring and controlling is done with the help of a GSM module. Valves are turned

on or off depending on the water requirement of the plant. This system informs the user about any abnormalities present in the field such as less moisture content, rise in temperature, all this is informed via a SMS through the GSM module. The moisture sensor output will determine whether the plant needs to be watered or not. This system can work effectively for small scale fields as there will be water loss by using this method.

[5] Soil moisture content is being detected by using acoustic based technique. The main purpose of this technique is to develop a tool to help measure soil moisture in real time. This method is dependent on two main factors i.e. speed of sound and degree of saturation with respect to water in soil. With this it was concluded that the speed of sound decreases with the soil moisture content and it depends on the kind of soil. While this method can be used to pinpoint the moisture level of a soil sample in real time, it is much too complicated and not feasible for use by farmers.

III. Proposed Work

All the above mentioned methods use a separate communication module or use some sort of complicated communication protocol to transmit and receive the data from the sensors. The NodeMCU (ESP8266) can be used as an alternative for the separate communication module. This NodeMCU contains an inbuilt Wi-Fi communication module in it, this way the factor of using different transmission methods from the sensors to the microcontroller can be eliminated. By using the NodeMCU (ESP8266) we also cut costs by not having to use an Arduino board to act as the micro controller. The Moisture sensor (LM393) detects the moisture content present in the soil and sends the data to the NodeMCU (ESP8266), similarly the humidity sensor (DHT11) sends the data to the NodeMCU (ESP8266), once the data is received by the NodeMCU (ESP8266) the microcontroller cross checks the received data with the data fed to it depending on the soil profile. This way, if the data received is lower than the data fed to the NodeMCU (ESP8266) then a signal is sent to the Relay module which in-turn powers on the pump.

IV. System Description

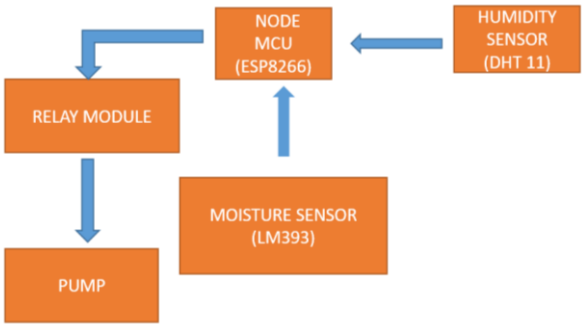

Fig1. Block Diagram of the System

4.1 Soil Moisture Sensor (LM393)

Gauging out the moisture content in soil is very important in agriculture, this helps the farmer manage the irrigation system. The Soil Moisture Sensor (LM393) is a device which basically measures the moisture content present in the soil. This device measures the moisture level by sending electrical current in the soil, if the current meets resistance then the moisture content in the soil is low and if there is no resistance then the moisture content present in the soil is measured. This way the soil moisture sensor (LM393) can find out the moisture content present in the soil and can relay the information to the Microcontroller.

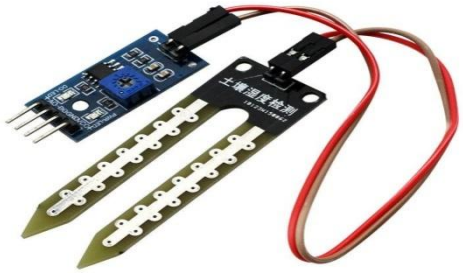

Fig2. Moisture Sensor(LM393)

4.2 Humidity Sensor (DHT11)

The Humidity sensor measures the humidity of the atmosphere; this sensor can be used to determine if the fields are in humid area or in dry area. This can also be used to determine if it might rain in surrounding area, if it does then there would be no need to activate the pump. The principle behind humidity sensor (DHT11) is that two electrical conductors with a non-conductive polymer film is laid out between them to create an electrical field between them. The moisture from the atmosphere collects on the polymer film and causes changes in the voltage levels between the two plates. This change is then converted into digital measurement of the air's relative humidity after taking the air temperature into account. Hence it can be said that the DHT11 calculates relative humidity by measuring the electrical resistance between two electrodes.

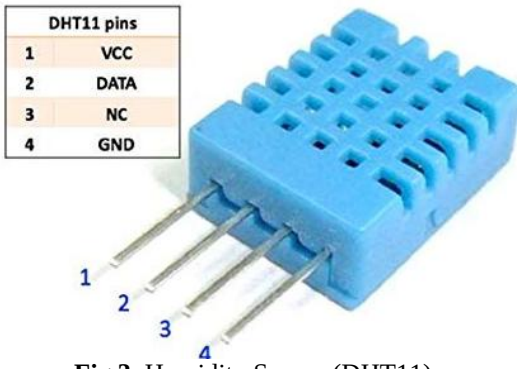

Fig 3. Humidity Sensor (DHT11)

4.3 NodeMCU (ESP8266)

The NodeMCU (ESP8266) is a microcontroller with an inbuilt Wi-Fi module. It is a device with a total of 30 pins out of which 17 are GPIO pins, these GPIO pins are connected to various sensors to receive data from the sensors and send output data to the connected devices. The NodeMCU (ESP8266) has 128KB of RAM and a 4MB flash memory storage to store programs and data. The code is dumped into the NodeMCU (ESP8266) and is stored in it. Whenever the NodeMCU (ESP 8266) receives input data from various sensors, it crosschecks the data received and the data stored in it. Depending on the data received it sends a pulse to the Relay Module which in-turn acts as a switch to on or off the pump. The operating frequency of the NodeMCU (ESP8266) ranges from 80 to 160 MHZ, and the operating voltage ranges from 3 to 3.6V. The range of the Wi-Fi module presents in the NodeMCU (ESP8266) ranges from 46 (indoors) to 92 (Outdoors) Meters.

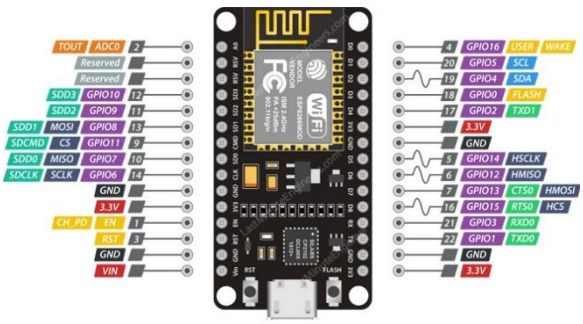

Fig 4. NodeMCU (ESP8266)

V. Conclusion

The system developed is beneficial and is cost effective when compared to other systems currently being used. This system is versatile and can be used in an extensive range of geographical locations ranging from dry lands to humid lands. The system is cost effective and affordable to farmers who want to step into automation domain and want to increase their productivity.

References

[1]. Joaquin Gutierrez, Juan Francisco Villa-Medina, and Alejandra Nieto-Garibay, Miguel Angel Porta-Gandara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE Transaction on Instrumentation and Measurement, 2013.

[2]. Karan Kansara, Vishal Zaveri, Shreyans Shah, SandipDelwadkar and KaushalJani, "Sensor based Automated Irrigation System with IOT", International Journal of Computer Science and Information Technology Vol. 6, Issue 6, 2015.

[3]. G.Nisha and J.Megala, "Wireless Sensor Network Based Automated Irrigation and Crop Field", Sixth International Conference on Advanced Computing ICoAC, 2014.

[4]. Kavianand G, Nivas V M, Kiruthika R and Lalitha S, "Automated drip Irrigation system", IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development, 2016.
[5]. Samy Sadeky, Ayoub Al-Hamadiy, Bernd Michaelisy, UsamaSayedz,"An Acoustic Method for Soil Moisture Measurement", IEEE 2004.
[6]. K.Prabhakara Rao, et al "Automation and Monitoring of Water Treatment plant IOSR Journal of Electronics and Communications, Volume-12, Issue-1, May 2016
[7]. K Vinay Kumar, K Prabhakara Rao,"Wearable RFID based Real TimeActivity Recognition System "IOSR Journal of Electronics and Communication Engineering, Volume 13, Issue 1 (January 2018), pp.32-36

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