International Journal of Applied Engineering and Technology ISSN: 2277-212X (Online)
Online International Journal Available at http://www.cibtech.org/jet.htm
2020 Vol. 9, pp.192-196/Hemavarthini et al.
***Research Article** (Open Access)*

IOT BASED FIELD MONITORING AND SMART FARMING USING RASPBERRY PI 3B

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ABSTRACT
As there is rapid growth in world's population, food consumption worldwide also grows rapidly. A rapid escalation in food production to cater to the growing demand is not an easy task. Agriculture being the oldest industry has evolved so far to the age of what can now be termed as The Third Green Revolution. The world is witnessing yet another fundamental modification with the wake of a new industrial revolution that employs application of modern Information and Communication Technologies that is IOT into agriculture in order to deliver a sustainable agricultural production. Today automation is one of the important role in human life because it provides reduction in energy improves efficiency and saves time. Here sensors are used to collect the data like temperature, water level and moisture etc from the field and interface with raspberry pi .These data then send to mobile via wifi module which is used to control the motor in the field using GUI. This study further describe how the web server, NGINX is created to store the data in cloud and to get the data in mobile phone. Thus the overall objective of this paper is to store the data in the cloud and in local database for future reference and to control the water motor automatically.

***Key Words:** IOT, Raspberry Pi, Nginx Server, GUI.*

INTRODUCTION

Smart agriculture involves integration of advanced technologies into already persisting agricultural practices with a view to boost production quality and efficiency for farming products. It helps in automated farming with the collection of data for further analysis to provide the operator with accurate information for better decision making to gain high quality output of the product. The raspberry pi is the heart of the system. Python programming language is used for automation purpose. The system is a network of sensors and a base station which can be used to provide the sensors data to automate the irrigation system. The system can used the sensors such as humidity and temperature sensor, soil moisture sensor and also touch sensor. The raspberry pi model is programmed such that if the either soil moisture or temperature parameters cross a predefined threshold level, the irrigation system isautomated,i.e. the relay connected to the raspberry pi will turn ON or OFF the motor. with the help of webseve these data are send to farmer as instantaneous report from which they came to know about the changes that occur in the field. And taking immediate action to these changes will leads to the overall improvement in the agricultural productivity.

ELATEDWORK

This paper shows the technology used in agriculture sector based on IOT and RaspberryPi.
1.Sadler and Evans proposed on the paper of defining and describing site-specific irrigation .It results in optimized irrigation where non-cropped areas existing in the field is completely turned off to provide spatial productivity.
2.Cambra and Garcia proposed on the system on designing a smart IOT communication system manager using low cost irrigation controller.This developed multimedia platform can be controlled remotely by mobile phone.
3.Xiao and Luo proposed a paper for monitoring moisture and water height of field soil.It results in implementation of real time moisture data and expert data.So it is applicable for rice growth process by sustaining water resources.
4.Atzori and Morabito addresses IOT which is the integration of several technologies and communication solutions through wireless networks.It results in synergetic activities conducted in different fields of knowledge.

PROPOSEDSYSTEM

The main components used in this system are Sensors, Raspberry Pi module, Wi-Fi connection, Database, relay and motor

TRANSMITTING SECTION

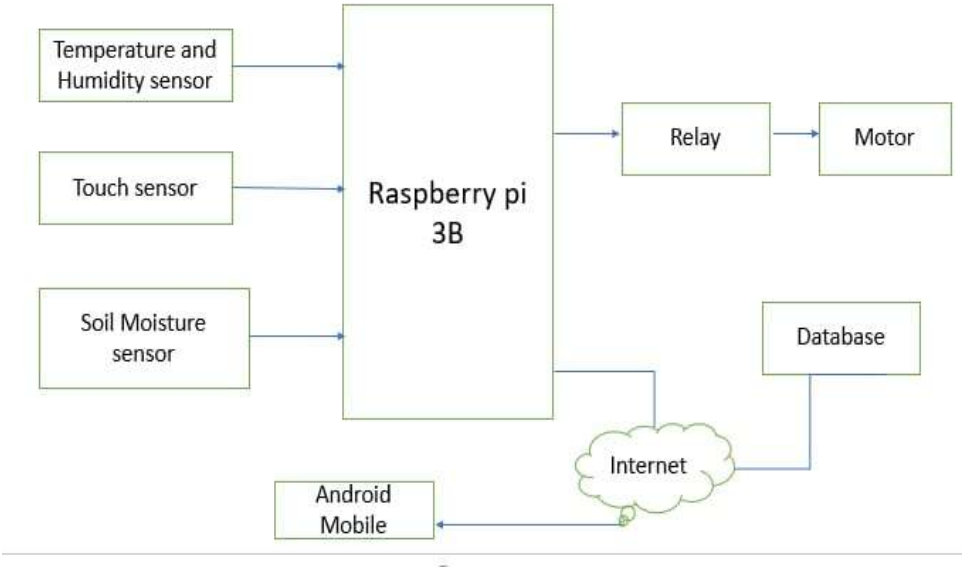

Figure1: Transmitting Section

The above figure shows the block diagram . In this diagram main model is Raspberry pi 3b model, Relay, Sensors. Here the three sensors are used such as soil moisture sensor, temperature sensor, touch sensors which are connected to the raspberry pi 3 model and also Wi-Fi connection is connected to the model. The connection of raspberry pi is given to the relay which are again given to the motor respectively for automation control.

RECEIVING SECTION

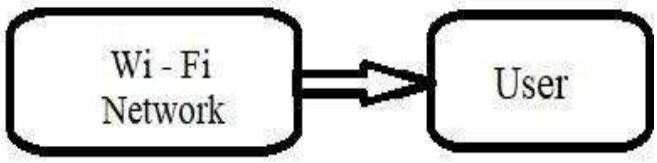

Figure2: Monitoring Unit (Receiving Section)

Above figure shows that receiving section. In that two section are present one is Wi-Fi network and user. This connection again given to the raspberry pi 3 module.

SERVER

Nginx is a web server which can also be used as a reverse proxy, load balancer, mail proxy and HTTP cache. Nginx is free and open-source software.It is a Name- and IP address-based virtual server.It is IPv6-compatible.It provides high level of accuracy and serves static content quickly.

SENSORS

A sensor is a device that detects and responds to some type of input from the physical environment. The specific input couldbe light, heat, motion, moisture, pressure or any one of a great number of other environmental phenomena.The output is generally a signal that is converted to human-readable display at the sensor location or transmitted electronically over a network for reading or processing.

TEMPERATURE AND HUMIDITY SENSOR

DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor. The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. The sampling rate of this sensor is 1Hz .i.e. it gives one reading for every second. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA.

Fig 3: DHT 11(Temperature Sensor)

SOIL MOISTURE SENSO

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise neutrons, and replacement of the moisture content. This sensor mainly utilizes capacitance to gauge the water content of the soil (dielectric permittivity). The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent.

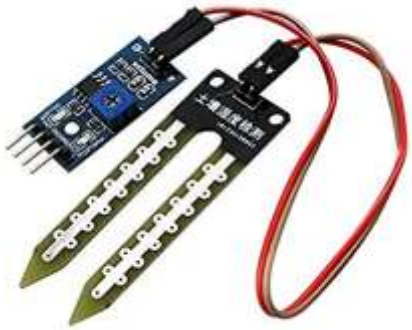

Figure 4: Soil Moisture Sensor

RASPBERRY PI

The Raspberry Pi 3 Model B is the third generation Raspberry Pi.It is 10x Faster than its predecessor. It has Broadcom BCM2387 ARM Cortex-A53 64 bit Quad Core Processor powered Single Board Computer running at 1.2GHz.It has1GB RAM so it is used for more powerful applications. It is fully HAT compatible. It has 40 pin extended GPIO to enhance "real world" projects. It has in-built 802.11 b/g/n Wireless LAN and Bluetooth 4.1 and Micro SD slot for storing information and loading the operating systems.It has10/100 BaseT Ethernet socket to quickly connect the Raspberry Pi to the Internet.

Figure 5: Raspberry Pi Model

RELAY

A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a separate low-power signal. A relay with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload. As shown in above figure raspberry pi is connected to the devices via relay. Here relay can be operated as switch to on or off the devices.

Figure 6: Relay

WORKING PRINCIPLE

The Raspberry pi is the heart of this system. It consumes less power .This board has in-built wifi module which makes the storing of data in cloud easier. various sensors are used to sense the physical changes like temperature, moisture content etc. The output of the sensors are given to raspberry pi. The data from the sensors can be stored in cloud using **Nginx,** an open source web server .If the soil moisture sensor detect the value which is less than threshold then the water motor automatically ON. If the water level touch the sensor then the motor gets automatically OFF. We can also create a **GUI** to control the motor using mobile phone.The motor is connected to

relay. The Raspberry Pi cannot directly drive the relay. It has only zero volts or 3.3 V. It needs 12V to drive electromechanical relay. In that case it uses a driver circuit which provides 12V amplitude to drive the relay.

CONCLUSION

This field monitoring system is reliable and cost effective for improving agricultural productivity.The system can provide data related to climatic changes and soil nature effectively.This can also used to save water by controlling the water level in field.we can also add solar panel to power the board which can save electricity.

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