INTERNET OF THINGS BASED WIRELESS WEATHER MONITORING SYSTEM USING BLYNK SERVER

K. Karthigaeni*1, R. Nithyalakshmi*2

*1PG Student, Department of ECE, Bharathiyar Institute of Engineering for Women, Salem, India.
*2Assistant Professor, Department of ECE, Bharathiyar Institute of Engineering for Women, Salem, India.

ABSTRACT

Agriculture is the backbone of our country and industries equally plays major role for the development of a country. Strengthening both the agricultural and industrial fields can be achieved by reducing the major flaws occurring in both the fields. Smartness in work improves the betterment of both the agricultural and industrial fields than before. Smartness in work includes both human efforts and technological development. This paper describes about the wireless weather monitoring system based on Internet of things (IOT). Monitoring the weather conditions is not only used for agricultural field but also in industrial sectors too. The proposed system mainly describes about four parameters namely temperature, soil moisture, humidity and vibration level. The user can access any data using their smart phones through internet connection. These technological advances make these things true conveniently and at reasonable cost.

Keywords: IOT, ESP8266, Blynk server, Arduino.

I. INTRODUCTION

Weather monitoring station provides the information related to the atmospheric conditional changes. Our government invests huge amount of funds to launch satellites for forecasting the weather conditions. This shows the importance of weather monitoring system and also how the changes of weather play a vital role in our life. In industries, the quality, capacity and configuration system of machines are tested with the help of a vibration sensor or piezoelectric sensor. The result obtained from the vibration sensor is important for calculating the life time of machines or how it long lasts for the specified work. In industries, the calculation of temperature and humidity is important for manufacturing new products and recycling the older ones like gold, plastics etc. Also, in agricultural field measuring the humidity and soil moisture is important for harvesting and planting the crops. Continuous monitoring of weather by traditional methods is impossible and manual results may bring error. The results of the analog components are complicate to conclude the current situation. When compared to IOT technology, the other technologies have many difficulties such as the low transmission speed, high installation and maintenance costs, not safe and secure.

The proposed system consists of three sensors namely, DHT11, vibration and soil moisture sensors. DHT11 sensor is used to measure the temperature and humidity level. Vibration and soil moisture sensors are used to measure the respective parameters. These sensors were integrated with Arduino UNO board. This Arduino UNO microcontroller converts analog information into digital value and it displays in LCD. Based on IOT technology, the user can visualize the information through internet enabled devices by using Esp8266 Wi-Fi module. This proposed system uses blynk server to access the data through our mobile phone that was programmed by embedded C for providing the information conveniently.

II. HARDWARE AND SOFTWARES COMPONENTS

2.1 HARDWARE COMPONENTS

2.1.1 DHT11
Figure 2.1: DHT11

The DHT11 is a low cost and commonly used digital temperature and humidity sensor. This sensor is capable of interfacing it with any microcontroller to determine the humidity and temperature at a particular instant of time. This type of sensor seems to exist as a sensor and also as a module. The pull-up resistor and a power LED is the only main difference for a sensor and a module. It is a relative humidity sensor and to determine the humidity of the atmospheric air it employs a thermistor and a capacitive humidity sensor. Figure 2.1 illustrates the DHT11 (Temperature and humidity sensor) used in this system.

2.1.2 SOIL MOISTURE SENSOR

Figure 2.2 Soil moisture sensor

The soil moisture sensor is used to determine the amount of volumetric water content present inside the soil. To determine the free soil moisture, the direct gravimetric measurement requires removing, drying and weighing the soil sample whereas the soil moisture sensor determines the amount of volumetric water content present inside the soil by using certain soil properties like the soil electrical resistance, soil dielectric constant or interacts with the neutrons present in the soil for the soil moisture content. Figure 2.2 illustrates the soil moisture sensor used in this system.

2.1.3 VIBRATION SENSOR

Figure 2.3: Vibration sensor
Vibration sensors are used to determine the pressure, acceleration, vibrational changes of a system or a device. Vibration sensor is also known as a piezoelectric sensor. Vibration sensors are capable of identifying the vibrational movements that can cause earthquakes and mechanical flaws in machinery equipments. Due to the identification of vibrational movements early preventive measures can be taken to save the environment from disasters. Figure 2.3 illustrates the vibration sensor used in this system

2.1.4 ARDUINO UNO

![Arduino UNO board](image)

Arduino UNO was developed by Arduino.cc where the name ‘UNO’ in Italian means ‘one’ which describes the version of the Arduino software that was released initially. It is a microcontroller board that consists of a set of digital and analog (IP/OP) pins that can be interfaced to several boards and circuits. The Arduino UNO board consists of 20 digital IP/OP pins where 6 IP/OP pins are used as analog inputs and 6 IP/OP pins are used as PWM outputs, a resonator, power plugs, ICSP (In-circuit system programming) header and a reset switch. The Arduino UNO boards do not employ the FTDI USB-to-serial chip which makes it different from all other electrical boards. Instead, it employs ATmega16U2 programmed to work as a USB-to-serial convertor. It has a USB bootloader where the users are allowed to reprogram it anytime. Figure 2.4 illustrates the Arduino UNO board used in this system.

2.1.5 ESP8266

![ESP8266](image)

ESP8266 is a low cost commonly used Wi-Fi microchip that was developed by EspressifSystems in China. This Wi-Fi module allows any type of microcontroller to link to a Wi-Fi network connection and using Hayes-style commands it makes simple TCP/IP connections. It consists of 1MB in-built storage that allows the building of single chip devices to connect to a Wi-Fi network. Figure 2.5 illustrates the ESP8266 Wi-Fi module used in this system.

2.2 SOFTWARE COMPONENTS

2.2.1 ARDUINO IDE

The Arduino IDE (Integrated Development Environment) is an application written in functions from C and C++ programming languages and it is available for WINDOWS, mac operating systems and LINUX. It is commonly used to write coding and upload it to Arduino compatible boards. By using third-party cores,
we can write and upload coding to other development boards. Under the GNU General Public license version 2, the source code for the Integrated Development Environment was released. It supports C and C++ programming with the help of special rules for code structuring. The Arduino codes consists of only two basic functions that are compiled and are connected to a stub main (), into an executable program. These two functions include setup () and loop () where setup () is a function that is executed when the Arduino board is powered ON for starting a program and loop () is a function that is called continuously until the Arduino board is powered OFF.

2.2.2 BLYNK SERVER

In IOS and Android apps, Blynk is an IOT platform that is used to control the Arduino, Wi-Fi module, and other platforms using an internet connection. The graphical interface can be easily built for any projects by simply dragging and dropping the widgets since it is a digital dashboard. Blynk app, Blynk server and Blynk libraries are the three main components that exist in the BLYNK server platform.

III. WEATHER MONITORING SYSTEM

![Figure 3.1: Block diagram of internet of things based wireless weather monitoring system using blynk server](image)

Figure 3.1 illustrates the block diagram of internet of things based wireless weather monitoring system using blynk server. This system describes the weather monitoring using Internet of Things (IOT). Four parameters of weather are proposed in this system. DHT11, soil moisture sensor and vibration sensor are
the sensors used in this proposed system. DHT11 sensor (Temperature and humidity sensor) is used to determine the temperature and humidity. It is a relative humidity sensor and to determine the humidity of the atmospheric air it employs a thermistor and a capacitive humidity sensor. It provides calibrated digital output, therefore the OUT pin of DHT11 is connected to D0 of Arduino UNO board. The other two pins, Vcc is connected 3v3 pin of the Arduino UNO board and GND is grounded in Arduino UNO board. The soil moisture sensor is used to determine the amount of volumetric water content present inside the soil. The two probes of the sensor are injected into the soil for about two to three centimeters. The probes detect the dielectric permittivity of the soil and experienced the electrical resistance of the soil. If electrical resistance in the soil is high, the water content present in the soil is low and if electrical resistance in the soil is low, the water content present in the soil is high. The water content present in the soil is inversely proportional to electrical resistance in the soil. Soil moisture sensor provides analog output, therefore output pin is connected to A0 of Arduino UNO board. The other two pins, Vcc is connected to 5v of Arduino UNO board and GND is grounded to the Arduino UNO board. Vibration sensor or piezoelectric sensor provides analog output; therefore, the output pin is connected to A1 of Arduino UNO board. The Vcc pin is connected to GND of the Arduino UNO board. The Arduino UNO has inbuilt analog to digital converter (ADC). The ADC converts analog output of soil moisture and vibration sensor into digital value. Arduino IDE (Integrated Development Environment) is used for Machine to Machine communication (M2M). Arduino UNO has Esp8266 Wi-Fi module and it is programmed by embedded C programming language. BLYNK server is used as the IOT platform in this system. The data were stored in cloud storage. The user can retrieve it whenever needed by internet enabled devices such as smart phones, laptops, etc. The user can visualize the information by downloading blynk app through an internet enabled mobile phone. User is capable of controlling the threshold value of these three sensors. If the sensor values cross the threshold value, the relay circuit triggers the buzzer to indicate the user by a message or alarm.

IV. CONCLUSION

Nature can change at any time; it cannot be controlled but we can make plans for prevention that may reduce the natural disaster. The correct and prior information is a vital thing to reduce the flaws in any field. Monitoring the weather conditions, through the wireless sensor networks using Internet of Things (IOT) technology, will bring the environment into real life. Our proposed system has three commercial sensors which is integrated within the system to monitor the temperature, humidity, soil moisture and vibration level. We can monitor continuously the changes of nature by using the Wi-Fi connection enabled devices such as smart phones, laptops, etc. The proposed system is very useful for developing an area into smarter than before. This system is very useful for both industrial zones and agricultural field. After implementing this system in real life, it provides continuous information about weather and the maintenance cost is very reasonable. Therefore, Internet of Things based wireless weather monitoring system using blynk server overcomes the difficulties that arises in the existing system.

V. REFERENCES


[13] Yung-Chung Tsao, Yin Te Tsai, Yaw-Wen Kuo, Chaokung Hwang, An Implementation of IoT-Based Weather Monitoring System, 2019 IEEE International Conferences on Ubiquitous Computing & Communications (IUCC) and Data Science and Computational Intelligence (DSCI) and Smart Computing, Networking and Services (Smart CNS)