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Weather Monitoring System using Blynk Application

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Abstract*: The Internet of Things (IoT) is a latest concept of relating physical computing devices or any other objects to internet and can communicate with each other. Each object is provided with unique identifiers and the ability to transfer data over internet network without human intervention and machine interaction. The project targets on a simple microcontroller, Arduino UNO with connection to the wireless weather monitoring system, WiFi-WeMos ESP8266 which monitor weather condition using three sensors such as temperature, rain and carbon monoxide sensor. It then displays all data in the Blynk application. The project have been developed by using Arduino UNO Microcontroller, WiFi-WeMos ESP8266, DHT 11 temperature and humidity sensor, rain sensor and MQ-7 Carbon monoxide sensor. It is suitable for monitoring weather in any place and any time.

Keywords*: Internet of Things (IoT), Blynk Application, Weather Monitoring.

I. INTRODUCTION

Weather monitoring is an important aspect in many situations. For example, the weather conditions are need to be monitored in order to maintain the healthy growth in plants. Other than that, it also needed for ensuring the safe environment in city or suburban. The people who want to go to city can easily know the weather on that time and will plan their travel easily. Today, there are some announcement about the weather from radio or television but at a certain time only and not efficient anymore. In modernization world, technology is important for human to facilitate everyday life. Hence, the technology is used in this project to help the people to know the condition of weather at a certain place by only using fingertips.

The weather monitoring system can be categorized into wired or wireless system. In wireless communication, the connectivity will be more convenient and user-friendly. Thus, weather monitoring system would not need the responsible person to be presence at the location [1].

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Wireless communication also is the transfer of information or data over a distance without the use of wires from the transmitter to the receiver. The distance of transferring data can be short or long. The weather monitoring system will collect all the data and will send to the application known as Blynk. This application can allow the user to know the exact weather every time and every day. The motivation for this project is to make a people easily move from one place to another place.

II. METHODOLOGY

The methodology for this project contains the flow chart and block diagram, which explains the overall method taken during the project. Besides that, this part also introduces software development and hardware development. In order to develop the system, its starts with designing the system. Designing the system conclude identifying the suitable component. After all the component has been listed, the next step is to build up all component. This part will focus on coding using IDE software. The program will be finish and complete when the system had been configured.

A. Overview of Weather Monitoring System

The Arduino microcontroller is the main component in the system that is connected to all the components as shown in the Figure 1. The sensors for the system are connected to the analog input of the Arduino microcontroller. The Arduino is also linked to the WiFi-WeMos ESP8266. All the collected data will be send to Blynk application.

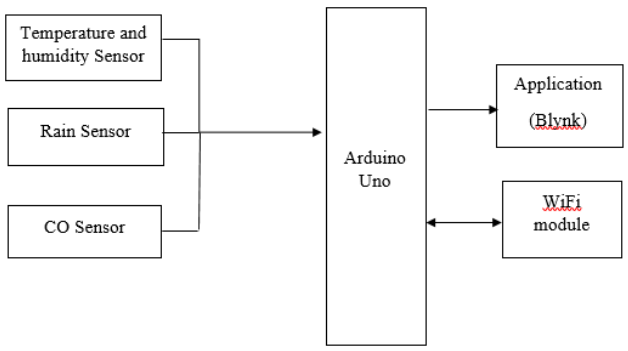

Fig. 1: Block diagram of Weather Monitoring System using Blynk

The flowchart in Figure 2 shows the weather monitoring system process from the start until the end. Initially, all sensors will collect the data from the system.

Next, the sensor such as temperature, rain and carbon monoxide sensor will combine the data and will send to the application Blynk. Therefore, the user can only open the application and able to know the weather condition.

B. Software Development

This software is an open source Arduino software. The code will be written on this software and it will be upload to Arduino board. The Arduino board always changing to adapt to new needs and challenges and its offer simple 8-bit boards to products for IoT applications, wearable, 3D printing and embedded environment [5]. Blynk is a platform with Ios and Android apps to control Arduino, Rasberry Pi and the others over the Internet [6].

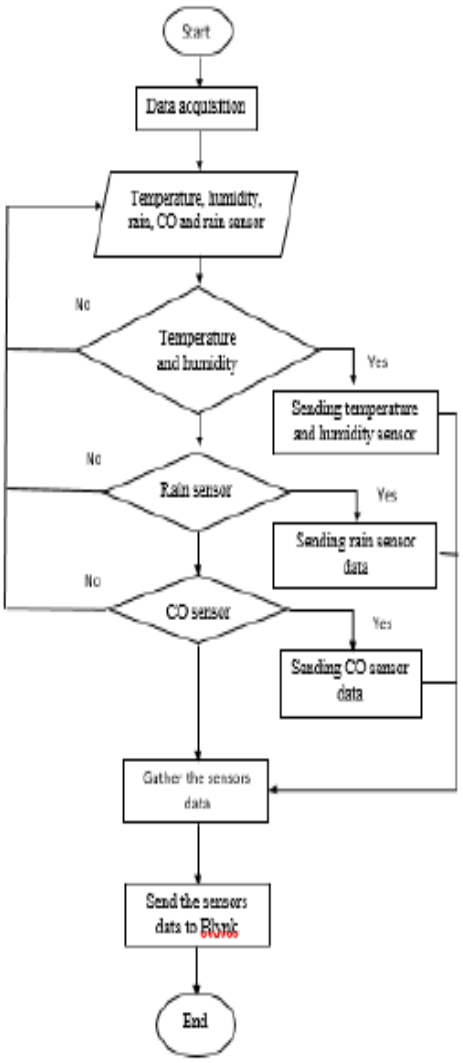

Fig. 2: Weather monitoring system process

C. Hardware Development

For hardware, the main parts are Arduino and We MosD1. Arduino Uno is a microcontroller board based on the ATmega328P. As shown in Figure 3, the Arduino has 20 input/output pins, which is divided to 14 digital input/output pins and 6 analog inputs. Arduino also has a 16 Mhz quartz crystal, a power input, a USB connection, an ICSP header and a button for reset purpose. It also simply connects it to a computer whether with a USB cable or with AC-to-DC adapter or battery for system to get started [7].

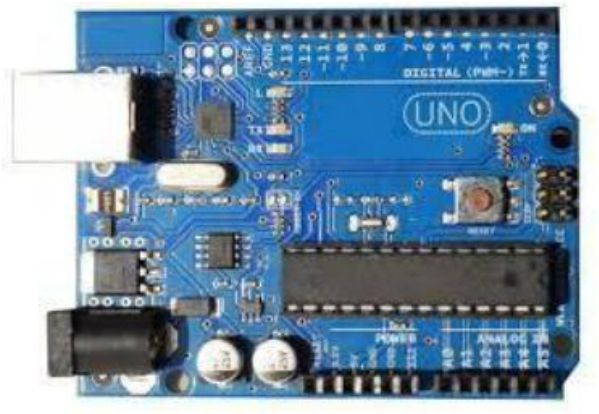

Fig. 3: Arduino Uno

The WeMos D1 is a ESP8266 WiFi based board that uses the Arduino layout and operates with voltage of 3.3V. As shown in Figure 4, the board is controlled by ESP8266 chip that has a larger flash memory compared to an Arduino. It consists of 11 digital input/output and 1 analog pin [8].

Fig. 4: WeMos D1

Figure 5 shows temperature and humidity sensor. The sensor has small size, consume low power and able to transmit signal up to 20-meter in distance. Thus, it always become best choice for many applications. The component is 4-pin single row pin package [9].

Fig. 5: Temperature and humidity sensor

The monitoring system also use MQ-7 sensor that can detect CO-gas concentration from 0 to 2000ppm as shown in Figure 6. The sensor also has high sensitivity and fast response time for the data collection [10].

Fig. 6: MQ-7

The rain sensor module is an easy tool for rain detection as shown in Figure 7. The analog output is used in detection rainfall drops. The sensor is connected to 5V power supply and LED on the sensor will turn on when induction board has no rain drop [11].

Fig. 7: Rain sensor

Figure 8 shows the schematic diagram for weather monitoring system. The circuit layout consists of electronic devices that was used in this project such as Arduino UNO, WeMos D1 WiFi ESP8266, DHT11 temperature and humidity sensor, rain sensor and MQ-7 carbon monoxide sensor. In order to evaluate the effectiveness of the system, the system schematic was design using Fritzing. The system will function when all the sensor detects the data.

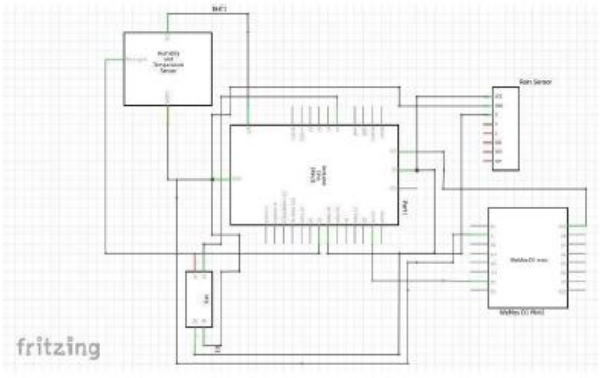

Fig. 8: Schematic circuit for weather monitoring system

III. RESULT AND DISCUSSION

This part shall explain briefly and show the result that would get from the circuit implemented. All the hardware equipment is being assembly and several kinds of data in this project are analysed to ensure that the performance of the systems is stable and in desired condition. The result of the project are observed for analysis part. Based on the result and data analysis of the system, it can help user to analyse the performance of the system and check the system function. Thus, it able to monitor the weather in the outdoor environment.

A. Weather Monitoring System

The final form of this project prototype, overall view and side view of the system are shown as below Figure 9.

Fig. 9: Weather monitoring system prototype

B. Blynk Application

Blynk have been used to collect all the data. Firstly, the user need to sign up to make an account. Next, Blynk will send the Auth Token to the email that have been register. After the Auth Token have been send, the user can use the application and can make their own data such as graph, display value, button, table and others. The Figure 10 below shows the Blynk Application interface.

Fig. 10: Blynk application interface

C. Temperature and Humidity Sensor

The experiment was conducted from the detection of the temperature and humidity sensor. There are different values for different day. The data have been collected at 1pm. Temperature measure of hotness or coldness are implemented and it indicates the direction in which heat energy will spread spontaneously. There are a few scales that have been used such as Fahrenheit(°F), Celcius(°C) and Kelvin(K). For this project, the reading of temperature was taken in Celcius. It is because Celcius is the commonly used around the world. In Melaka, the average reading for temperature is 29°C. The average was suitable to the society to do some work and can visit the place safety without worrying the air quality.

D. Carbon Monoxide Sensor

The level of carbon monoxide concentration is measured using a Parts Per Million (PPM). For example, 50 PPM carbon monoxide means that for every 999,950 molecules of air, there are 60 molecules of carbon monoxide. The value for the normal carbon monoxide is below 50 PPM. At Melaka as shown in Figure 11, the average of carbon monoxide value is around 13 ppm. The reading is a normal and safe for the society to visit that place.

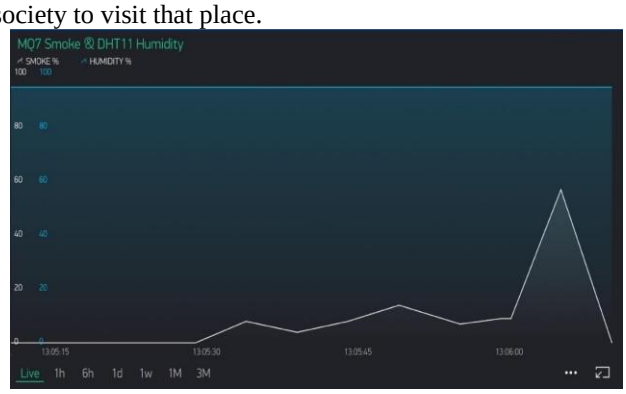

Fig. 11: MQ7 sensor reading

E. Rain Sensor

During the system take the reading and place at Melaka, weather conditions are hot and humid. This system cannot be implemented because there was no rain during the week. Although, by using the application Blynk, the user can know the exact weather condition whether there is rain or not. The figure below shows the application detect the rain and not detect the rain. When the sensor detects the rain, the system on the application Blynk will change the notification to the red circle as shown in Figure 12. Next when the sensor does not detect the rain, the system on the application Blynk will remain the notification with black circle. This notify the user to know whether it raining or not.

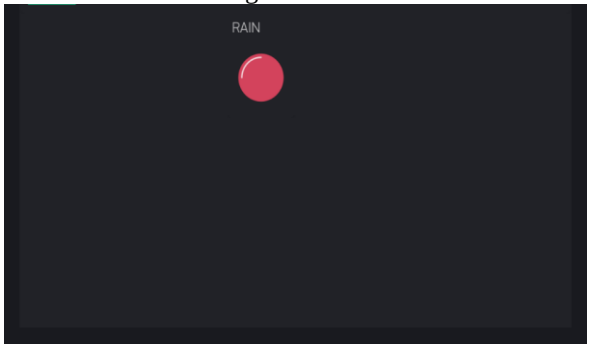

Fig. 12: Red circle on Blynk application

F. Discussion

At the end of this project, it must implement the Weather Monitoring System by building the prototype model. In the initial state, the system needs to be turned on. This Weather Monitoring System is used to monitor the weather at Melaka. The system will detect the temperature reading, carbon monoxide reading and rain condition. After the system detect all the data, it will upload to the application Blynk. In the application, all the people can search and know the exact condition of weather. The society can visit that place without worrying the air quality.

In order to develop this project "Weather Monitoring System", it is divided by two sections that are software and hardware development. For the software development, many researches have been done. The programming by using the Arduino compiler is the most complicated part of this project. There were a lot of problem that have been facing. Error always pop up every time the program is executed. However, all the problems are solved after the errors have been found.

For the hardware development, there are many problems too. Sometimes the sensor does not sense the condition. This problem happens when the connection of the wire was not fully connected or loose. Before running the system, it needs to check all the wires are tight and see if any of the wires are not connected.

IV. CONCLUSION

This project entitles "Weather Monitoring Weather using Blynk" which attempt to monitor the weather at the city and also important for farmer. This project achieved the objectives where to build weather monitoring system that can check the weather conditions using application, Blynk. Next, the project also able to display the current weather conditions on weather monitoring system. The implementation of a system to monitor the weather using Internet of Things (IoT) is accomplished.

The system provides a low power solution for monitoring weather and environment. The monitoring system has been tested in outdoor environment and successfully updated data from sensor. The data will be used for various type of analysis and it can be shared to other people or users.

The project has the potential to be implemented for monitoring the developing cities and industrial zones especially for pollution monitoring. In order to protect the public health from pollution, the system also able to provide an efficient and low cost solution for the authority. It also suitable for continuous monitoring of environment in the future.

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