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# Development of Remote Climate Monitoring System using IOT

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**Abstract:** In this paper, the remote climate monitoring system scheme with two sensors and three parameters to display the environment measurement. The remote climate monitoring system method helps to minimize the workers at the farm to alert about the changes of weather. The system is controlled by a ESP8266. With the advancement of microcontroller technology, Internet connectivity, cloud storage and digital component miniaturization, it has now become easier to link physical objects to the Internet, making the World Wide Web a 'Internet of Things (IoT). The presented device was constructed to monitor weather parameters remotely. This paper focuses on the online uploading technique of data obtained so that the system can be used to track weather parameters remotely and ultimately evaluate trends of climate change. The paper also highlights the basic development of the internet of Things, and its possible applications , especially for monitoring and analyzing.

**Keywords:** Climate, Monitoring, Blynk, DHT11, BMP180, IoT

## 1.0 INTRODUCTION

The growth and progress of nations is measured in all areas of life by the alternative of their use and implementation of the new invented technologies. Control in engineering is one of those things that many researchers have provided a great deal. This has become a major concern in many fields such as industrial, production, medicine, education, and infrastructure (Telagam et al., 2017). The Internet of Things (IoT) has the power to make the planet more hospitable to humanity's present and future generations. The IoT technologies can be used for sustainable development in several different ways. An IoT system can be used to evaluate physical parameters to a physical object and, for example, upload real-time data to an online storage server where it can also be analyzed in real-time (Y. F. Li et al., 2017; Samsudin et al., 2018; Šećerov et al., 2019).

Weather and climate are among the foremost factors which determine how a society develops in geographical region. Weather generally defines the specific occurrence or situation for a brief period, such as hours or days, while climate refers to the atmosphere behavior for several years to a region. At the other hand, the weather involves actual environmental conditions such as precipitation, temperature, air pressure and humidity, while the climate defines the general environmental conditions of a given region for a long period of time.

Weather information is valuable in our everyday lives. The results collected, such as humidity and temperature, may contribute as a safety precaution against the devastation of the animal at the farms. Besides that, it's necessary for others to schedule their jobs. Climate data obtained over a long period of time was used to forecast climate change in future trends. Climate data accumulated over the last decade may be used to examine the history of climate change (Arslan et al., 2014; Schnell et al., 2012).

Previous work on environmental monitoring was carried out by several researchers. (Gaikwad & Mistry, 2015)reported several methods in a review paper where environmental monitoring was performed using wireless sensor networks together with GPRS (Global Positioning Radio System) or GSM (Global System for Mobile Communications) for energy management.

Another study by (J. Li et al., 2020) reported environmental monitoring in China, where satellite data is used to extract environmental conditions such as soil moisture, land surface temperature and evapotranspiration. Analysis of the collected data was promises huge benefits towards the future of environmental protection and preservation.

(Vijayalakhmi & Senthilkumar, 2020) reported an environmental monitoring system for crops planted in a greenhouse. The proposed a series of wireless sensor networks paired with GSM technology for the continuous monitoring of like temperature, humidity, smoke, CO2, light and greenhouse gases. A web-based user interface was proposed as a reporting platform for this system.

## 2.0 MATERIALS AND METHODS

The ESP 8266 is an expensive Wi-Fi microchip with complete TCP/IP stack and microcontroller functionality. The ESP 8266 can either host an application or load all Wi-Fi networking features from another device processor. This device has on-board processing and storage capacity which enables it to be integrated with sensors and other application-specific equipment with minimal upfront creation and minimal runtime loading through its GPIOs.

The high level of integration on the chip allows minimal external circuitry, and on the front-end module, to occupy minimum PCB space. The ESP8266 supports APSD for Bluetooth coexistence VoIP applications and interface; it features a self-calibrated RF which allows it to run under all operating conditions and does not require external RF components. ESP8266 NodeMCU needs a voltage value of 2.5V to 3.6V. NodeMCU has a RST button for resetting the ESP8266 module, as well as a FLASH button for installing latest programs and a consumer-programmable Blue LED.

Figure 1: View from the front of prototype.

Figure 2: View from the top of prototype.

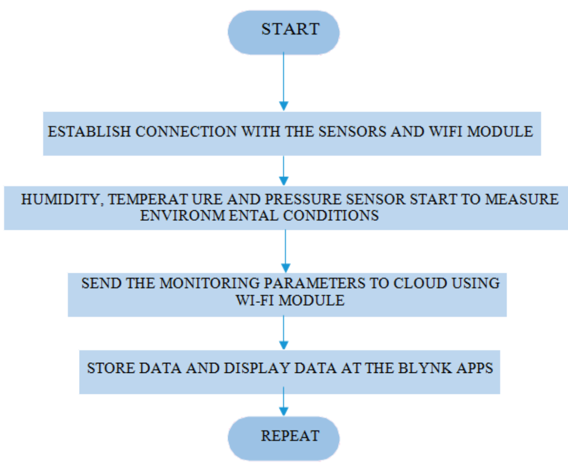
Figure 3: Wi-fi module

The DHT11 is a digital temperature and humidity sensor, which is simple and ultra-low-cost. The surrounding air is measured with a capacitive humidity sensor and thermistor, and a digital signal is generated on the output pin. It's fairly easy to use, but it requires good timing to record the information. The only biggest drawback of this sensor is that you will only get new information from it every 2 minutes, so that the sensor readings can be up to 2 seconds old when you use our library. In the project it will measure the temperature and humidity parameters for every second. In addition, temperature ranges from 0 to 50°C are evaluated with a precision of ±2°C. All variables are retrieved at a resolution of 8 bits.


Figure 4: Temperature and humidity sensor

The barometric pressure sensors measure the absolute air pressure surrounding it. This pressure varies with the climate and the altitude. Depending on how you interpret the data, you can track changes in weather, determine altitude, or any other tasks that include accurate reading of the pressure. Pressure is a variable that must be examined and strongly aligned to manufacturing sectors and space exploration.


Figure 5: Air pressure sensor




This project was development to remotely monitoring climate system. First of all, when the power supplies are ON, the ESP8266 and three sensors which is humidity, temperature and air pressure will be turn ON and function. When the Wi-Fi module is turn ON, it will establish connection with the sensors. Then the sensors will start to measure their parameters. For this system, it will give three output reading which is humidity, temperature and air pressure reading. Humidity result will display in "%", temperature in "°C" and air pressure in "mb".

Moreover, after the measurement of the parameters from the three parameters, the data will be sent to cloud using Wi-Fi module. The data will be uploaded in the cloud and it will be display at the Blynk application.

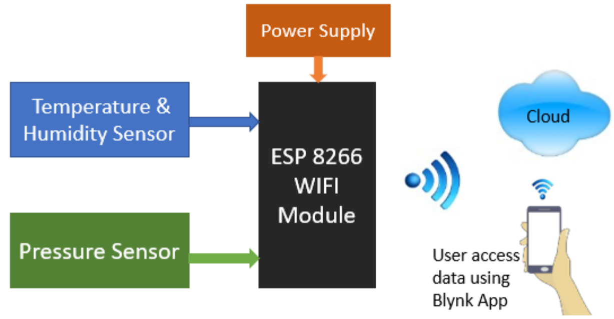



Figure 7: Block diagram of Project

## 3.0 RESULTS AND DISCUSSION

The Development of Remote Climate Monitoring System resulting the parameters where Blynk send the notification automatically.


Figure 8: Environment reading.

Referring to Figure 9, there are two gauge meters and one SuperChart. Meter gauge that red colour is represent the temperature reading and the blue meter gauge represent the humidity reading.

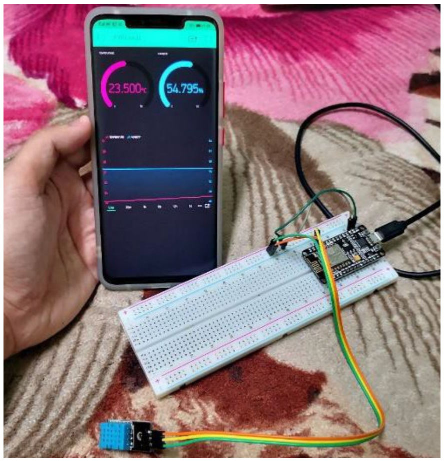



Figure 9. Project at living room.

Then for the SuperChart, the red line represents temperature reading and the blue line represents the humidity reading.


Figure 10: Result at the living room before the air-condition turn ON.

From the Figure 10, it shows that the temperature reading is high with 31°C and humidity reading is low with 47% for the first 9 minutes from 1:31pm until 1:40pm. This is because at that time the fan and air-condition are not turned ON.

Referring to Figure 11, after air-condition is switched ON, we can see that the reading of the temperature starts to drop slowly while the humidity reading starts to increase rapidly. This shows that the living room is becoming cool. After 30 minutes, we can see that the humidity suddenly rise up. This is because I sprayed water using a spray bottle, to see if it really measures the humidity changes. From the results, the sensor is working well.

So from the figure 11 above, we can see that the room is already cool with the low temperature and ideal humidity with constant result.

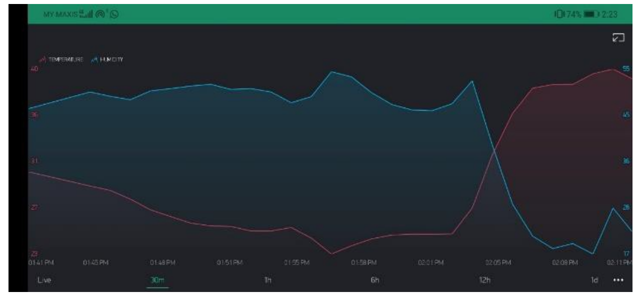



Figure 11: Result at the living room after the air-condition turn ON.

Later at 2:04pm, going out to a sunny place and place the remote climate monitoring system there. We can see that the temperature reading rises up so fast with the humidity reading dropping fast. This is because of sunny day and no wind at that time.

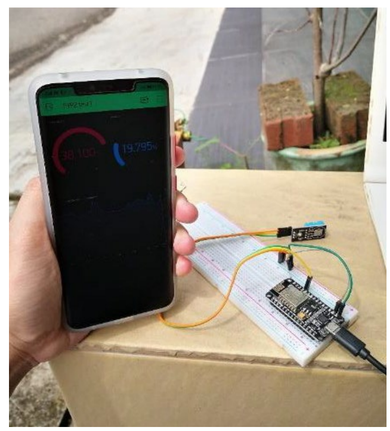


Figure 12: The project at outdoors.


Figure 13: Result at outdoors.

From Figure 13 above, we can see the results at the outdoors with direct sunlight where the temperature is high that can reach about 40°C and humidity can drop until 17%.

We can see in Figure 13, at 02.12PM until 02.15PM the humidity reading had increased. This happened when I sprayed water near the sensor. The sensor measured the correct parameters of its surrounding environment. After that, the reading of humidity drop again to a low and constant.

Figure 14: Result from outside moving into the house.

As a result Figure 14, the reading of temperature dropped sharply and reading of humidity increased high when moving from outside into the house. This result happened because of the outside is hot and moving into the living room which is cool condition where the air-condition is still ON.

So, from the results that I get at the outside of my house is not good compared to in the house. This can be related to the place where I need to apply it which is at the farm. Every animals need to get an ideal temperature and humidity in order to stay healthy and live longer. Ideal temperature that is suitable for animals is about the range 23°C - 37°C, and the ideal humidity suitable for animals is in the range of 30% - 60%. Although the air pressure is not measured in this project, ideal condition for animals is in the range of 980mb – 1050mb. This is depends on what types of animals. The data I give is more suitable for the cows and goats. The livestock are not suitable enough to stay long time under the sunny day, this will affects the livestock become weak and will get sick.

All the result obtained had met the objective to provide remote climate monitoring system. It will enable the farmer to track the surrounding environment at the farm wherever they are.

## 5.0 CONCLUSION

To sum up, the aim of the project was to develop a prototype of remote climate monitoring system. It is vital in helping farmers to get the real-time data at the farms. As it can manage to minimize the workers energy, increasing the number of production and ensure the temperature and humidity is suitable for livestock at the farm. Using the ESP8266 as the controller of the system can removes the difficulty of programming.

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