Development of Rain Detector System Using ESP32 with Alarm and Blynk Application

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Abstract: This paper presents the development of rain detector with alarm and Blynk Application. This project is done by using the application of IoT concept which is widely use in Smart Home. The operation of this project is by detecting the incoming rain and give the alarm and mobile notification to users via Blynk application. It will help to users who always need to rush out to pick up their drying clothes at outside when the rain is suddenly coming. So, this project will help them by informing them through phone notification about the presence of rain. The main component that involved in this project is ESP32 Wifi Module and rainfall sensor that connected to the WiFi module acted as the input to this project. Finally, the result is obtained and show two different value range that differentiate or indicate the condition between 'NOT RAINING' and 'IT'S RAINING'.

Keywords: ESP32, Internet Of Things, Rain Detector System, Smart Home

1. Introduction

Smart Home technology is the most used among the people around the world and one of them is a smart rain detector. smart home is a convenient house setting in which appliances and devices may be managed remotely using a mobile or other networked device from anywhere with an internet connection. A smart home's devices are connected via the internet, allowing the user to handle features such as home security, temperature, lighting, and a home theatre from afar [1-3].

This project is developed based on Smart Home Technology and functioning to alert the user when the rain is about to pour down. Thus, designing and building a gadget that gives you a heads-up when it starts to rain, allowing you enough time to gather the sun-dried materials Also, because it can rain at any time without warning, clothing that are almost dry on a clothesline outside the home may get wet if we do not notice it is raining in time. The system will also ease us to check the weather and help us

to plan our outside activities for that day [4-8]. This project operates using Rain Detector Plate, LED, Buzzer and ESP32 Module. This system is automatically operated and when the Rain Detector Plate detects the raindrop the system alerts us. Rain detector plate is made from mica, which is a reactive metal, it will react when there are water droplets falling on it. This system is needed to help the user detect the rain and especially help them to secure their clothes on the cloth line. These systems apply the used of IoT which is Blynk Application which is one of the methods to get the notification in a few second. Mostly, this project is very suitable for smart home application because the user just needs to connect to the Wi-Fi to get know the latest information about the weather outside.

The advantage of this system is the user get to know the presence of the rain without need to go outside or check the Weather Forecast on the TV and this situation can save a lot of energy because the user does not need to open the TV and the user doesn't need to rush out to check whether their clothes is getting wet because they have been notified early about the presence of the rain. The objective of these project is Simulate Rain Detector with Alarm using Proteus Software. Design and develop a Rain Detector with Alarm using with Blynk Application Prototype and study the effectiveness of Rain Detector with Alarm using Blynk Application in detecting and giving information about presence of the rain.

2. Materials and Methods

2.1 Materials

ESP32 Module as shown in **Figure 1** is a microcontroller that used to control the project of the IoT Project. It uses Wi-Fi Module and Bluetooth that is integrated inside these of economic system microchip. It functioning to lower the communication stack overhead that main application processor process and can also be linked with another system as the Wi-Fi and Bluetooth provider through its SPI/SDIO or I2C/UART linking [9]. These Module can build-up into 520KB of RAM that is adequate for most projects.

Figure 1: ESP32 Module

Rainfall sensor basically is the sensor that is buildup to detect the presence of rain. This sensor is measuring the raindrop that is apply on the Mica plate that is a very sensitive to the water as shown in **Figure 2**. The usual sensor value for rainfall sensor is 1024. The Mica Plate then depresses or releases an electrical switch, and the rate of drying is typically controlled by controlling the ventilation reaching the stack. However, various electrical sensors that use tipping bucket or conductance type probes to monitor rainfall are also available [10-15].

Figure 2: Rainfall sensor

2.2 Block Diagram

Figure 3 shows the power source is connected to the ESP32 Module to turn it on and activate the rain sensor. The sensor will give information to ESP32 Module either there is rain or not. Then, the processor will pass the information to the outputs. If there is rain, the buzzer will produce sound and the red led will turn on. The serial monitor will show the value of sensor and decide either it is raining or not. It also will give an alert to the user by phone. The red led and buzzer will not function if there is no rain, but green led will take part during "no raining" situation. So, during no rain, green led will turn ON'.
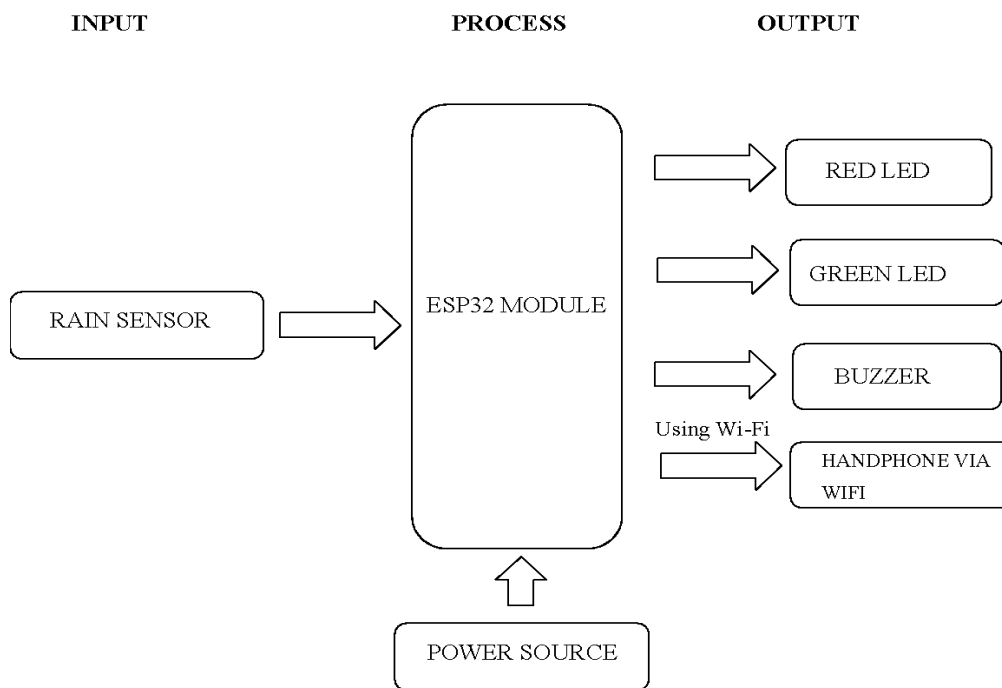

Figure 3: Block diagram of the project

2.3 Flowchart

Figure 4 above show the flowchart of these project. Rain sensor will be function as the input for the system. If the rain sensor detects any rain, the buzzer will operate with the red led on. Then, the serial monitor will show the value of sensor and decide either it is raining or not. If the decision is raining, user will get notification through their phone, which is an alert that saying, "it's raining". However, buzzer will not produce any sound and the green led will turns on if there is no rain at that moment. The serial monitor will show "not raining".
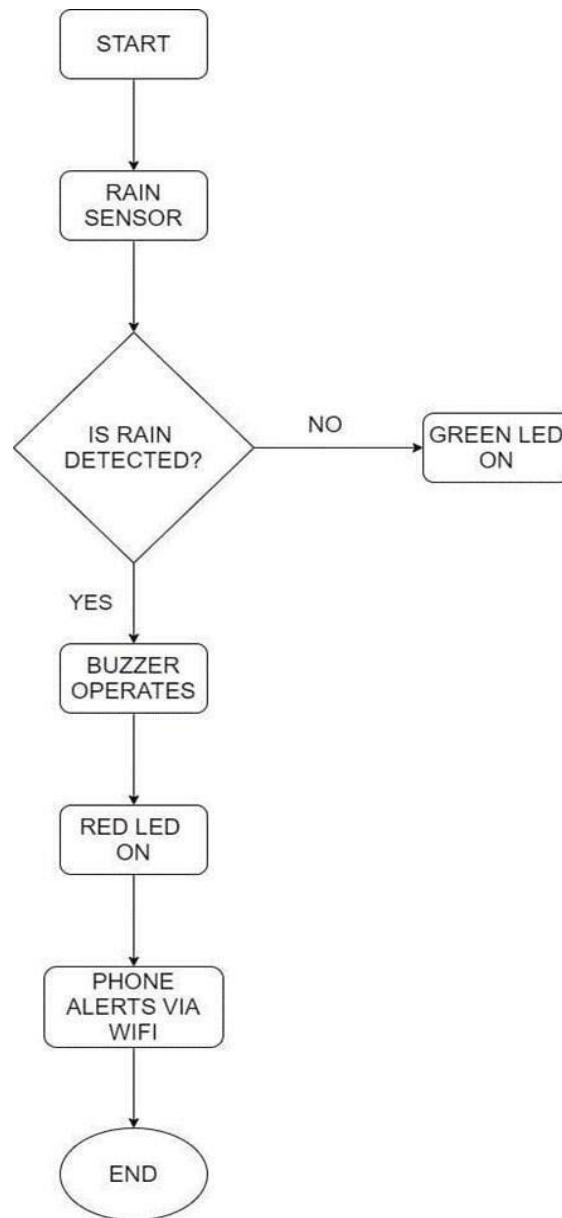
Figure 4: Flowchart of the project

3. Results and Discussion

3.1 Simulation Results

Figure 5 show that in the virtual simulation when we use "0" as the input in the rain sensor. It will present no rain situation. In this condition, only green led will turn ON. Virtual terminal then will show "NOT RAINING" statement. While red led and buzzer will remain silent and turn OFF up until we put "1" as the input in the rain sensor.

Figure 6 shows that when we use "1" as the input in the rain sensor. It will present raining situation. In this condition red led, and buzzer will turn ON. Buzzer will make noise as a warning to the user. Virtual terminal then will show "IT'S RAINING" statement and green led will turn OFF immediately.
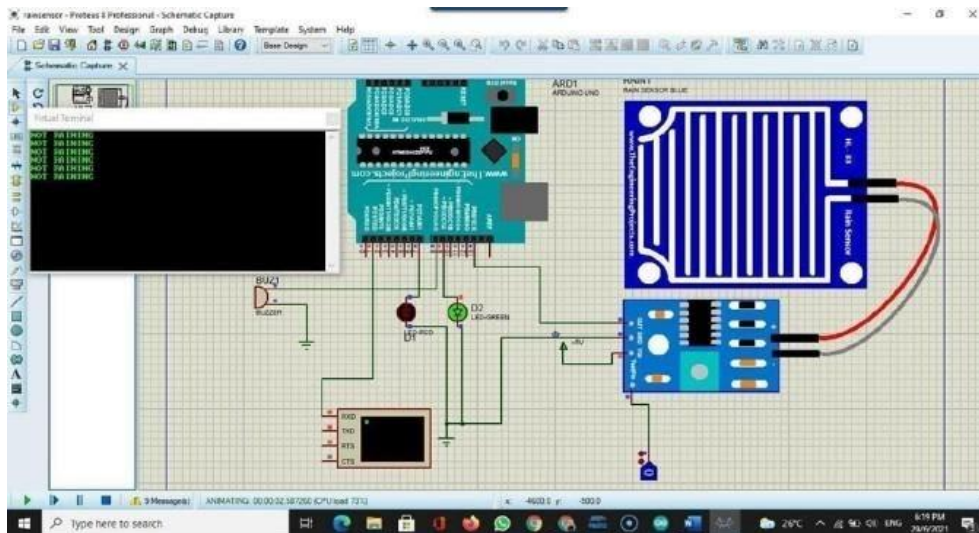
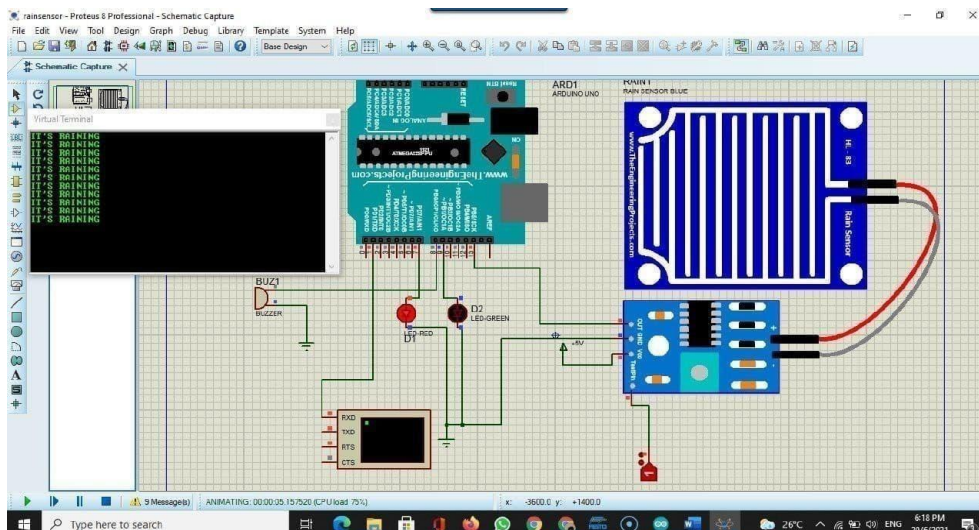**Figure 5: shown "NOT RAINING" situation result in virtual simulation**

**Figure 6: shown "IT'S RAINING" situation result in virtual simulation**

3.2 Prototype Results

3.2.1 Result when there is no rain

When there is no rain, the serial monitor on Arduino ide as shown in **Figure (7)(a)** will show values that more than 300. When rain sensor give value 300 and more, it means there is no rain, and serial monitor will write decision as "NOT RAINING". When there is no rain, only green led will turn ON and BLYNK application will not send any warning to the user as shown in **Figure (7)(b)**. Red led and buzzer will stay turn OFF up until the rain sensor gives serial monitor values less than 300.
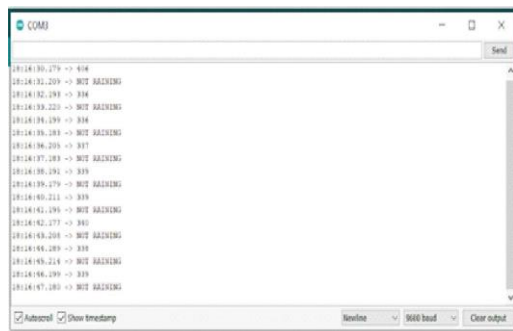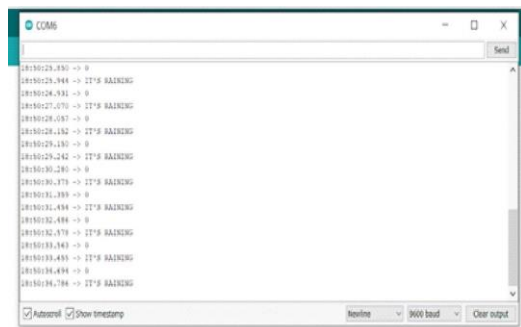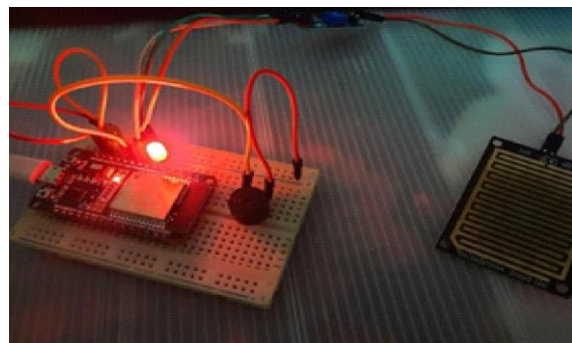
(a)
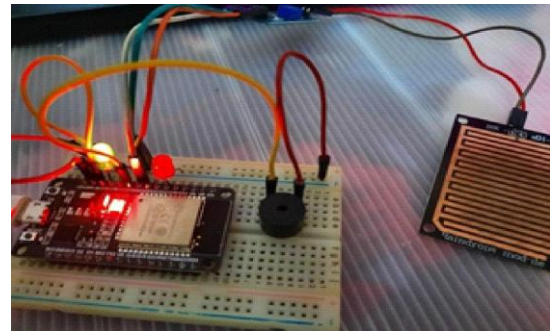
(b)

Figure 7: (a) shown the serial monitor values when there is no rain, (b) shown the result when there is no rain

3.2.2 Result when there is rain

When there is rain the serial monitor on Arduino ide in **Figure (8)(a)** will show values that less than 300 and serial monitor will write decision as "IT'S RAINING". When there is rain, only red led and buzzer will turn ON and BLYNK application will send warning to the user as shown in **Figure (8)(b)**. Buzzer will make a noise sound as a warning to the occupants in the house. User also will get notification on their phone saying that "IT'S RAINING". So that user can be alert and be able to take action as soon as possible. The buzzer will continue make noise until the whole system is turn OFF by the user, if not buzzer will make sound until rain stop pouring.

(a)

(b)

Figure 8: (a) shown the serial monitor values when there is rain, (b) shown the result when there is rain

Table 1 shows the serial monitor value and condition outside the house. **Figure 9** shown the notification receive by the user when there is rain.

Table 1: Serial monitor value and condition

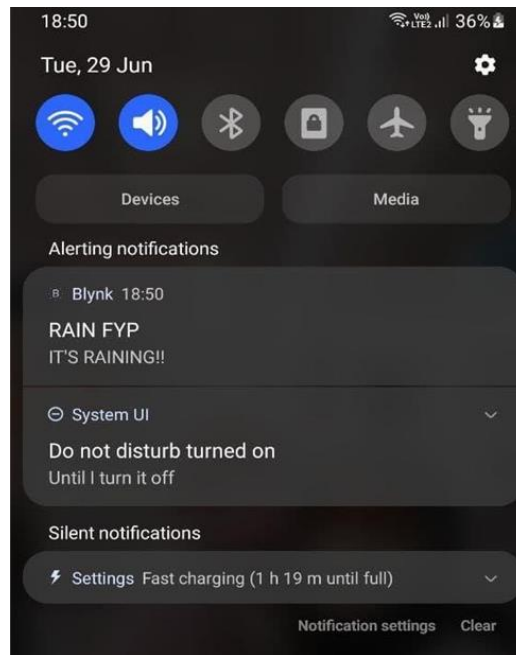| Item	Parameter Name	Serial Monitor Value	Condition
1	Data Point 1	> 300	"NOT RAINING"
2	Data Point 2	< 300	"IT'S RAINING"

Figure 9: Notification receive by the user when there is rain

4. Conclusion

A rain sensor with an alarm system to detect rainfall has been designed and constructed for this project. The aim and objectives for this project has been met where we successfully did the simulation and used Blynk for the prototype. This project is user-friendly because they can get a notification from Blynk when the sensor detects rain fall if their phone is connected to Wi-Fi. It can be used for many purposes such as when hanging clothes at the yard or for the businesses that need to dry their product under the sun and avoid the rain. The result shows how our project works with the help of all the components and software. The green led, red led, and buzzer will function according to the coding that has been programmed in the Arduino. However, the buzzer will keep producing sound until the sky is clear so, the future project should redesign a rain sensor with an alarm that can be automatically off and with a better power source such as solar energy.

Acknowledgement

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