IOT Based Temperature Sensing through TinkerCad Simulation Platform

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Abstract: IOT based temperature sensing is reported through this paper. It paper shows a simulation based approach for temperature monitoring and IOT based analysis of the same. The softwares used for simulation are TinkerCad . Thingspeak Cloud platform and Fritzing for Circuit analysis.The circuit was simulated on TinkerCad in which we have used TMP36 temperature sensor ,Arduino UNO and ESP8266 wifi module.Wifi Module gives an API call to the thingspeak cloud for data transmission.Final results are plotted on the thingspeak only. This Simulation was tested for different conditions and graphs were plotted.

Keywords - Arduino, IoT, ThingSpeak, Fritzing, Tinkercad

I. INTRODUCTION

Temperature sensing is very important when it comes to industrial purpose or any experimental analysis. For the purpose of temperature sensing we require sensors.Whenever a sensor displays some data physical presence of a person is required to read the data.But this problem can be solved by the use of IOT.This technology allows us to send and recieve data in realtime. In this project we are using TMP36 sensor for transmitting data to Thingspeak by using Arduino and ESP8266. By this method, we can monitor our data over the internet using ThingSpeak cloud platform. And we can view the recorded data and graph over time on Thingspeak website.[1]

Internet Of Things (IoT) based Sensors to Cloud system using ESP8266 and Arduino Due by Nerella Ome, et.al The system proposed in this paper is a solution for monitoring the weather conditions and make the data avaible world wide. [3]. Thingspeak Based Sensing and Monitoring System for IoT with matlab Analysis by Sharmad Pasha The project uses Thingspeak cloud platform which is a free API for monitoring and analysis of various data. [4]. Temperature and Humidity Monitoring and Control System with Thingspeak by Khin Kyawt Kyawt Khaing , et.al The system proposed in this paper is to monitor and pass the real-time values of the temperatureand humidity of a particular place from any location via internet. [5]. Temperature and Humidity monitor with ESP8266 by Deeksha Srivastava, et.al The proposed system provide implementation in details of IoT based ESP8266to monitor environmental parameters.[6]. Measurement o Temperature and Humidity by using Arduino Tool and DHT11 by Jie Xiao, Jing Tao , et.al The project is about measuring the temperature and humidity by using Arduino tool and DHT11, which will be beneficial for balancing the environment to increase productivity. [7].In all these papers IOT based work has been done with a hardware assembly.

An effort has been done to develop a IOT based temperature sensing system using TinkerCad software for simulation.

II. METHODOLOGY/EXPERIMENTAL

A) Components:

1.) Arduino Board

Arduino UNO is a board which uses ATMEGA328P microcontroller and is developed by Arduino.cc.circuits.It has a total 20 pins with the Arduino, via a type B USB cable [8].The same has been depicted in the Fig.1.

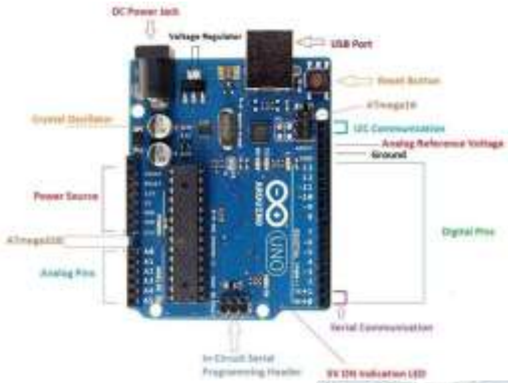


Fig.1: Arduino Board

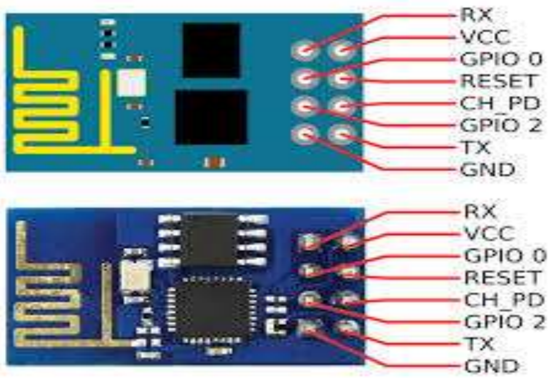


Fig.2:ESP8266 Module

2.) WIFI Module:

The ESP8266 is a very convenient and low cost device to provide Internet connectivity to your projects. The module acts as an access point, you can create an access point and as a station (can connect to a Wi-Fi network, so it can be received by the data, and then upload it to the Internet, so the internet is very simple. It can be downloaded from the web, with the help of an API, so that the project can gain access to all of the information that's available on the web, so it would make sense. Another interesting feature of this module is that it can be programmed using the Arduino IDE, which makes it much more user-friendly [9]

3.) Temperature Sensor(TMP36):

When the temperature changes there is a voltage change in the base emitter of the transistor now this change is amplified which is directly proportional to the temperature and that is how this sensor works.[10]

Fig.3: Temperature Sensor

B) Flowchart (Arduino code):

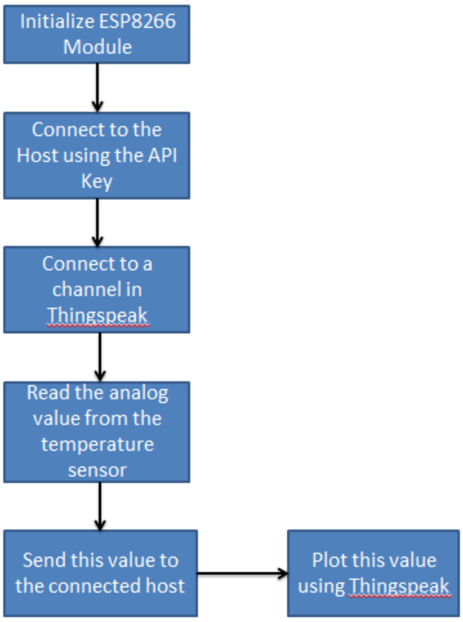


Fig.4: Flowchart of Program

C) Circuit Diagram:

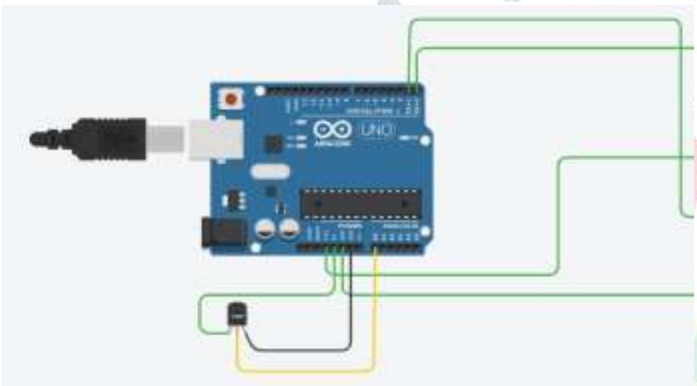


Fig.5: Circuit from Tinkercad

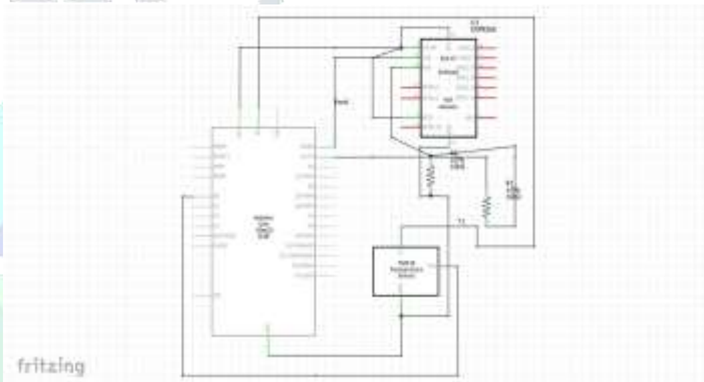


Fig.6: Schematic Circuit Diagram (Fritzing)

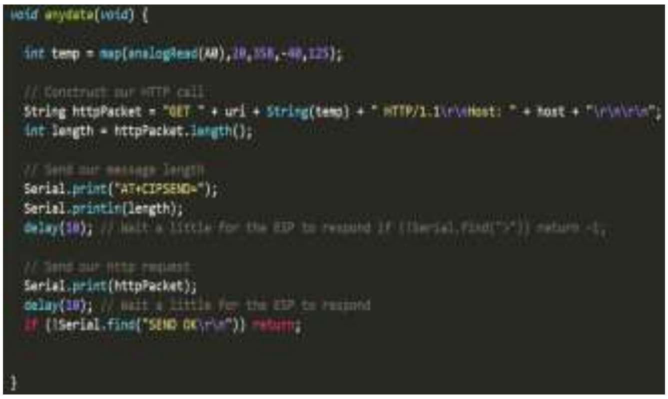
1. The TX pin of wifi module to the RX of Arduino and RX of the module to TX of arduino.
2. The Vout of sensor to the A0 pin of Arduino.
3. GND of sensor is connected to GND of arduino and Vcc to +5v of arduino.
4. Fig.5 depicts all the connections explained above and that same circuit is used for simulation on TinkerCad.
5. Fig.6 depicts the Schematic of circuit diagram in Fig.5.

D) ArduinoCode:

A Function "setupESP8266" is declared in which initially the serial communication is established at a fixed baud rate and then this wifi module connects to Thingspeak by giving a API call using API key given earlier as depicted in Fig.7.

Another Function "anydata" is used to read the data from temperature sensor and to send it over the IOT as shown in Fig.8.

(Fig.7: Arduino Code P1)



(Fig.8: Arduino Code P2)

E) Simulation:

The simulation is done on TinkerCad software (web application). The testing range of temperature was decided to be from -22°C to 122°C.

- **Testing:**
  Testing is done by varying the temperature using TMP36 sensor.

Test Cases	Temperature Reading(°C)
Test case 1	63°C
Test case 2	100°C
Test case 3	39°C
Test case 4	-8°C
Test case 5	-22°C
Test case 6	87°C
Test case 7	122°C

III. Results and Discussion

All the graphs are plotted on Thingspeak platform.There was a delay of around 1-2 seconds after the temperature is sensed and till it is plotted on the graph. Temperature is varied manually with the help of simulation. The X-axis show the Time in minutes and the Y-axis shows the temperature reading in degrees Centigrade.

Fig.9: Plotted Graph of test case 1

Fig.10: Plotted Graph of test case 2

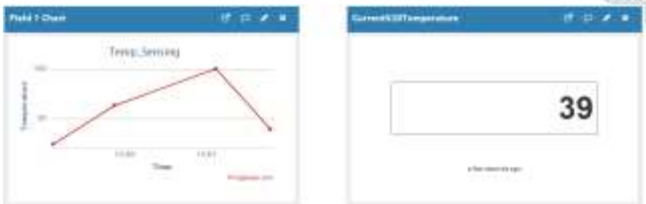


Fig.11: Plotted Graph of test case 3

Fig.12: Plotted Graph of test case 4

Fig.13: Plotted Graph of test case 5

Fig.14: Plotted Graph of test case 6

Fig.15: Plotted Graph of test case 7

IV. CONCLUSION

The decided range of testing was from -22°C to 122°C and there were 7 different test cases for which the simulation was tested , for which appropriate and satisfactory results were obtained.

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