Webology (ISSN: 1735-188X)
Volume 15, Number 01, 2018

Cloud-Connected Iot Temperature Control System With Lm35 Sensor

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Received: 04/01/2018 Accepted: 06/02/2018 Published: 08/03/2018

Abstract:
Internet of Things is going to perform a vital role in appliances, as an exemplification healthcare system, smart cities, smart home, Industrial internet etc. In this paper, controlling the fan speed based on room temperature has been presented. Temperature of the room can be perceived by using LM35 temperature sensor. An Arduino board is operated to regulate all the functions. Temperature of a particular room can be found from anywhere using LM35 sensor and hosting on cloud. The developed approach is benefited in terms of preventing the energy wastage while it's not adequate temperature to use a fan and assist the disabled to switch on or off fan automatically. Experimental evaluation shows that the proposed approach is accurate in terms of processing time, less circuit size. External clock is also not required and programming an Arduino is easy when compared to 8051 microprocessors.

Keywords: Smart Appliances, Cloud connected IoT, Arduino Uno Board, LM35 Sensor.

1.INTRODUCTION

Internet of Things (IoT) is a network of devices, appliances, other embedded objects, software, sensors, actuators and network connections that enable these devices to connect and exchange data. Each item looks unique with its embedded computer program but is capable of interacting with each other.
IoT enables objects to be perceived or regulated distantly throughout prevailing network framework, originating prospects for immediate association into automated procedure, and leading to enhanced performance, precision and financial advantage furthermore diminishing mankind adjudication. Whenever IoT is exaggerated by sensors and actuators, automation happens an example of the most common phase of internet-based systems, which include technicalities such as intelligent grids, smart roads, smart power plants, smart garbage systems, smart homes, smart hospitals, smart cities etc.,
Things or Objects accumulate important data by applying diverse engineering methodologies and automatically stream data among diverse appliances.
The first and main part of the IoT app are sensors and electronic devices that can associate to objects and capture data on them. The sensor obtains data where that has to be transformed into a comprehensible structure and connect that sensor device using a specific convention that configurate in the second layer and refine the particulars i.e., limit facts to obtain wise choices. Network

communication; associate the things with a wired or wireless connection. These connections are modified founded on framework and conditions. This layer can be referred as a security layer or an abbreviated layer of application or data extraction where we can add protection to our artifact. Location of this layer should be modified contingent on the subject and applying shortcut to appliances. In the meantime, we will continue our thinking, use this data to make wise decisions or for the purpose of presenting the summarized knowledge. This is a significant layer that pictorially represents the product vision. This layer also called as presentation layer that considers the prerequisites that applies machine learning algorithms to extract knowledge and demonstrates the results and also transmits indications and signals to the sensors.

There exist numerous technicalities incorporated with the Internet of Things that help in its effectiveness. IoT technology has the following features that generate estimate and collaborate endeavors of mankind; they also develop IoT network techniques through collaboration and being integral of a complete framework.

IoT emerges with an association of algorithms and calculations, hardware, software etc., that produce intelligent and smart system. Contexture intelligence in IoT develops its abilities that enable objects to react knowledgeably to a specific context and assist them in performing certain function. Despite all the noise of smart technology, knowledge in IoT only works as a process of correlation among appliances, while user-device collaboration is accomplished through conventional introductory methods and a user-friendly communication. Communication deputes the Internet of Things by integrating regular things. The interaction of these things is important because the elementary communication of the material level provides to the integrated percipience of the IoT reticulation. Facilitates network accessibility and consistency. By this association, new opportunities in the online commodity market can be established by interlinking of smart devices and appliances.

The main function of the Internet of Things is to accumulate observations from the surroundings dynamically. This is accomplished by the tractable amendments that position near the appliances. The condition of these appliances varies widely. In addition to the situation and condition of the device, the enormous number of devices also varies according to identity, location and period.

Numerous appliances that require to be operated and connected to each other will be much larger than the things currently connected to the Internet. Administration of the data originated from these things and their description for implementation’s sake turns very sensitive.

Sensors play the most important role in the concept of Internet of Things. They observe or perceive from the surroundings and provoke the reports or indeed communicate with the environment. Sensory automation offers ways to produce skills that contemplate an actual consciousness of the substantial creation and its multitude. Sensory facts are merely the inclusion of a congener from the substantial creation and its multitude, but it can furnish an affluent comprehension of our labyrinthine universe.

Heterogeneity in the Internet of Things is another important factor. IoT devices are contingent on divergent hardware and networks that could communicate with auxiliary devices across diverse systems. IoT structures should assist communication between different networks. The essential design prerequisites for different objects and their locations in IoT are interoperability, modularity, scalabilities, extensibility etc.,

IoT devices are inherently susceptible to safeguard menace. It is important to protect the repositories, networks and the data that is transmitted between the networks by virtue of formulating an exemplification of security. Research work has been done to illustrate various applications of Internet of Things that has been presented in literature survey.

2.LITERATURE SURVEY

In day to day, there are various necessities of common man. Internet of Things will show up a vital function in appliances for instance healthcare system, smart cities, smart home, Industrial internet etc. In this paper, the methodology used to regulate the speed of the fan speed based on the warmth level

of the chamber. Temperature of the room can be perceived by using DHT11 sensor. If the temperature is low then fan rotates slowly and vice-versa. Temperature of a particular room can be found from anywhere using DHT11sensor and hosting on cloud. Various IoT based appliances developed by the researchers are illustrated in this literature survey. An efficient control system for efficient utilization of energy based on IoT have been developed by various researchers. A novel wireless and wired architecture have been developed and deployed in a cloud platform that uses MQTT network protocol [1]. A technology for appliances of IoT that based on LPWANs that can able to endure extended transmission interruptions. Falcon influences a runtime thermal forecast standard in addition receipts the ambient temperature into the contemplation to tune the rotation of the fan [10]. In explicit stages and weather conditions, quality of air in the homes is most important. It is possible due to the proper aeriation. A platform has been presented by numerous researchers that integrates the technologies of big data and data analytics for IoT appliances. Integral–derivative method has been established for Energy-Efficient at homes and also for the better utilization of power consumption [9]. Various Machine Learning, Internet of Things and Data Analytical Algorithms have been developed by the researchers in order to improve the efficiency and also get the accurate results in a faster way [3-8]. IoT can be merged with 5G technology to upsurge the wireless networking technology for monitoring with the sensors. There are various challenges to be noted while considering wireless technologies such as traditional batteries. This paper develops various methods related to energies for composite and wind harvesters. The studies investigated that the performance of these techniques outperforms various other techniques when considered different wind speeds [2]. To improve the information models of builds, various IoT techniques are used. The process demonstrated in this paper improves the integration and automation techniques and tools for integrating builds and IoT techniques [11]. Various techniques like Neural Network, Fuzzy Logics and Artificial Intelligence integrating with IoT have been discussed and adopted. The self-optimizing network is the most important parameter in this system [13].
Various techniques like Reinforcement Learning, Computational Intelligence, Artificial Intelligence, Deep Learning and its allied technologies are integrated to produce a product that can control the pollution. The machine which supplies the power and works like an inverter has been designed [12]. A microcontroller has been set to make the home as smarter, with an integrated framework and the controlled approach to monitoring the temperature [14]. A smart system has been designed for monitoring appliances such as light and fan. This has an energy management and automation. It uses and IR motion sensor and LDR sensor for smart tube [15]. A novel architecture for field programming has been proposed to vehicle monitoring by adopting IEEE1451.2 standard. The proposed IoT also uses the field programmable gate array to improve the efficiency and adaptability [16].

Literature study illustrated the work related to various appliances in the real world that uses Machine Learning, Neural Networks, Artificial Intelligence technologies along with IoT. The proposed work is applicable to regulate the speed of the fan based on the temperature of the chamber. Applications on controlling air conditioners and remote monitoring system using OneNet cloud service platform was also studied. In this paper the author proposes two algorithms along with the block diagrams for controlling fan speed and accessing temperature through cloud. The proposed algorithms and block diagrams are presented in the methodology section.

3. METHODOLOGY

The proposed approach is the automation that is employed to condense the ingesting of the power. A micro controller called arduino Uno board is employed to manage all the operations. In this paper, temperature of the chamber is being perceived using DHT11 sensor. This obtained temperature using the sensors can be utilized for regulating the speed of the fan. When the temperature is low the fan turns slightly and when the temperature is high the fan turns quickly. If the temperature is lower than 26 degrees centigrade then fan robotically off. If the temperature is equal to 26 degrees centigrade then fan revolves with 20% speed and if temperature is equal to 27 degrees centigrade then fan rotates

with 40% speed. If the temperature is equal to 28 degrees centigrade then fan rotates with 60% speed. If the temperature is 29 degrees centigrade then fan revolves with 80% speed and if the temperature is more than 29 degrees centigrade then fan rotates with 100% speed. Cloud technology is used to obtain the temperature of a specific chamber from anywhere. DHT11 sensor and a ESP8266 Wi-Fi module are utilized for implementation of the proposed system framework.
In this paper, the author proposes an algorithm for controlling the fan speed and accessing the temperature using cloud. This algorithm is used along the hardware requirements that are connected as per the block diagram to yield the results.
This design is contingent on software as well as hardware. The hardware specifications are represented as below.

3.1 Arduino Uno Board:

Arduino is a freely accessible platform that consists of both a systematic circuit board (commonly called as a microcontroller) and a fraction of software or an Integrated Development Environment functioning to formulate and upload the written code onto the board.
In contrast with many former standard programmable circuit boards, Arduino does not require a segregate fragment of hardware to load the developed code onto the board. With the help of USB cable, the code can be directly dumped onto the board. Furthermore, Arduino IDE exercises a reduced version of C ++, producing it simpler to program. Ultimately, Arduino offers a conventional form which contains the packages for providing the microcontroller functionalities.
Arduino is a microcontroller-based board for ATmega8 that contain 16 MHz ceramic resonator, 6 analog input, 14 digital input/ output pins in which 6 available for PWM output, an USB power jack, reset button and ICSP. It is a tiny controller that just power it with an AC-to-DC adapter or attach it to a computer with an USB cable to get started.

The Uno is different from all previous boards in that it does not have a FIDI USB-to-serial driver chip. Rather its characteristics the Atmega16U2 (Atmega8U2 up to version R2) configured as an USB-to-serial converter. The Uno 2 board update has the subsequent advanced characteristics:

- ATmega 16U2 supplant the 8U2.
- Stronger RESET circuit.
- pinout: added SDA and SCL pins adjacent to the AREF pin two other new pins located next to the RESET pin, IOREF allows the shields to match the given voltage from the board. Subsequently, the shields will be consociated to both AVR, 5v and Arduino Due 33v. The second is an offline PIN conserved for impending objectives.

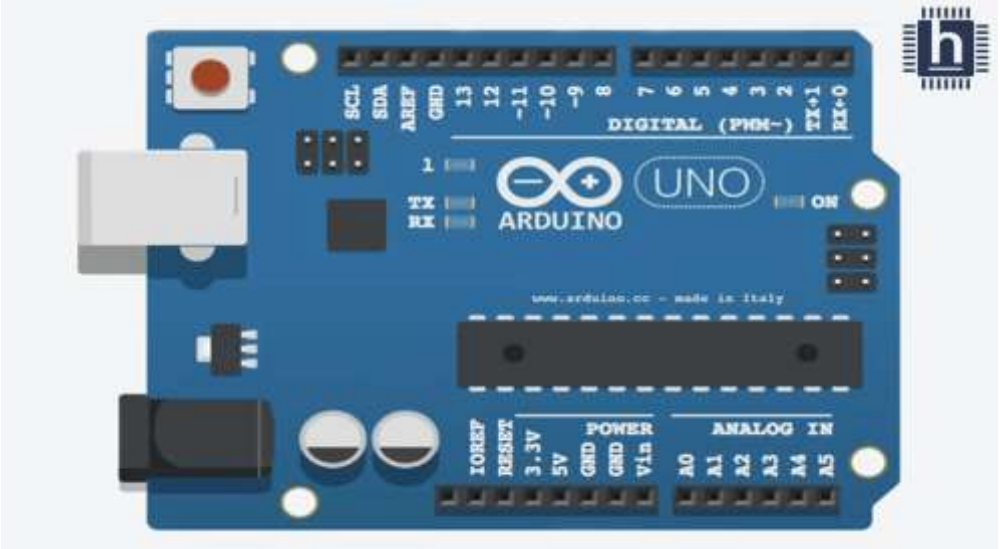

Fig 1 Arduino Uno Board

Fig 1 shows an arduino uno board. It contains 6 analog input pins, 14 digital input /output pins, a reset button, a header, an USB connection, a power jack.

Table 1: Specifications of Arduino

Input Voltage(recommended)	7-12V
Input Voltage(limits)	6-20V
Operating Voltage	5V
Analog I/O Pins	6
Digital I/O Pins	14(of which 6 provide PWM output)
DC Current for 3.3V Pin	50mA
DC Current per I/O Pin	40mA
Microcontroller	ATmega328
SRAM	2KB(ATmega328)
Flash Memory	32KB(ATmega328) of which 0.5KB used by bootloader
EEPROM	1KB(ATmega328)
Parameters for Arduino Uno	Enumeration
Weight	25g
Clock Speed	16MHz
Width	53.4 mm
Length	68.6 mm

Table 1 contains all the specifications that are required by the arduino uno board.

3.2 ESP8266 WI-FI MODULE:

The ESP8266 module is inexpensive and presents pre-configured with the AT command firm set firmware, that could merely connect this to the Arduino device and get more WiFi power as the WiFi Shield presents. This module has on-board formulation capabilities and reposition repertoire that permit it to be combined with sensors and diverse applications by means of its GPIOs.

The AT firmware is consistent with Arduino IDE, so this microprogram will be used in this instructive. Connect ESP8266 according to the circuit.

- GPIO0 and GPIO2 are general contemplate digital ports.
- VCC shall be associated to the 3.3V power supply.
- Rx: Goes to Arduino pin0 (But necessities a voltage regulating).
- Tx: Goes to Arduino pin1.
- RST: Reset. Keep it on high (3.3V) for regular functioning. Put it on 0V to readjust the chip.
- CH_PD: Chip enable. Maintain it on high (3.3V) for standard process.
- GND is ground.

Fig. 2: ESP8266 Wi-Fi Module

The Fig. 2 shows a ESP8266 Wi-Fi module which functions as a Wi-Fi shield for the project to place the sensed temperature in the cloud.

3.3 DHT11 SENSOR:

DHT11 is a basic, inexpensive digital sensor and moisture sensor. It uses a capacitive humidity sensor and a thermistor to determine ambient air and dumps a digital pin-in-data signal (analog input pins not required).
Easy to employ, but necessitates vigilant time to hold data. The only real case with this sensor is that new data can be retrieved from it once in every 2 seconds, so if you are using Arduino library, sensory reading can take up to 2 seconds.
This sensor contains three pins. One is used for connecting the voltage, second one is for data and the third pin is for GND.

Features:

- 3 to 5V power and I/O
- Good for 0-50°C temperature readings ±2°C accuracy
- Good for 20-80% humidity readings with 5% accuracy
- 2.5mA max current use during transformation (while requesting data)
- Low cost
- No more than 1 Hz sampling rate (once every second)

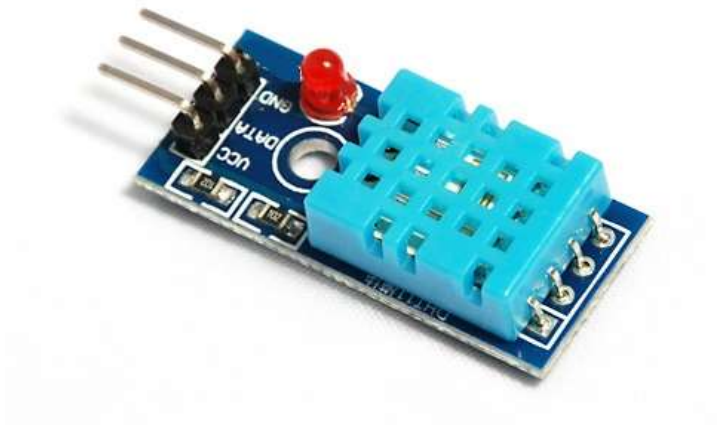

Fig. 3: DHT11 Sensor

The Fig. 3 shows a DHT11 sensor that is used to sense the environmental temperature. It contains a built-in resistor.

3.4 LIQUID CRYSTAL DISPLAY (LCD):

Liquid Crystal Display is an electronic display module and offers a wide range of applications. The 16x2 LCD display is a basic module and is widely used in various devices and circuits. These modules are selected over seven segment and more LED segment segments. Reasons for LCDs to be economically organized; they have no limit to display special and even custom characters (as opposed to seven segments), animations and more.

16 characters in a line are represented in 16x2 LCD and there are 2 such lines. LCD has Data register and Command register. The character is presented on an array of 5x7 pixels on the LCD screen.

LCD gives the instructions to the command register, where it stores those instructions. There are various types of commands that do a specific task or function. Some of those functions are clear

screen, control display, set the cursor position, launching etc., LCD displays the ASCII value of each character. LCD extracts this data from the data register, where the data register stores all the data.

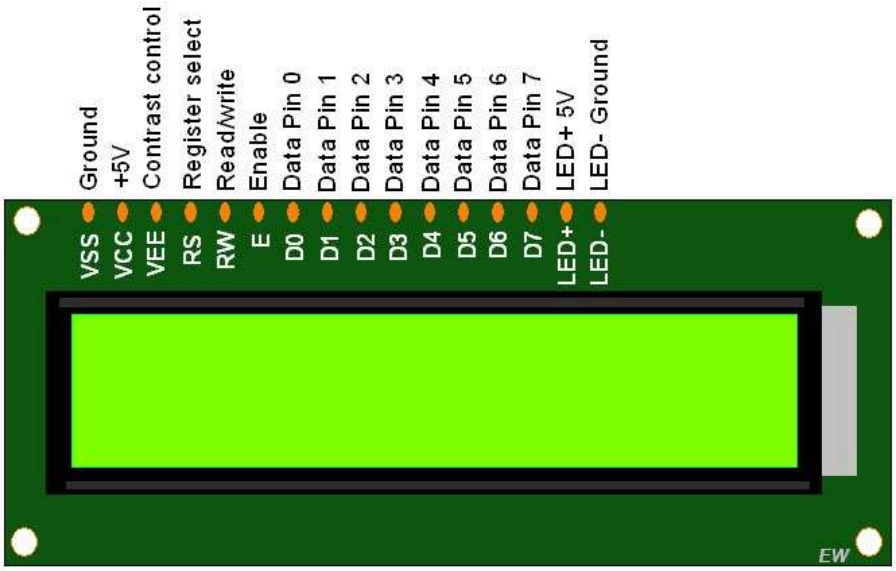

Fig. 4: LCD Screen

The Fig. 4 shows a LCD screen which is a basic module for displaying the output. In 16X2 LCD screen, a maximum of 2 lines with 16 characters each can be displayed. The table 2 contains all the specifications that are required by the arduino uno board.

Table 2: Specification of LCD Screen

Pin No	Name	Function
1	Ground	Ground (0 v)
2	V_{cc}	Supply Voltage: 5V
3	V_{EE}	Contrast adjustment: through a variable resistor
4	Register Select	Selects data register when high and command register when low
5	Read/Write	High to read from the register; Low to write to the register
6	Enable	Sends data to data pins when a high to low pulse is provided
7	DB0	8-bit data pins
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	Led+	Backlight V_{cc} (5V)

3.5 AN ELECTRICAL OUTLET:

An electrical outlet is an electrical device that supplies electrical energy to an electrical load. Transformation of one type of electricity into another is one of the main functions of a power supply. Either 9V dc power is used, or straightaway power supplied circuit is connected to the computer. Supply electricity is a separate, independent system while others are developed into larger machines and their own loads.

3.6 CONNECTING WIRES:

Wires are used to carry loads of equipment or communications or electrical signals. Wire is made by depicting a metal on the hole of the draw plate.
Software requirements such as Arduino Ide and Thing Speak are represented as follows:

3.7 ARDUINO IDE:

Uploading Code and Writing code is convenient by using Open-source Arduino Software IDE. It can able to execute on various types of software such as Linux, Mac OS and Windows. Java programming language is used to develop the environment, that could be operated with every Arduino board. Arduino development area links to Arduino hardware to upload programs, which has text console, text message area, for writing code text editor, toolbar with standard function keys. Sketches are the software documented using Arduino, that has. ino file extension.

3.8 THINGSPEAK:

An open-source Internet of Things application is Thing Speak. Its API is used to access and store data on objects over the Local Network or Internet using the HTTP protocol. Thing Speak has comprehensive assist from the MATLAB software from Math Works, which enables Thing Speak users to visualize the data using Matlab without having to procure a Matlab license from Math works. Thing Speak allows the formation of applications to track the location, social networking with status updates and sensor applications.

3.9 PROCESS MODEL:

In this section the system configuration prior to circuit implementation has been designed. A tiny sophisticated controller called Arduino (ATmega8) has been utilized. It is built with many features such as shift registers, 16MHz clock, analog to digital converter.
DHT11 temperature sensor has been embedded in this system. This voltage is supplied to Arduino. The 16x2 LCD is adjusted for output demonstration (i.e., ambient DHT11 temperature) per centigrade unit. In accordance to the system, it operates the analog signal into digital and generates a certain amount of electrical temperature. Simultaneously, it controls the fan speed based on room temperature.
When the temperature is high the fan turns quickly, and when the temperature is low the fan turns slightly. If the temperature is lower than 26 degrees centigrade then fan instinctively off. If the temperature equal to 26 degrees centigrade then fan revolves with 20% speed and if temperature is equal to 27 degrees centigrade then fan rotates with 40% speed. If the temperature is equal to 28 degrees centigrade then fan rotates with 60% speed. If the temperature is equal to 29 degrees centigrade then fan revolves with 80% speed and if the temperature is more than 29 degrees centigrade then fan rotates with 100% speed.
In addition to this we show the temperature of one place from another using a cloud. For that, DHT11 sensor and a ESP8266 Wi-Fi module are being used. The arduino uno board, DHT11 sensor and ESP8266 are connected to each other and display the output on the website called Thing Speak.
In this phase we design to observe and regulate the temperature of the developed model. We have used the DHT11 heat sensor to produce a small voltage consistent to the temperature throughout the IC.
Arduino (ATmega8) can be used as controller. The control unit receives this voltage. Electrical power is provided by Arogino Uno's 0 (A0) Analog hole. Analog input is read by Arduino Uno. A-to-D converter converts this analog voltage into a digital format. For processing 10 bits are being used. Then the multiplication of the digital data with 0.488 is done by the ATmega328 microcontroller. Furthermore, to convert into unit of Fahrenheit, 1.8 is being multiplied and 32 is being add to voltage level. As a result, the Arduino has to transmit the data to be displayed on a 16x2 LCD by transmitting via digital port (2,3,4,5).
As shown in fig. 3.5, 16x2 LCD is linked to microcontroller. LCD exhibits temperature in Celsius. Enable pin is connected to pin 11 and RS pin is connected to pin 12 through Arduino communication.

For adjusting the brightness of LCD screen, pin 3 has to be set. Pin 2 is used for connecting to V_{cc} and Pin 1 is connected to ground. Simultaneously Arduino transmits control bit 1 or 0 on the digital port 6. This bit can be utilized for regulatory purpose. For bit 1 Arduino transmits 9V and bit 0 transmits 0V toward the result. This sensed temperature is used for controlling the fan speed. If the temperature is high then fan revolves rapidly and if temperature is low then fan revolves gently. If the temperature is lower than 26 degrees centigrade then fan instinctively off. If the temperature is equal to 26 degrees centigrade then fan rotates with 20% speed and if temperature is equal to 27 degrees centigrade then fan rotates with 40% speed. If the temperature is equal to 28 degrees centigrade then fan rotates with 60% speed. If the temperature is 29 degrees centigrade then fan turns with 80% speed and if the temperature is more than 29 degrees centigrade then fan rotates with 100% speed. Thus, a fan speed can be automatically controlled with the help of the IoT domain.

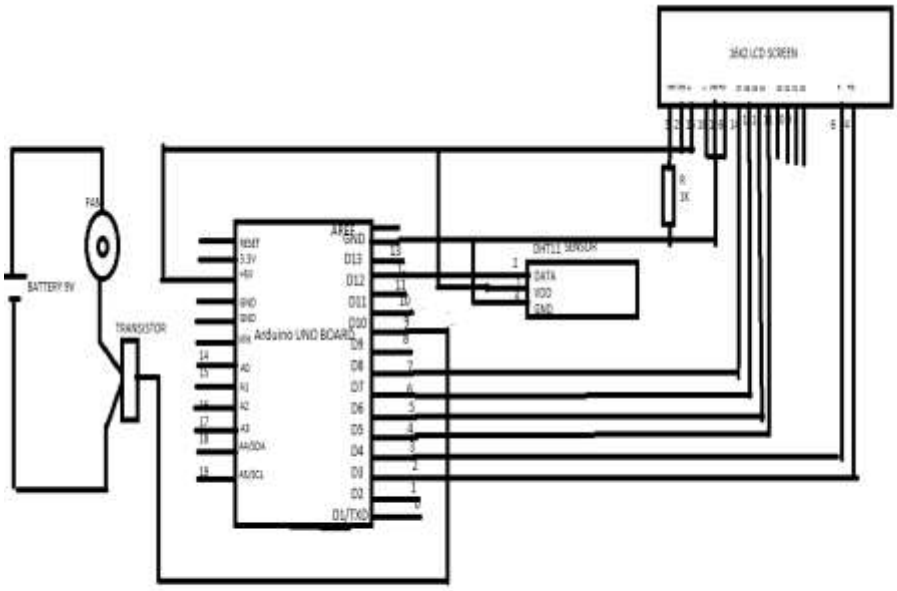

Fig. 5: Block Diagram for controlling fan speed

Fig. 5 shows the block diagram for controlling fan speed based on room temperature. The fan, DHT11 sensor, transistor, resistor, 16X2 LCD screen and battery are connected accordingly.

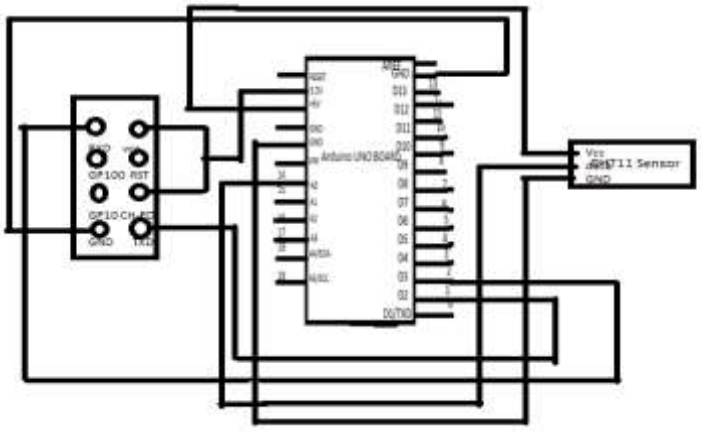

Fig. 6: Block diagram for displaying temperature using cloud

Fig. 6 shows the block diagram for displaying the temperature using cloud. For displaying the temperature using the cloud technology, the Arduino Uno board is interfaced with the DHT11 sensor and ESP8266. For displaying the temperature of a particular place, we use a cloud website called Thing Speak where the data is displayed in from of graphs.
To load the program in Arduino board, Arduino IDE software is used for implementation purpose. The overall process flow for controlling the fan speed based on room temperature has been represented in fig. 7.

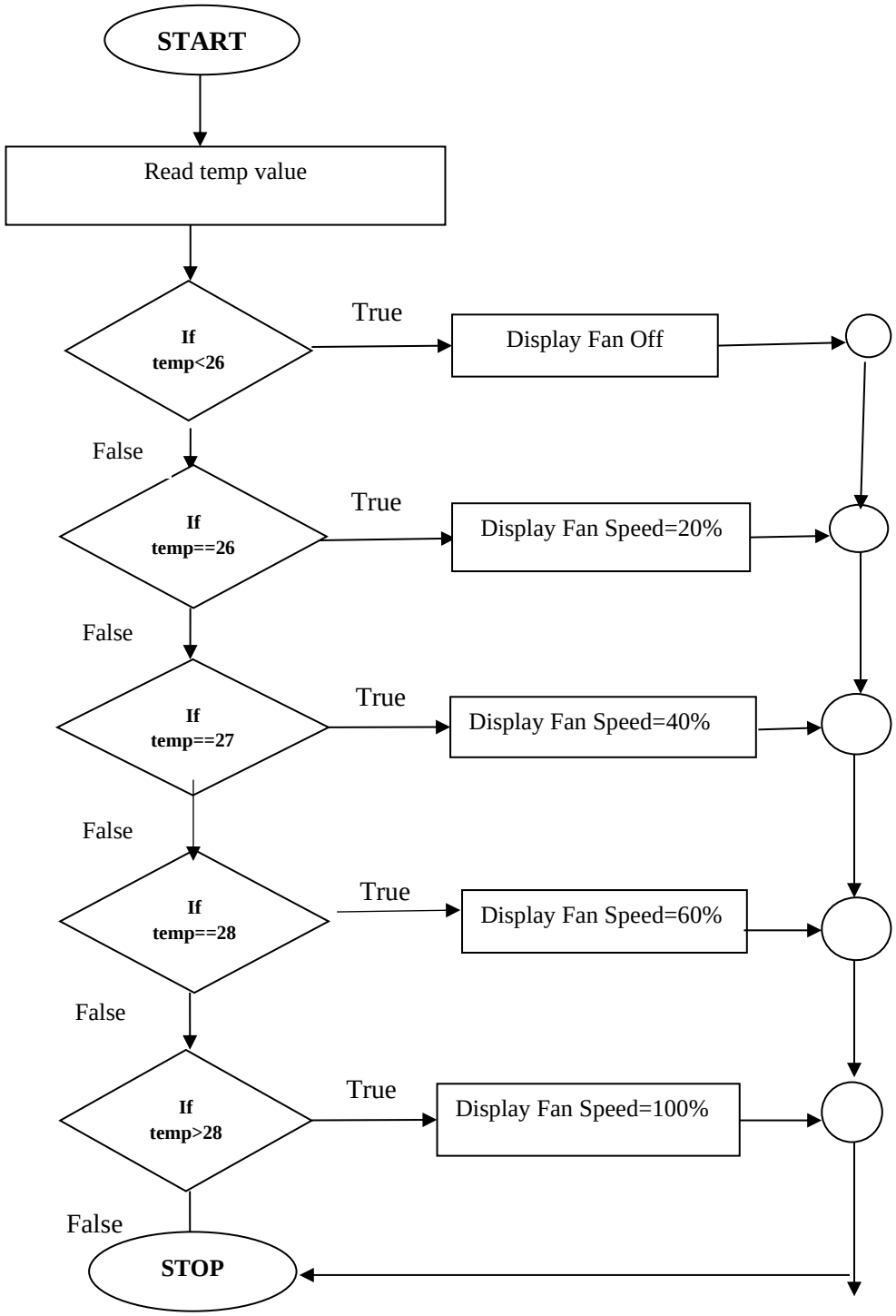

Fig. 7: Flow chart for controlling fan speed based on room temperature

3.10 ALGORITHM FOR CONTROLLING FAN SPEED BASED ON ROOM TEMPERATURE:

Input:
i) power supply:- 9v battery
ii) temperature:- sensed value

Desired output:
LCD will display the temperature along with the speed of the fan.

Method:
Pwm<- 9
Start Setup ()
analog Write (0, 255)
end Setup ()
start loop ()
temp<-DHT. temperature
if(temp<25)
analog Write (9,0)
speed=20%
else if(temp==26)
analog Write (pwm,51)
speed=40%
else if(temp==27)
analog Write(pwm,102)
speed=60%
else if(temp==28)
analog Write(pwm,153)
speed=80%
else
analog Write(pwm,255)
speed=100%
end loop ()

DESCRIPTION:
Read the room temperature by using a sensor called DHT11. If temperature is less than 20 then set pin to 9 and value to 0 in analog Write, display fan off, else if temperature is less than or equal to 25 then set pin to PWM and value to 51 in analog Write, display fan speed=25%, else if temperature is less than or equal to 30 then set pin to PWM and value to 102 in analog Write, display fan speed=40%, else if temperature is less than or equal to 35 then set to pin to PWM and value to 153 analog Write, display fan speed=60% else if temperature is less than or equal to 40 then set pin to PWM and value to 204 in analog Write and display fan speed=80%, else if set pin to PWM and value to 255 in analog Write and display fan speed=100%.

3.11 ALGORITHM FOR DISPLAYING TEMPERATURE THROUGH CLOUD:
Input:
i) SSID, password.
ii)temperature:- sensed value

Desired output:
The sensed temperature and humidity is displayed on the website called ThingSpeak.

Method:

```
Loop ()
humidity <- DHT. humidity;
temperature <- DHT. temperature;
cmd = "AT+CIPSTART=\"TCP\",\"";
cmd <- cmd + "184.106.153.149";
cmd <- cmd+ "\",80";
end loop ()
```

DESCRIPTION:
The SSID and password of the Wi-Fi are given as input. The humidity and temperature are sensed using DHT11 sensor. The sensed data will be sent to cloud by using the IP address of the ThingSpeak Website.
The proposed algorithm is experimented accordingly and represented as follows.

4. EXPERIMENTAL ANALYSIS AND RESULTS

Temperature observation and accessing the temperature through cloud and also controlling procedure is represented and also experimented. Accuracy of the experimented system has been calculated. The system should exhibit the present temperature and the fan speed with which it rotates based on the room temperature which is sensed by DHT11 sensor. In the considering operating zone, the performance of the system should be better. Troubleshooting of the problem should be done if the framework does not operate rightfully.
For the cloud part, we need to upload the code on the arduino uno board. If everything works properly the humidity and temperature that is sensed is seen in the output on the Thing Speak website.

4.1 TESTING PROCEDURE:
The microcontroller employed in this approach has a PWM module which is adapted to regulate fan speed by the change of duty cycle. In concordance with the values that are sensed by the sensor duty cycle will be changed automatically thus controlling fan speed. The Table 3 contains the duty cycles varying with the sensed temperature.

Table 3: Duty cycle and Temperature

S.no	Temperature in celsuis	Duty cycle%	Speed
1	<=20	0	0
2	<=25	20	20
3	<=30	40	40
4	<=35	60	60
5	<=40	80	80
6	<=45	100	100

The variation of the duty cycle according to the temperature is shown in Fig. 8. The fan rotates with full speed when duty cycle is 100% and varies accordingly due to temperature changes.

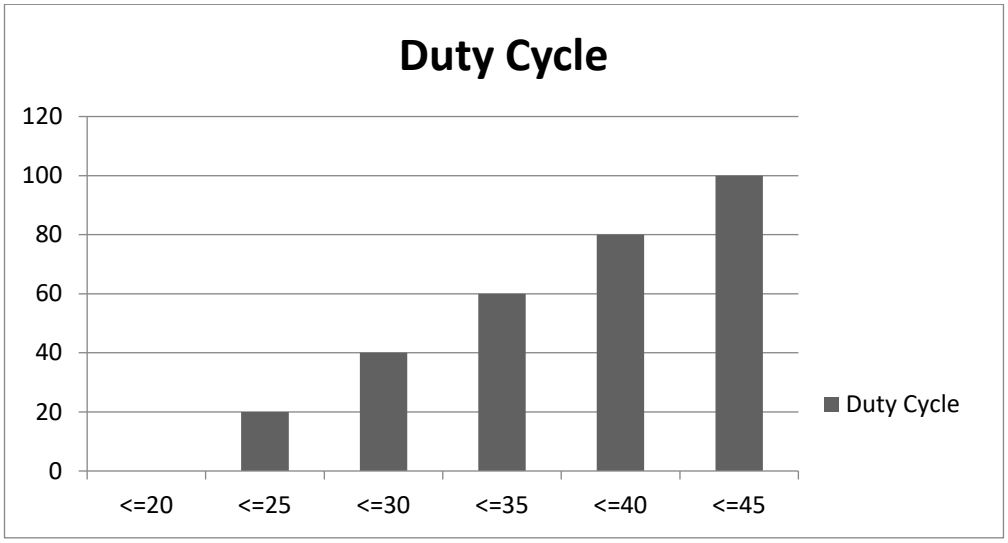

Fig. 8: Temperature vs. Duty Cycle

This project requires two inputs such as power supply and temperature.
Output: According to this paper, after building the circuit we test it. The output of the project is the temperature that is sensed and the speed of the fan which will vary in concordance with the room temperature.

Table 4: Sensed temperature and fan speed

S. No	Sensed temperature	Fan Speed
1	23	10%
2	22	10%
3	26	20%
4	27	20%
5	21	10%
6	20	10%

In Table 4, the proposed work has been tested and the values are recorded accordingly. The sensed temperature represents the value that is sensed by the sensor and the fan speed represents the speed of the fan that changes with respect to the sensed temperature.

First the circuit has been built as demonstrated in fig. 9 and power is supplied to Arduino. Accordingly, the entire test circuit is constructed. We now offer inputs to DHT11 as a change in ambient temperature. Temperature vicissitudes should be displayed on a 16x2 LCD screen. The system should run in compliance with the embedded program.
Overview of experimental approach
1) Connect the circuit as demonstrated in fig 9
2) Furnish power to the circuit.
3) Oscillate the temperature.
4) Functioning of LCD is observed.

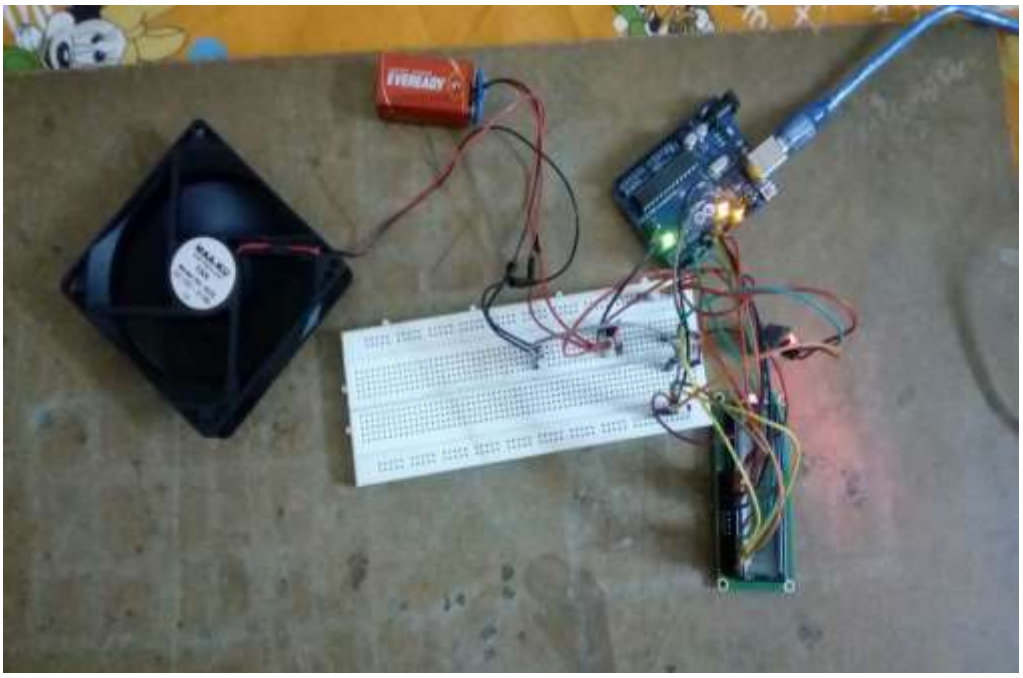

Fig. 9: Connections of controlling rotation of the fan in accordance with the temperature of the cabin

The Fig. 9 demonstrates the connections of controlling rotation of the fan in accordance with the temperature of the cabin.

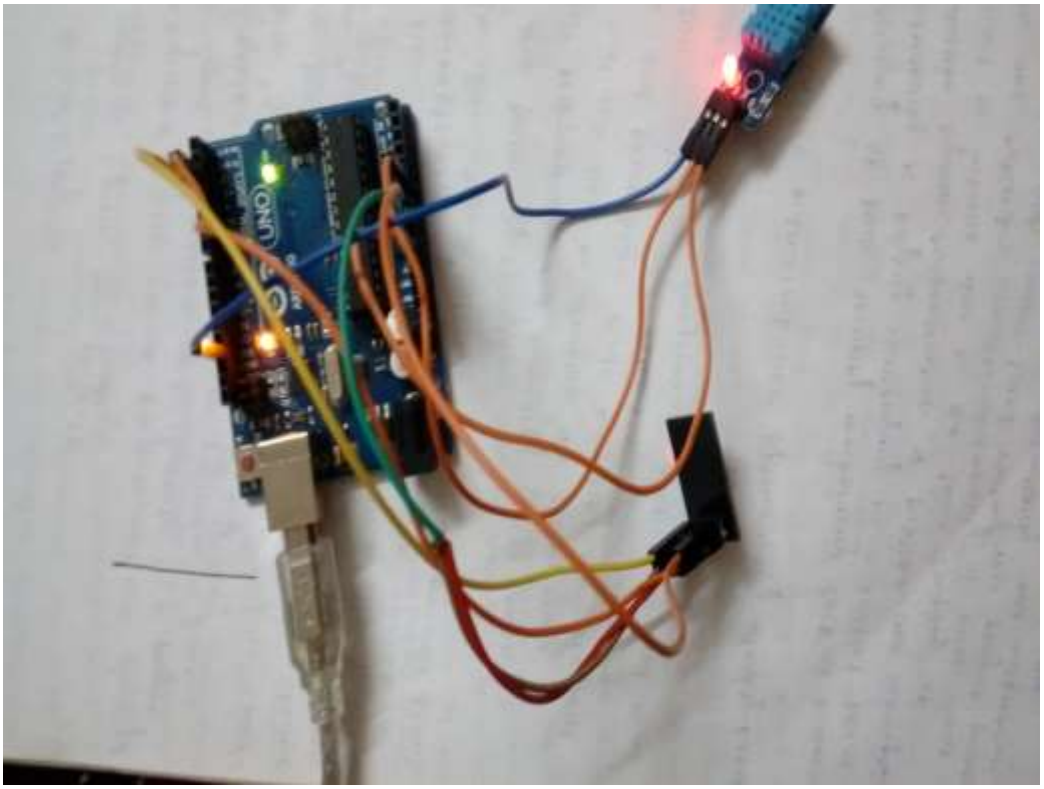

Fig. 10: Connections for displaying humidity and temperature using Cloud

The Fig. 10 shows the connections for displaying the humidity and temperature using the cloud technology.

4.2 ACTUAL OUTPUT:

Expected output is the speed of the fan rotation with the speed based on the room temperature. As a part of project name itself indicates controlling fan speed based on room temperature it controls accordingly. The other part of the project displays the temperature that is sensed in a particular room to somewhere else. So, the whole project contains two outputs. They are:

a) A LCD Screen that displays the room temperature and the speed of the fan.
b) The room temperature of a particular place is displayed in ThingSpeak. So, that it can be accessed from anywhere.

Fig. 11: LCD displaying temperature and fan speed

The Fig. 11 shows the sensed room temperature and the fan speed on the LCD screen with which it rotates.

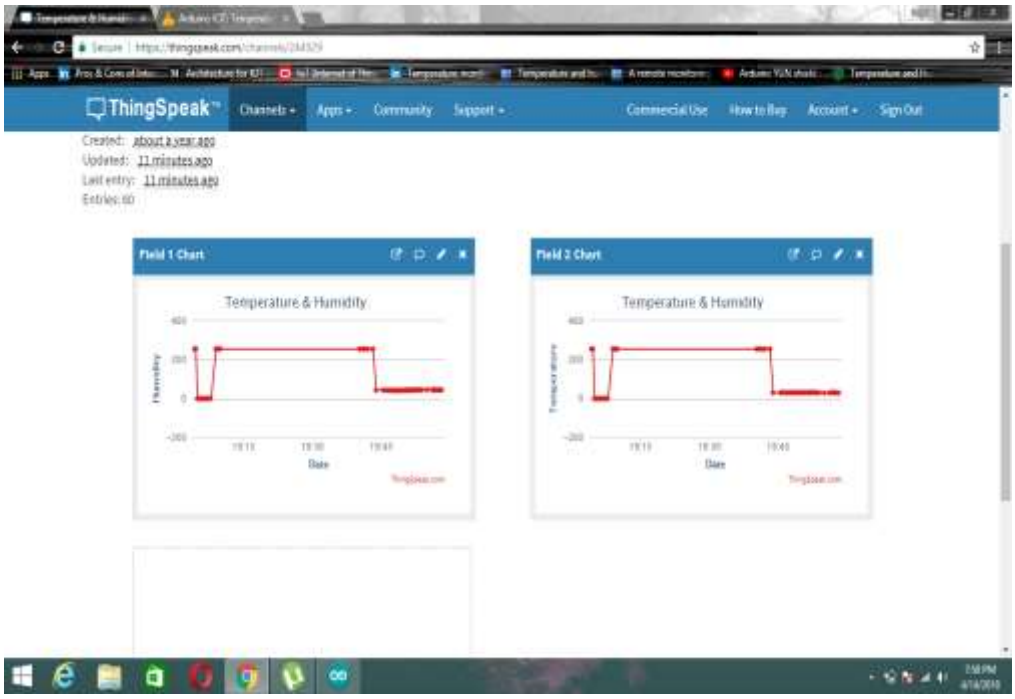

Fig. 13: Screenshot of the Humidity and Temperature display using Thing Speak

The Fig. 13 shows the sensed humidity and temperature that are sensed using the DHT11 sensor and send the data to Thing Speak. The output is shown in the graphical format.

5. CONCLUSION

In this paper, the designed automatic fan speed controller system with an Arduino board and display humidity and temperature using cloud has been described. The demonstration of the results was checked. As represented in the experimentation, fan rotates based on the levels of temperature. There are various appliances of this this model. It can be used at industry even to monitor remotely; at home to prevent consumption of energy unnecessarily. This automatic mechanism helps the disabled people for assisting. In a similar way, another appliance is a buzzer connected circuit that can be attached to

an instrument for instance a metallic container to save electricity by preventing overheating of the expedient. The circuit can be associated to an expedient whose temperature has to be measured at a specific boundary approximately an aquatic tank with a heater whose temperature container remain fixed to a specific value. The proposed method can be extended in various ways. The developed model can be expanded by associating a GSM Module to the developed model. By this the control room is automatically being reported with the form of message if it crosses the fixed temperature.

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