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# SRP-EFFICIENT MODIFIED GSM CLOUD BASED WEATHER MONITORING USING WIRELESS SENSOR NETWORKS

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**ABSTRACT**

Proposed system in this paper is for record of weather conditions at a identify place and monitor the same from anywhere. Weather monitoring plays major role since weather conditions are changing dynamically. The Mobile system based wireless Telecom technology behind this will enable us to interface the things in the Internet cloud. Meteorological parameters are measured by using an automated weather station using sensors without intervention of humans. The measured parameters can be stored in a built-in data logger or can be transmitted to a remote location via a communication link. The framework manages monitoring and controlling the natural conditions like temperature, humidity, light force and CO2 level with sensors and sends the data to the remote end to store and afterward plot the sensor information as graphical insights.

**Keywords:** *GSM,WSN, SRP*.

## 1. INTRODUCTION:

The weather conditions are required to be observed to keep up workplace with sufficient climate and active environment. Because of innovative development, the way toward perusing the natural parameters ended up less demanding contrasted with the previous days. The sensors are the scaled down electronic gadgets used to gauge the physical and natural parameters [2]. Sensors are less power consuming device and response is faster enable us to capture the data in live [4]. The framework proposed in this paper depicts the executed stream of the weather monitoring station. It incorporates the wireless communication technology both GSM & IEEE 802.11 b/g. The purpose for sending the information to the page is to keep up the weather states of a specific place can be known anyplace on the world.

The system consists of temperature sensor, Air sensor, Humidity Monitoring sensor and photosensitive resistor. These sensors can gauge the relating weather parameter. The proposed model is incorporating with a microcontroller to process every one of the tasks of the sensors and different peripherals. The wireless communication standard was picked in our system by investigating the necessities of the application that the weather conditions ought to be checked and refreshed all the time consistently. There are numerous neighborhood benchmarks for communication, yet they are all independent communication forms and totally confined communication.[6]

In our proposed model, we need to influence the weather state of a specific place to can be useful anyplace around the world. The other communication technologies like ZigBee, RF Link can make the communication almost in a similar scope of Wi-Fi however they can't communicate the data as they can just convey distributed. The World Wide Web (www) needs

one customer server design for communication. It customer should be associated with the server with its IP address which can be all around open. The model is furnished with specific sensor design that should goes about as customer to send the information to the web server. For building up an association between the sensor system and cloud, we utilized a Wi-Fi module as an additional communication interface controlled by the microcontroller. Interconnecting the Wi-Fi module with a cloud using GSM, it goes about as customer and sends the sensor information recovered by the microcontroller. Internet of Things (IoT) is a technology of associating the whole world at one place. Hence sensors can be associated with share the information acquired in different areas and process/examinations that information for planning the applications like weather monitoring, activity flagging, mobile health monitoring in medicinal applications and modern security guaranteeing strategies, and so on.

A wireless sensor associated with communication offers an extensive different protocols and different properties of uses for acquiring the total machine to machine cooperation [5]. The customary technologies using wireless sensor systems and control frameworks will turn out to be more productive and quicker witted because of contribution of IoT. In weather monitoring the strength is monitoring of weather event and sends the data wireless. The IoT additionally assumes an imperative part in media applications for promoting and trading the data around the world.

## 2. LITERATURE SURVEY:

The existing review has right off the bat done on wireless advancements to set up a Wireless sensor arranged. Study continued picking the reasonable wireless technology. It ought to be reasonable in all angles like financial and innovative [6]. The essential concern we need to make while picking the specialized technique is scope of communication. Hence we have picked 802.11 b/g Wi-Fi with GSM. When we are giving a web source, the information can be traded anyplace on the world through its IP address. The further investigation has done on choosing the microcontroller. The planning and execution is contained with a concealed objective of accomplishing low power consumable arrangement. The microcontroller ought to be likewise low power devouring close by all the rest of the sensors additionally low power expending.[7] We have picked a low power microcontroller and works with just 3.3v.

The next study went for data logger to store the output data of sensors. The data collected from the sensors is mostly in the form of integer values representing the value of environmental parameter. After storing the data in EEPROM as data logger then with the help of IoT the data of EEPROM is also stored on the web page. EEPROM is our temporary storage on system. The web page displaying the data of sensors directly will not make a simpler impression for the users. It should be in a graphical representation for easy understanding of the users. The data hosted on an own web page will be more expensive and have to pay for it in a rental basis. To make the system less expensive, we preferred some free data hosting web sites who provides a cloud space for our sensor data to make it universal and also makes the system less expensive[8].

## 3. PROPOSED MODEL DIFFERENT FROM EXISTING SETUP:

The existing weather monitoring system is not using any web enabled tool for monitoring rather the data is being collected manually across different sensor and analyzed and prediction and forecasting is being given. Normal weather condition does not measure oxygen level during forecasting. But in this proposal we are going to monitor weather forecasting with oxygen level monitoring also.

## 4. SYSTEM ARCHITECTURE:

**Proposed** model consists of a microcontroller as a fundamental preparing unit and all the sensor and gadgets can be associated with the microcontroller. The sensors can be worked by the microcontroller to recover the information from them and it forms the examination with the sensor information and updates it to the web through Wi-Fi module associated with it.The block diagram shows our proposed model with component. The microcontroller utilized as a part of this model is a powerful decision. The microcontroller ought to be additionally low power expending having 8 channels Analog to Digital converter which will be a noteworthy favorable position with this microcontroller to get the information from the simple sensors associated with it[5]. It is having such huge numbers of highlights on chip. Here we utilized ESP8266 Wi-Fi module which is having TCP/IP protocol stack coordinated on chip. So it can furnish any microcontroller to get associated with Wi-Fi organize. ESP8266 is a

prearranged System on a chip SOC and any microcontroller need to speak with it through UART interface. It works with a supply voltage of 3.3v. The module is arranged with AT orders and the microcontroller ought to be customized to send the AT orders in an expected grouping to design the module in customer mode. The module can be utilized as a part of both customer and server modes. When it gets associated in a Wi-Fi organize, we'll get one IP address which is available in its nearby system. The module is moreover having 2 GPIO sticks close by UART pins. It is additionally having inbuilt SPI protocol by utilizing the two pins of UART as information lines and by arranging the two GPIO sticks as control lines and clock flag. It is additionally having 1MB on-chip streak memory. Inside it is having power service unit with all controllers and PLLs. The on-chip processor it is having is a 32 bit CPU.

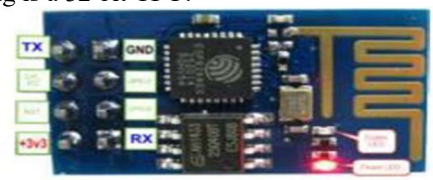


*Fig 4.1: ESP8266 Pin Details*

**Sensors:** in this proposed model we are going to use temperature sensor and Air pollution monitoring sensor (MQ135 Gas sensor) to monitor temperature and humidity level separately. Air Pollution Monitoring System in which we will monitor the Air Quality over a webserver using internet and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO2, smoke, alcohol, benzene and NH3. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily. In addition we are going to use LDR for monitoring the light power i.e, in the event of the light force is getting low then consequently the LED light will gleam with a required power. This will consume power in weather monitoring area as well as can be applied in house hold appliance. All other weather parameters can designed as future model by suitably replacing the sensor and corresponding Input/ Output with separate coding. Relay is utilized to play out the exchanging activities for the AC/DC gadgets. In the proposed framework, relay is utilized to switch the cooling fan. At whatever point the room temperature is getting higher than the breaking point, at that point the cooling fan will be ON consequently through transfer.

In the proposed model the software usage assumes a noteworthy part while recovering the sensor information and refreshing it to the server[7]. Here we are going to use Arduino software which underpins different microcontrollers and gives an entire software condition to the microcontrollers.. Arduino Streak enchantment is a tool utilized for composing the machine dialect code into the microcontroller's streak memory. This instrument likewise encourages the extra highlights like terminal window for the equipment gadgets. Right off the bat, we need to instate the ESP8266 by sending a couple AT orders. Instatement process incorporates, monitoring the communication with ESP8266 to microcontroller, hunting down a Wi-Fi arrange inside its range and interfacing the Wi-Fi module to that system by getting validated with required accreditations. After the instatement procedure, we need to program for arranging the Wi-Fi module as a TCP/IP customer. While arranging the ESP8266, monitoring the affirmation is vital to guarantee that the module is designed accurately. Subsequent to designing the ESP8266, we need to program for perusing the sensor information. The ADC (Analog to Digital Converter) unit should design with all essentials like clock recurrence, determination and information arrange[4]. At that point the microcontroller will run the direction constantly to get the refreshed information esteems from sensors. Presently the real undertaking has touched base in dialog, i.e. plotting the sensor information in a graphical frame. Here we have to experience some sort of a systems service condition, where we have to manage IP address communication.[6] .As we specified in the before parts, we utilized Arduino open source information to make decrease the usage cost similarly we need to plot the information into site, we have to possess and pay for the area space and outline the website page according to our necessities, which is mind boggling and costlier strategy. Rather than paying for a possess space, we utilized one site called "Thing speak". It gives a free client space to making the information channels. Each channel will have 8 fields to compose the different information and it naturally plots the given information in a graphical portrayal. The communication with Thing speak server should be possible by utilizing its IP address. We need to program for ESP8266 to send the required AT charges and to build up an association between the Microcontroller and Thing speak server. When we made once channel for entering the information into site, the channel will be assigned with one API key.

So we need to compose the API key before composing the real information, at that point the information will be put away and showed in the required channel.

## 5. SOFTWARE IMPLEMENTATION:

After connecting the WiFi module with Gas sensor as per the existing setup it requires (MQ135) calibration for exact measurement of quantity. In the code, we have defined the libraries and the variables for the Gas sensor and the LCD. By using the Software Serial Library, we can make any digital pin as TX and RX pin. In this code, we have made Pin 9 as the RX pin and the pin 10 as the TX pin for the ESP8266. We have included the library for the LCD and have defined the pins for the same. We have also defined two more variables: one for the sensor analog pin and other for storing air quality value. Port 8 as the output pin where we have connected the buzzer. lcd.begin (16,2) command will start the LCD to receive data and then we will set the cursor to first line and will print the 'circuit digest'. Then we will set the cursor on the second line and will print 'Sensor Warming'. Different ESP's have different baud rates so write it according to your ESP's baud rate. Then we will send the commands to set the ESP to communicate with the Arduino and show the IP address on the serial monitor.

For output on the webpage in web browser, we will have to use HTML programming. So, we have created a string named *webpage* and stored the output in it. We are subtracting 48 from the output because the *read()* function returns the ASCII decimal value and the first decimal number which is 0 starts at 48.

The data we stored in string named *'webpage'* will be saved in string named *'command'*. The ESP will then read the character one by one from the *'command'* and will print it on the webpage.

Before uploading the code, we are connected to the Wi-Fi of your ESP8266 device. After uploading, open the serial monitor and it will show the IP address. This IP address to be utilized for loading the data on webpage. For testing purpose We have setup a local server to monitor the air quality from anywhere in the world, we need to forward the port 80 (used for HTTP or internet) to local or private IP address (192.168*) of device. After port forwarding all the incoming connections will be forwarded to this local/private address and we can open webpage by just entering the public IP address of internet from anywhere.

By above method the air quality can be measured using Wireless sensor network and can be monitored anywhere from the web. Now in addition to above parameters we need to monitor temperature at a specific location there by which needs to be monitored. For this we are going to use MLX90614 is an Infra-Red thermometer for non-contact temperature measurements. The thermometer comes factory calibrated with a digital SMBus output giving full access to the measured temperature in the complete temperature range(s) with a resolution of0.02°C. The user can configure the digital output to be PWM. As a standard, the 10-bit PWM is configured to continuously transmit the measured temperature in range of -20 to 120 °C, with an output resolution of 0.14 °C. The Ethernet shield output is connected to the Internet cloud through the RJ45 Cable. For this connectivity, a static ip address is taken and using this static ip address, the distant end monitoring person will be able to fetch the information in his browser by typing this ip address. Thus the security is also maintained in this system.The Temperature sensor MLX 90614 which have 4 pins are to be connected to the Micro controller base board as shown in the figure. The connections are done using pin 4 and 5 of analogue side of the Micro controller Board and 3V3 voltage and ground are used for the power to the thermometer This thermometer will monitor the temperature of the given environment at frequent interval of time set by us in the coding and gives the information in analogue format ie., Celsius and Fahrenheit . This analogue temperature information will be fed to the Microcontroller and with the help of the coding burnt in this Microcontroller; this will convert the Analogue temperature information into equivalent digital information and will pass to the Ethernet shield. The Ethernet shield takes this information and converts it in the format to be sent through the Ethernet socket in the form IP Packets to the Internet cloud. For this , in the Ethernet shield the output Ip address and output port (port forwarding) are designated. The static ip address is used for monitoring the contents of the Temperature statistics of the given environment from remote location using the Browser.

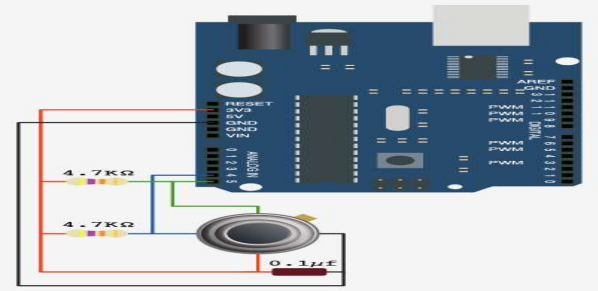


*Fig5.1. Micro Controller*

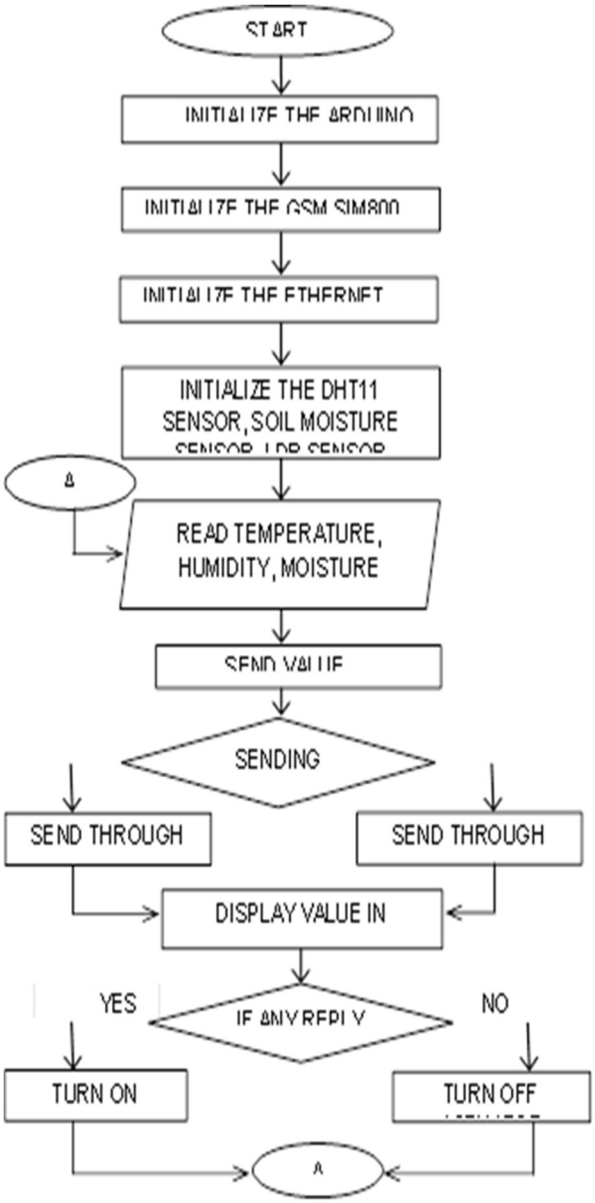


*Fig 5.2. Proposed Flow of the Process*

The changes happening in the temperature of the given environment is monitored by the authorized person at the remote end. Since this system works on 'on line mode', immediate restorative action is possible whenever any abnormality in temperature occurs. By the above method we can parallel monitor both Temperature and Air quality using the same micro controller. Instead of Ethernet shield we may use the GSM control board for transferring the data to internet using GSM cloud. As the micro controller is easily programmable, we can modify the coding accordingly so that data can be monitored anywhere from the field.

## 6. RESULT OUTPUT:

This system allows us to measure the environment temperature, air status and update it to monitor at distant end. It is of great importance to measure the temperature changes and to inform immediately on 'ONLINE' basis to the persons concerned irrespective of any distance. This system allows us to take immediate restorative action. The upload the required program in Arduino Software (IDE) and the temperature, Air monitoring are displayed on the serial monitor. This will enable us to verify whether the coding information is required as per our expectation. The environ- mental monitoring data sensors monitor the temperature and humidity. The hardware *screen* shot and temperature and air status readings are shown below. Temperature and air can be maintained in a room by using this system. With this we can monitor the room temperature and air to our comfort. The recorded humidity and temperature data can be stored in excel sheet. The temperature is sensed as 30 degree Celsius and 32 degree Celsius. The humidity is sensed as 63% and 64% (Relative Humidity). The development of a Microcontroller based embedded system for weather monitoring helps us to gather the parameters like temperature and humidity. These can be stored in excel sheet and can be further used for processing. Wireless sensors can play greater roles in the processing of structural response data, this feature can be utilized to screen data for signs of structural damage. The above methodology designed specifically targets assisted living residents and others who may benefit from continuous, remote monitoring in the present scenario. This project is derived at low cost since the micro controller is readily available for integration.

We will be able to monitor the environmental

temperature continuously and any changes occurred in temperature is critically monitored and updated anywhere in the world through Ethernet network. For the receiver who wants the above information, needs only to have a web based browser. Future scope for development of this project can further be developed with more temperature sensors arranged and provided in groups with a sink sensor heading them to cover a vast range of area. This will ultimately lead to effective disaster management of that area and can be used to critically monitor and arrange for the restorative action whenever and wherever required.

## 7. CONCLUSION:

Remote Environment Temperature monitoring and air monitoring system has been an interesting topic recently among Communication Engineers as well as IT Professionals and various other segments in the industry environments. This monitoring system is beneficial to the society where the implementation of such system will save environment from disaster. The proposed system senses the temperature and air level and we can modify suitably to measure humidity after some intervals. For this temperature sensor to be interchange with DHT11 humidity sensor which will measure both humidity and temperature. It can also be used in packaging industry where weather monitoring plays crucial role. Whether it is the pharmaceutical, cosmetics, food or consumer goods industry, packaging requirements are as varied as the products we deal with every day.

Temperature and air status can be sensed in a room or an industry by using this system. People who suffer from asthma or the new born or old age people prefer to have temperature and humidity in particular range. It is going to sense temperature and humidity of targeted area not city or village. By this way we get specific results regarding environmental factors. The system developed is cost effective and all the parameters are uniquely identifiable through the embedded com- putting system. The system can be further modified as a system which senses the room temperature and humidity after some duration and communicates it to the IoT analytics platform service in future. This information can be accessed via android app. As a further part, one can control to switch the A.C. on/off. It takes in- formation about the surrounding environment through sensors and uploads it directly to the internet, where it can be accessed anytime and anywhere through internet

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