International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

IoT Based Weather Station

Dr. Neha Agrawal, Devesh Khurana, Sushant Ahuja

Abstract: ***The system proposed in this paper is an advanced solution for monitoring the weather conditions at a particular place and make the information visible anywhere in the world. The technology behind this is Internet of Things (IoT), which is an advanced and efficient solution for connecting the things to the internet and to connect the entire world of things in a network. Here things might be whatever like electronic gadgets, sensors and automotive electronic equipment. The system deals with monitoring and keeps track of temperature, humidity, wind speed and direction, rainfall amount etc. The system displays these readings in real time on a display. It also keeps track of historical information on an hourly and daily basis. This data can be display on LCD and sends the information to the web page and then plot the sensor data as graphical statistics. The data updated from the implemented system can be accessible in the internet from anywhere in the world.***

1. Introduction

The importance of weather monitoring is existed in a lot of ways. The weather parameters are required to be monitored to sustain the development in agriculture and to ensure the safe working environment in industries, etc. The primary motivation behind taking up this project is the large utility of the wireless weather monitoring in varied areas ranging from agricultural growth and development to industrial development. The weather conditions of a field can be monitored from a distant place by farmers and won't require them to be physically present there in order to know the climatic behavior at the location by using wireless communication. Due to technological growth, the process of reading the environmental parameters became easier compared to the past days.

The sensors are the miniaturized electronic devices used to measure the physical and environmental parameters. By using the sensors for monitoring the weather conditions, the results will be accurate and the entire system will be faster and less power consuming. The system proposed in this paper describes the implemented flow of the weather monitoring station. Sensors are essential components in many applications, not only in the industries for process control but also in daily life for buildings safety and security monitoring, traffic low measuring, weather condition monitoring and etc. In weather monitoring, for instance, parameters such as temperature and humidity thus sensors have always been given the task for doing so. The advancement in technology has made these small and reliable electronic sensors capable of monitoring environmental parameters more favorably. Kang and Park (2000)and *Oldham Et* al., (2000) *have* developed monitoring systems, using sensors for indoor climate and environment based on the parameters mentioned.

The system monitors the weather conditions and updates the information to the web page. The reason behind sending the data to the web page is to maintain the weather conditions of a particular place can be known anywhere in the world. The weather condition is also displayed on the systems LCD. The system consist of Temperature and Humidity sensor combined which is Hygroclip, wind direction sensor which is Potentiometric wind vane, wind speed sensor which is Three Cup chopper Anemometer and rain quantity sensor which is Rain Gauge. This sensors are standard sensors which are used in IMD (India Meteorological Department) for weather Forecasting. We get all this sensors from IMD, Pune. All this sensors can measure the corresponding weather parameter. The system is intended to use in hill station large residential buildings and manufacturing industries. The system is including with a microcontroller to process all the operations of the sensors and other peripherals.

The wireless communication standard was chosen in our system by analyzing the requirements of the application, that the weather conditions should be monitored and updated all the time continuously. There are many local area network standards for communication, but they are all standalone communication processes and completely localized communication. In our application, we have to make the weather condition of a particular place can be informative anywhere worldwide. The other communication technologies like ZigBee, RF Link can make the communication nearly in the same range of Wi-Fi but they can't broadcast the information as they can only communicate peer to peer therefore we are using GPRS module as our communication device of system. The World Wide Web (www) needs to have one client – server configuration for communication. It client needs to be connected to the server with its IP address which can be universally accessible. The GPRS module at certain period of time updates the information to the web page through the server. The system is equipped with all sensor devices should acts as client to send the data to the web server. For establishing a connection between the sensor network and internet, we used a GPRS module as an additional communication interface controlled by the microcontroller. A GPRS module requires a source of internet connection with the help of SIM card. Once configuring the GPRS module with an internet source, it acts as client and sends the sensor data retrieved by the microcontroller and we can access it from anywhere using internet. The idea of connecting all the sensors to the internet is Internet of Things(IoT).

1.1 Internet of Things (IoT)

It is a futuristic technology of connecting the entire world at one place. All the objects, things and sensors can be connected to share the data obtained in various locations and processes/analyses that data for co-ordinating the applications like traffic signaling, mobile health monitoring in medical applications and industrial safety ensuring methods, etc. As per the estimation of technological experts, 50 billion objects will be connected in IoT by 2020. IoT offers a wide range of connectivity of devices with

various protocols and various properties of applications for obtaining the complete machine to machine interaction.

The traditional technologies like home automation, wireless sensor networks and control systems will become more efficient and smarter due to involvement of IoT. IoT is having a wide range of application areas. Such as Medical applications for monitoring the health of a patient and sends the information wireless. The present developing Wearable instrumentation is also based on IoT. The example wearable instrumentation is Smart wrist bands, navigation pills, etc. All this methods require an internet interface to update the health info or to control the device with a smart phone. The IoT also plays a vital role in media applications for advertising and exchanging the information worldwide. The manufacturing processes also require IoT for supply chain management, digital control systems for monitoring the manufacturing processes. The space requirements of IoT technology, the geographical specifications are always important in case of tracking applications. The geographical dimensions of objects are also important while obtaining the data from the objects. IoT in automobile applications and traffic maintenance became a most using area of automation. The automated devices in a vehicle should be connected to a cloud to update the car health within a period of time. By connecting the vehicles and traffic signaling systems to the internet, people can easily find the shortest path for their destination from the traffic monitoring systems and can navigate automatically by checking all other directions.

2. Literature Survey

The survey has firstly done on standard technologies to establish a standard sensor network. Study went on choosing the suitable standard sensors. It should be suitable in all aspects like economic and technological. The primary concern we have to make while choosing the communication method is range of communication. Here we have chosen SIM800L GPRS module. When we are giving an internet source, the data can be exchanged anywhere in the world through its IP address. The further study has done on selecting the microcontroller. The system implementation is contained with a hidden goal of achieving low power consumable solution. The microcontroller should be also low power consuming alongside all the remaining sensors also low power consuming. We have chosen LPC2138, which is low power microcontroller and works with only 2.0V to 5.5V.

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 that provides a cloud space for our sensor data to make it universal and also makes the system less expensive.

3. System Architecture

The implemented system consists of a microcontroller (LPC2138) as a main processing unit for the entire system and all the sensor and devices can be connected with the microcontroller.

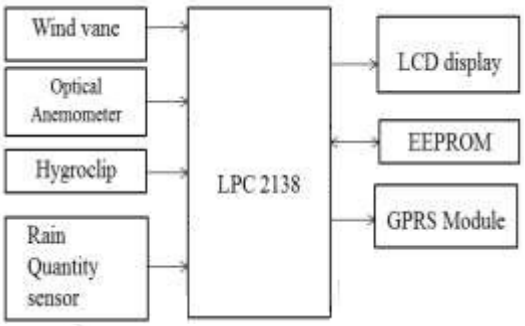

Figure 1: Block Diagram of IoT based

The sensors can be operated by the microcontroller to retrieve the data from them and it processes the analysis with the sensor data and updates it to the internet through GPRS module connected to it. In the above block diagram, there it is showing the main elements in the proposed system.

3.1 LPC2138

A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with less fall in performance.

3.2 GPRS Module

SIM800L is a quad-band GSM/GPRS module, that works on frequencies GSM850MHz, EGSM900MHz, DSC1800Mhz and PCS1900MHz. SIM800L which features GPRS multi-slot class 12 / class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With a tiny configuration of 15.8*17.8*2.4mm, SIM800L can meet almost all the space requirements in user applications, such as smart phone, PDA and other mobile devices. SIM800L has 88pin pads of LGA packaging, and includes all the hardware interfaces between the module and customers' boards. SIM800L support 5*5*2 keypads, one full modem serial port, user can configure two serial ports, one USB, the USB interfaces can debug, download software, audio channel which includes two microphone input; a receiver output and a speaker output, programmable general purpose input and output. A major advantage is SIM card interface, supports FM and one PWM.SIM800L is designed with power saving technique so that the current consumption is low with just around 0.7mA in sleep mode.

Figure 2: SIM800LPin Details

3.3 Sensors

The system consists of temperature sensor, humidity sensor, wind direction sensor, wind speed sensor and rain quantity sensor.

1) **Hygroclip:** Hygroclip is a combined sensor for both temperature and relative humidity. The basic sensor for relative humidity is a thin polymer, which has the property to absorb moisture from the air, and changes its electrical permittivity in proportion to the relative humidity. Hygroclip requires +12V dc power at field. It has a measuring range of 0-100% for relative humidity and -40 ˚C to 60 ˚C for temperature. The output of the sensor is0-1000mV.
2) **Potentiometric wind vane:** An IMD-make potentiometric wind vane is the sensor used for measurement of wind direction. The potentiometer in the wind vane is a servo-micro torque potentiometer and has a maximum resistance of 10 kilo-ohms over an end gap of about 4 degrees. The variation of 0-360 degree corresponds to 0 to 10 kilo ohms.

Table 1: Measurements of Wind vane

Direction	Resistance
North	0KΩ
East	2.5KΩ
South	5.0KΩ
West	7.0KΩ

References

[1] Xively. Xively Is the Public Cloud Specifically Built for the Internet of Things., [online] Available: https://xively.com/whats_xively/.
[2] F.-J. Wu, Y.-F. Kao and Y.-C. Tseng "From wireless sensor networks towards cyber physical systems", Pervasive Mobile Computer., vol. 7, no. 4, pp.398 -410 2011.
[3] IoT based Data Logger System for weather monitoring using Wireless sensor networks, [online] Available: www.ijettjournal.org/2016/volume-32/number-2/IJETT-V32P213.pdf.
[4] S. Tozlu, M. Senel, W. Mao and A. Keshavarzian "Wi-Fi enabled sensors for internet of things: A practical approach", IEEE Commun. Mag., vol. 50, no. 6, pp.136 -145 2012.
[5] H. Yang, Y. Qin, G. Feng and H. Ci "storage and leakage based on wireless sensor networks", IEEE Sensors J., vol. 13, no. 2, pp.516 -572 2013 and Temperature Transmitter 3008-40-V6.
[6] Sensor Moves Into Volume Production., [online] Available: http://www.enocean-alliance.org/en/gss-seamless- sensingco2-sensor-moves-into-volume-production
[7] IEEE digital library “adhoc sensor networks” available: https://ieeexplore.ieee.org/document/7981546