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IOT Based Whether Monitoring System using PIC Microcontroller

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Abstract: *A weather station is a technology that collects data related to the weather & environment using different electronics sensors. There are two types of weather station, one who is having their sensors and the second type of weather station is where we pull data from the weather station servers. In this project, we are designed by our weather station. We all know that a weather station is not a single device, but it is a combination of many small tools to form a larger system. It contains various sensors and gadgets that work together but in specific ways to transmit proper and accurate data of the weather parameters. It is quite tricky to uses of Webserver based weather station to non-technical peoples, so we are providing web server-based user interface as well as Webpage application. We are well known today most mobile units running on Android OS, and many people are well known to use the android phone. So, our application is beneficial for such purpose This device is all about IoT based Live Weather data Monitoring Using controller. We will interface DHT11 Humidity & Temperature Sensor, LDR, BMP280 Barometric Pressure Sensor and FC37 Rain Sensor with controller wi-fi Module.*

Keywords: Whether Monitoring, Sensors, IOT web Server, Microcontroller

I. INTRODUCTION

Will it rain and the match gets dismissed or will it be bright and sunny? How can it be determined that whether the? conditions are suitable for conducting a cricket match or not? The temperature is too high this summer, will it be rain or not? The answer to these types of questions is only given by the concept of machine learning in conjunction with IoT. To develop an IoT system, a thing is required which should be equipped with necessary sensors, actuators and a
communication interface. The communication interface is needed to connect the thing to the internet that allows them to send the data to cloud or at remote machine for monitoring and also for analytics purpose. The thing can also receive the control information based on some analytics and take some actuating decision.

The introduction of IoT (Internet of Things) establishes the platform for the world to showcase hi-tech machine-to-machine interaction ranging from connected cars to smart cities to weather monitoring systems and smart homes. The IoT revolution is transforming the way humans interact with machines.

The Weather Monitoring System using the IoT abstract is one such application of IoT that has paved the way for organizations to create new and efficient solutions. Businesses are rapidly adopting smart management systems that improve the accuracy of weather forecasts and transform IoT to 'Weather of Things' that collect weather data from drones, connected vehicles, wireless signals, and other IoT devices.

of the rapidly changing climate, the weather forecast is uncertain and inaccurate these days. As a result, the Weather Reporting System is primarily utilized to monitor the constantly changing climatic and weather conditions over-regulated areas like homes, industry, agriculture, and so on.

When objects like an environment furnished with sensor devices, microcontrollers, and different software applications become a self-monitoring and self-protecting environment, it is called a smart environment.

Similarly, here, the system uses sensors to monitor and adjust environmental parameters such as temperature, CO levels, and relative humidity. Then, it sends the data to a web page to plot the sensor data, shown as graphical statistics. The data updated

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from this system can be accessed on the internet from anywhere in the world. The embedded system enables the user to access the various criteria and store the data in the cloud.

Hence, the Internet of Things (IoT) is the core root of linking all the sensors to the internet and monitoring the weather in real-time

II. LITERATURE SURVEY

1. Ravi Kiran Varmeter's [2] Raspberry pi hardware board is an economical internet of things (IOT) hardware platform that can be used for wide variety of application. This paper discusses the hardware, software platforms and implementation details of an IOT application for environmental monitoring and control using raspberry pi 3 Model B. The DHT11 is used to monitor temperature and humidity to further control the air conditioning system, The FC-37 is used to detect the rainfall and further control the sprinkling system. The MQ135 sensor is used to detect the presence of hazardous gasses in the environment. DJANGO web technology platform is used to design a dash board for monitoring and controlling the things. MYSQL data base is used to log the sensor and fusion charts are used to display the trends in the graphical form.

2. Chew Myatt New etal [3] The proposed system is an advanced solution for monitoring the weather condition at the particular place and makes the information visible anywhere in the world. The technology behind this is the internet of things (IOT). The system deals with the monitoring the environmental condition like temperature, humidity with respect to its measured time with a microcontroller interfaced with sensors and GSM module to sends the information wirelessly to remote server and then plot the sensor data as the graphical statistics

3. Loan-madly Neagh eta. l [4] has proposed the sustainable smart cities a frog computing frame work for a smart urban transport network in this paper, a frog computing frame work for smart urban transport is developed. The proposed framework is adapted to the smart city concept it uses collaborative multitude of the end user clients to carry out a substantial amount of communication and computation it can be adapted for specific situation of smart cities in Romania

4. Sheafing Hou, eta. l[5] has described intelligent window system for the obtaining weather information based on internet. A smart electric push pull window composed of a actuator a control system a data acquisition system, a data processing system a weather website and a window the system can collect real-time weather information such as temperature and relative humidity PM 2.5 wind speed and cloudy or cloudy on the internet through a data acquisition system.

5. Fibs Reid G Cruz eta l [6] has proposed the network flood prediction system with rain gauge, temperature humidity pressure sensor, ultrasonic sensor, soil moisture sensor and anemometer. Located near the Pacific Ocean, Philippines is along in one of the places regarded as a typhoon belt having an average of 19 to 20 tropical cyclones occurring every year. These tropical cyclones leave a devastating effect especially to properties, infrastructures and lives of the people. The development of a system that can predict the flood level based on different weather parameters such as ambient temperature, relative humidity, barometric pressure and wind speed.

6.Cong Zheng Han eta. l [7] has proposed the rainfall monitoring based on next generation millimetre wave backhaul technology in a dense urban environment. High-resolution and accurate rainfall monitoring is the great importance to many applications, including meteorology, Hydrology, and flood monitoring in recent years, microwave backhaul links from wireless communication has been suggested for rainfall monitoring purposes, complementing the exiting monitoring systems with the advances in microwave technology, new microwave backhaul solutions have been proposed and applied for 5G networks.

7.T Dinesh, eta.[8] has proposed the paper in order to regulate the irrigation of water, some smart devices like raspberry paused control is used to save the water. The water is fed to the land by analysing the soil moisture level and the water updates through the wifi module. Whenever the soil moisture level detected as less than the threshold value then the raspberry pi opens the electromagnetic value. Water is irrigated through the drip irrigation to save the water. Various sensors like a co2 sensors, so2 sensors, light intensity sensors which as the LDR circuit are used for the environmental monitoring of that particular area Daily feedback readings to the farmer

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III. PROPOSED SYSTEM

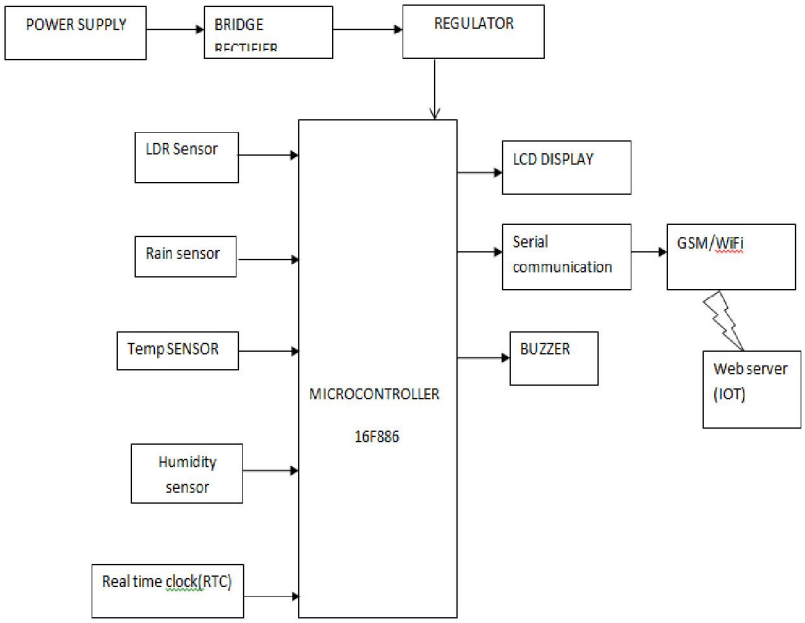

Fig. 2. Block Diagram

This project is all about IoT based Live Weather Station Monitoring using PIC microcontroller. We will interface DHT11 Humidity and temperature sensor, LDR, and rainfall and upload the data to a web server to the smart phone via GSM module inbuilt in internet facility.

A Integrated TCP/IP protocol stack is used for transmitting and receiving sensor information. Depending on a status of weather information to the wireless remote location. The PIC microcontroller controls the entire weather Prediction system peripherals and status on a thingsspeak iot web page or mobile application. In this way, a secure, flexible, trust- able and economical system is developed to solve above mentioned weather parameters. Also, you can check whether data through anywhere using Internet as we hosted this server publicly. We developed an android application for easy access to our weather monitoring system.

A. PIC 16f886 Microcontroller

The PIC16F886-I/SP is a 8-bit flash-based CMOS Microcontroller. It features 256bytes of EEPROM data memory, self-programming, an ICD, 2 comparators, 11 channels of 10-bit Analogue-to-Digital (A/D) converter, 1 capture/compare/PWM and 1 Enhanced capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire serial peripheral interface (SPI™) or the 2-wire inter-integrated circuit (I²C™) bus and an enhanced universal asynchronous receiver transmitter (EUSART). The Analogue-to-Digital converter (ADC) allows conversion of an analogue input signal to a 10-bit binary representation of that signal. This device uses analogue inputs, which are multiplexed into a single sample and hold circuit. The output of the sample and hold is connected to the input of the converter. The converter generates a 10-bit binary result via successive approximation and stores the conversion result into the ADC result registers (ADRESL and ADRESH).

- Software selectable frequency range of 8MHz to 32kHz
- Fail-safe clock monitoring for critical applications
- Clock mode switching during operation for low-power operation
- Power-saving sleep mode
- Power-on reset (POR)
- Selectable brown-out reset (BOR) voltage
- Extended watchdog timer (WDT) with its own on-chip RC oscillator for reliable operation
- In-circuit serial Programming™ (ICSP™) via two pins

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- In-circuit debug (ICD) via two pins
- High-endurance flash/EEPROM cell
- Self-reprogrammable under software control
- Programmable code protection
- Capture/compare/PWM (CCP) module
- Enhanced capture/compare/PWM (ECCP) module with auto-shutdown and PWM steering

Fig. 2. PIC18F886

B. Humidity sensor

DHT11 is a Humidity and Temperature Sensor, which generates calibrated digital output. DHT11 can be interface with any microcontroller like Arduino, Raspberry Pi, etc. and get instantaneous results. DHT11 is a low-cost humidity and temperature sensor which provides high reliability and long-term stability. uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and outputs a digital signal on the data pin (no analog input pins needed). It's very simple to use, and libraries and sample codes are available for Arduino and Raspberry Pi. This module makes is easy to connect the DHT11 sensor to an Arduino or microcontroller as includes the pull up resistor required to use the sensor. Only three connections are required to be made to use the sensor - Vcc, Gnd and Output.

It has high reliability and excellent long-term stability, thanks to the exclusive digital signal acquisition technique and temperature & humidity sensing technology.

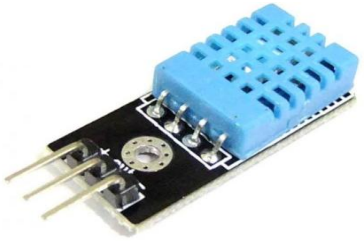

Fig. 3. Humidity Sensor

C. GSM Module (SIM800)

This GSM modem has a SIM800A chip and RS232 interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter. Once you connect the SIM800 modem using the USB to RS232 connector, you need to find the correct COM port from the Device Manger of the USB to Serial Adapter. Then you can open Putty or any other terminal software and open an connection to that COM port at 9600 baud rate, which is the default baud rate of this modem. Once a serial connection is open through the computer or your microcontroller you can start sending the AT commands. When you send AT commands for example: "AT\r" you should receive back a reply from the SIM800 modem saying "OK" or other response depending on the command send.

Features of SIM800A

- Bands: GSM 850MHz, EGSM 900MHz, DCS 1800MHz, PCS 1900MHz
- GPRS class 2/10
- Control via AT commands (3GPP TS 27.007, 27.005 and SIMCOM enhanced AT command set)
- Supply voltage 3.4-4.4V

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- Coding schemes: CS-1, CS-2, CS-3, CS-4 Tx power: Class 4 (2W), Class 1 (1W)
- Small package: 23 * 23 * 3mm
- Low power: down to 1mA in sleep mode.

Fig. 3. GSM Module

D. LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.

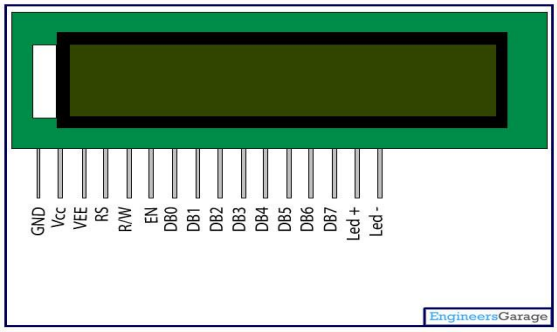

Fig. 4. LCD Display

E. Temp Sensor LM35:

Temperature is one of the most commonly measured parameters in the world. They are used in your daily household devices from Microwave, ridges, AC to all fields of engineering. Temperature sensor basically measures the heat/cold generated by an object to which it is connected. It then provides a proportional resistance, current or voltage output which is then measured or processed as per our application.

- LM35 is a temperature measuring device having an analog output voltage proportional to the temperature.
- It provides output voltage in Centigrade (Celsius). It does not require any external calibration circuitry.
- The sensitivity of LM35 is 10 mV/degree Celsius. As temperature increases, output voltage also increases E.g. 250 mV means 25°C.
- It is a 3-terminal sensor used to measure surrounding temperature ranging from -55 °C to 150 °C.
- LM35 gives temperature output which is more precise than thermistor output.

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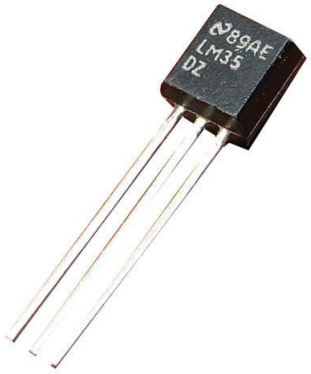

Fig. 5. LM35 sensor

F. IOT

Internet of Things (IoT) is a network of physical objects or people called "things" that are embedded with software, electronics, network, and sensors that allows these objects to collect and exchange data. The goal of IoT is to extend to internet connectivity from standard devices like computer, mobile, tablet to relatively dumb devices like a toaster.

IoT makes virtually everything "smart," by improving aspects of our life with the power of data collection, AI algorithm, and networks. The thing in IoT can also be a person with a diabetes monitor implant, an animal with tracking devices, etc

ThingSpeak is IoT Cloud platform where you can send sensor data to the cloud. You can also analyze and visualize your data with MATLAB or other software, including making your own applications. The ThingSpeak service is operated by MathWorks. In order to sign up for ThingSpeak, you must create a new MathWorks Account or log in to your existing MathWorks Account.

IV. CONCLUSION

To make this idea, genuine we need to take help of electronic sensor devices which are needed to place in the environment. By using this sensor, we can stream real-time data over the web server using GSM SIM800A. We also required one dedicated public IP to available this server over the open Internet. The excellent and low-cost weather are monitoring real-time system presented in this Report. An Integrated TCP/IP protocol stack is used for transmitting and receiving data.

Our aim is to implement a simple and low-cost weather monitoring system using LM35, LDR, DHT11, LCD and PIC Microcontroller 16F886 unit to monitor weather conditions of the desired location and transmit it to a cell phone at distant location through graph on web server. With the help of this system named IOT based whether monitoring system using pic microcontroller we calculate the light intensity in lux, humidity in percentage, temperature in degree, and rain which will be transmitted wirelessly to the base station i.e., web server named as Think Speak

V. FUTURE SCOPE

The technology of IoT has expanded in all sectors, and with the future scope and advantages of IoT-based weather monitoring systems, numerous industries can leverage them.

- The IoT weather reporting system has an application for farmers where they can ensure higher productivity of crops and lower the risk of weather hazards via the IoT weather.
- The IoT-based weather station proves helpful for monitoring the weather in areas like places with volcanoes or rain forests. This is especially important with drastic changes in the weather conditions we are experiencing.
- The IoT weather monitoring system using IoT supporting controllers is fully automated and efficient. It does not require any manual labor or attention.
- You can plan and visit the places anytime you like with prior notification of the weather conditions. You can simply get the status of the weather condition and the air quality, etc.
- Therefore, with the help of embedded devices and sensors, any environment can be converted to a smart environment for accumulating the data and analyzing the environment with real-time monitoring.

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Hence, with such advances on the Internet of Things (IoT), organizations are focusing on understanding the impact of weather on their operations and finding cutting-edge analytics on how to control the impact of their business

ACKNOWLEDGMENT

It gives us great pleasure in presenting the paper on "Iot Based Whether Monitoring using PIC Microcontroller". We would like to take this opportunity to thank our guide, Prof. R.A.Kadu & Prof. S.P.Bangal, Professor, Department of Electronics and Telecommunication Engineering Department, PREC,Loni for giving us all the help and guidance we needed. We are grateful to him for his kind support, and valuable suggestions were very helpful

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