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IOT Based Remote Monitoring of Weather Parameters for Solar, Wind Applications

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***Abstract*: -- A weather station can be described as an instrument or device, which provides us with the information of the weather in our neighbouring environment. For example it can provide us with details about the surrounding temperature, barometric pressure, humidity, etc. Hence, this device basically senses the temperature, pressure, humidity, light intensity, rain value. There are various types of sensors present in the prototype, using which all the aforementioned parameters can be measured. It can be used to monitor the temperature or humidity of a particular room/place. With the help of temperature and humidity, we can calculate other data parameters, such as the dew point. Weather monitoring plays an important role in human life, so the collection of information about the temporal dynamics of weather changes is very important. In any industry, during certain hazards, it is very important to monitor the weather. Two sensors are connected to the Node MCU namely temperature and humidity sensor (DHT11) and light dependent resistor (LDR).**

Keywords: IoT, ESP8266, DTH11 Sensor, LDR Sensor.

I. INTRODUCTION

Present innovations in technology mainly focus on controlling and monitoring of different activities. These are increasingly emerging to reach the human needs. Most of this technology is focused on efficient monitoring and controlling different activities. An efficient environmental monitoring system is required to monitor and assess the conditions in case of exceeding the prescribed level of parameters (e.g., noise, CO and radiation levels). With the advent of high speed Internet, more and more humans around the globe are interconnected. Internet of Things (IoT) takes this a step further, and connects not only humans but electronic devices which can speak amongst themselves [1]. With falling costs of Wifi enabled devices this trend will only gather more momentum. The main concept behind the Internet of Things(IoT) is to connect various electronic devices through a network and then retrieve the data from these devices (sensors) which can be distributed in any fashion, upload them to any cloud service where one can analyze and process the gathered information. In the cloud service one can utilize these data to alert people by various means such as using a buzzer or sending them an e-mail or sending them an SMS etc. Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Human beings have attempted to predict the weather informally for millennium and formally since the nineteenth century. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere on a given place and using scientific understanding of atmospheric processes to project how the .atmosphere will evolve on that place Weather is driven by air Pressure (temperature and moisture) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot, which varies by latitude from the tropics. The atmosphere is a chaotic system, so small changes to one part of the system can grow to have large effects on the system as a whole. This makes it difficult to accurately predict weather more than a few days in advance, though weather forecasters are continually working to extend this limit through the scientific study of weather, meteorology. It is theoretically impossible to make useful day-today predictions more than about two weeks ahead, imposing an upper limit to .potential for improved prediction skill,Once an all-human endeavor based mainly upon changes in barometric pressure current weather conditions, and sky condition, weather forecasting now relies on computerbased models that take many atmospheric factors into account. Human input is still required to pick the best possible forecast model to base the forecast upon, which involves pattern recognition skills, tele-connections, knowledge of model performance, and knowledge of model biases.

II.IMPLIMENTATION SETUP

A. Components required:
Hardware:
1) ESP8266 based wifi module Nodemcu[6]
2) Temperature and Humidity Sensor(DHT11)[7]
3) LDR[9]
4) Mobile phone to recieve email and SMS
B. Components required:

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Software:
1) Arduino IDE[11]
2) Thing Speak

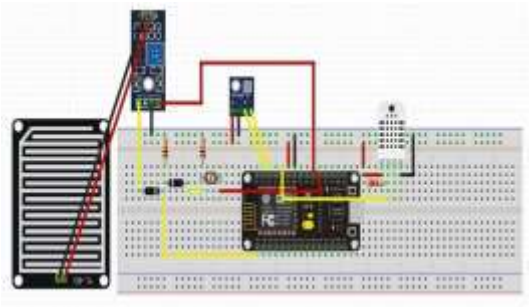

Fig. 1. The complete setup of the device.

III. METHADOLOGY

A. Nodemcu:

It is the heart of the device. It provides the platform for IOT. Its a wifi module havingesp8266 firmware within. All the other sensors are connected to this micro-controler. They send the measuered values to it and it uploads all the values to the cloud where the values are analyzed. The developer of this board is ESP8266 Opensource Community. It has an operating system called XTOS. TheCPU is ESP8266(LX106). It has an in-built memory of 128 KBytes and a storage capacity of 4MBytes. NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and -hardware which is based on the ESP .module. The term "NodeMCU" by default refers to the firmware rather than the dev kits 12 The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many ,open source projects, such as luacjson .and spiffs.

Fig. 2. Nodemcu.

B. DHT 11:

This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor complex. Its technology ensures the high reliability and excellent long-term stability. A high performance 8-bit microcontroller is connected. This sensor includes a resistive element and a sense of wet NTC temperature measuring devices. It has excellent quality, fast response, antiinterference ability and high cost performance advantages.Each DHT11 sensors features extremely accurate calibration of humidity calibration chamber. The calibration coefficients stored in the OTP program memory, internal sensors detect signals in the process, we should call these calibration coefficients. The single-wire serial interface system is integrated to become quick and easy. Small size, low power, signal transmission distance up to 20 meters, making it a variety of applications and even the most demanding applications. The product is 4-pin single row pin package. Convenient connection, special packages can be provided according to users need.

Fig. 3. DHT11.

C. Light Dependent Resistor (LDR):

A light dependant resistor also know as a LDR, photoresistor, photoconductor or photocell, is a resistor whose resistance increases or decreases depending on the amount of light intensity. LDRs (Light Dependant Resistors) are a very useful tool in a light/dark circuits. A LDRs can have a variety of resistance and fun ctions. For example it can be used to turn on a light when the LDR is in darkness or to turn on a light when the LDR is in light. It can also work the other way around so when the LDR is in light it turns on the circuit and when it's in darkness the resistance increase and disrupts the circuit. An LDR is a variable resistor controlled by light. The increasing light intensity falling on it decreases the resistance of the LDR. It has an analog output which is an input to the A0 pin of the nodemcu.Light dependant resistors have many uses, many of the uses have to do with objects that have to work in certain levels of light. Some of the uses of the LDR

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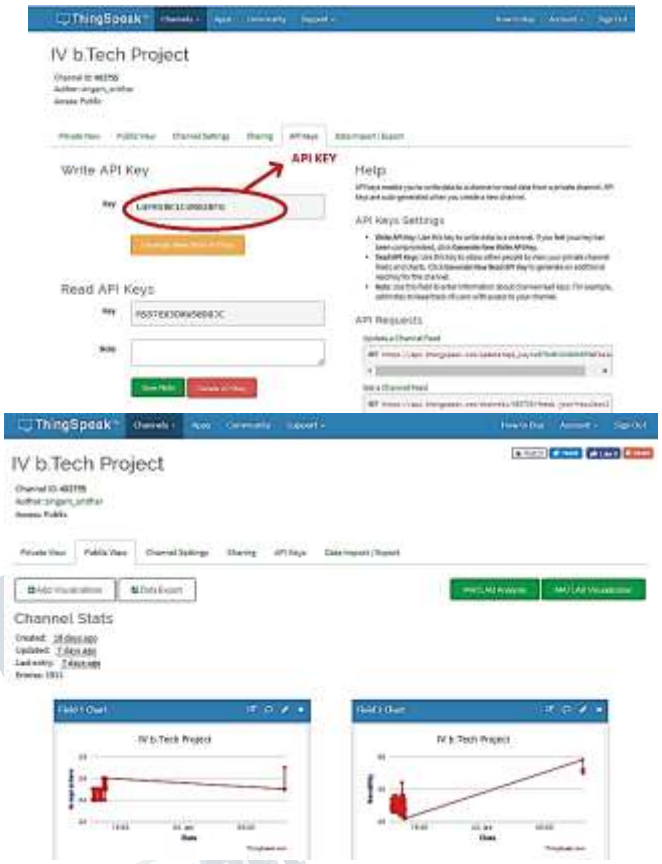
are in photographic light meters, streetlights and various alarms' light burglar alarms, re alarms and smoke alarms.

Fig. 4. LDR.

IV. WORKING MODEL

Working model of the System

Thing Speak IOT Platform:
According to its developers, "Thing Speak" is an open source Internet of Things (IOT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates". Thing Speak has integrated support from the numerical computing software MATLAB from MathWorks allowing Thing Speak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks.



Applications of IOT weather monitoring system:
1) IOT weather reporting system has application to farmers as well. The weather forecasting plays very important role in the field of agriculture.
2) IOT weather monitoring project proves really helpful for monitoring weather at places like volcano, rain forests. It is quite difficult for a human being to stay for longer time at such places. Or even areas which are exposed to radioactive leakage.

V.FUTURE SCOPE

The proposed IoT based weather station can be modified to incorporate many more features. We can add an OLED display to display the surrounding parameters into it. We can also add a GPS module in the design so that the location of the surrounding will also be mailed or messaged to the user along with the surrounding parameters,like, temperature, humidity, pressure, light intensity etc. It can also be modified such that whenever a message or email is sent from a particular phone number or email id to the server, all the environmental parameters of the device along with its location will be delivered to that phone or email id. This device can also be

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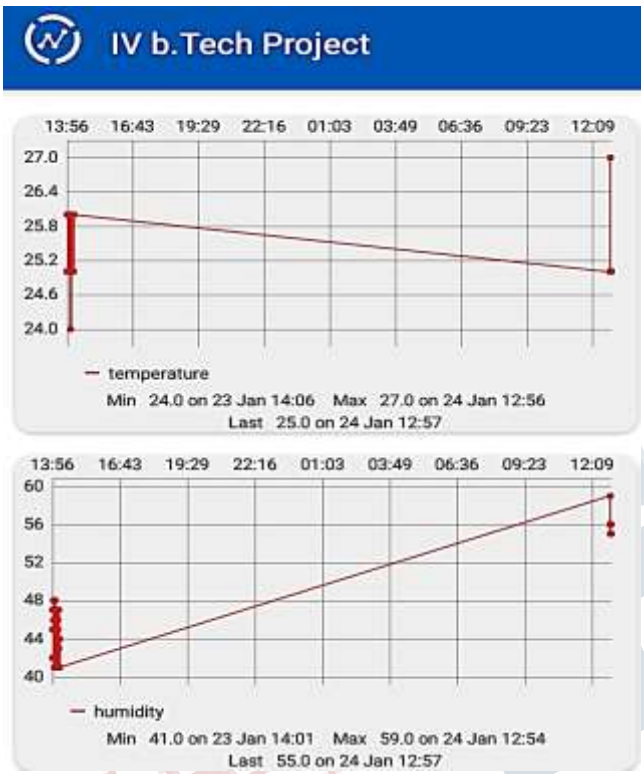
used to monitor a particular room or place whose environmental parameters are required to be monitored continuously.

VI. RESULTS



Observationesults from thing speak iot platform

VII. CONCLUSION

By keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi. The smart way to monitor environment and an efficient, low cost embedded system is presented with different models in this paper. The noise and air pollution monitoring system with Internet of Things (IoT) concept experimentally tested for monitoring two parameters. It also sent the sensor parameters to the cloud (Google Spread Sheets). This data will be helpful for future analysis and it can be easily shared to other end users. This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

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