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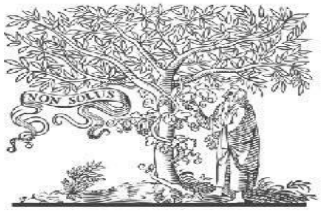

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Paper Authors

Dr. Md. Merajuddin, . Mohammed Masood Ali, Mohammed Adnan, Mohd Gazanfar Ali Khan

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SENSORS BASED ENVIRONMENTAL WEATHER VARIABLES MONITORING USING IOT

1. **Dr. Md. Merajuddin,** Assistant Professor, Department of ECE, Deccan College of Engineering and Technology, Telangana, India

2. **Mohammed Masood Ali** , Student, Department of ECE, Deccan College of Engineering and Technology, Telangana, India, mohdmasood3415@gmail.com

3. **Mohammed Adnan**, Student, Department of ECE, Deccan College of Engineering and Technology, Telangana, India, adnanmuhammed483@gmail.com

4. **Mohd Gazanfar Ali Khan**, Student, Department of ECE, Deccan College of Engineering and Technology, Telangana, India, gazanfar5632@gmail.com

Abstract: The Internet of Things (IoT) is known to play a critical capacity in regular daily existence the entire way through inescapable sensor correspondence networks that epitomize our general climate. Such framework gives the plan capacity to screen fundamental actual occasions produced information that can be moved and put away in the cloud from which it is feasible to share this data by means of utilization and choice is made to make a move for a happened occasion. Ecological Monitoring framework uses sensors for encompassing area moistness and temperature, gas, rain. These information could be used to animate transient conduct like gadget becoming hot or getting cool down and other long-haul insights of the gadgets. The detected information will be sent to cloud space, and the cloud is gotten to by a Smartphone application and results are introduced to end clients. The review is done the sort sensors, microcontroller and its ability, investigation of various kind's economical organization arrangement for ceaseless information assembling and checking. Different instruments used to investigate the information put away on the cloud.

Index Terms: IoT, LCD, Arduino, RPS

1. INTRODUCTION

Weather monitoring system deals with detecting and gathering various weather parameters at different locations which can be analysed or used for weather forecasting. The aim of this system is achieved by technologies such as Internet of Things (IOT) and Cloud. The idea of internet of things is to connect a device to the internet and to other required connected devices. Using Internet the information from the IOT device can easily be transferred to the cloud and then from the cloud to the end user .Weather Monitoring is an essential practical implementation of the concept of Internet of Things ,it involves sensing and recording various weather parameters and using them for alerts, sending notifications, adjusting appliances accordingly and also for long term analysis . Also we will try to identify and

display trends in parameters using graphical representation. The devices used for this purpose are used to collect, organize and display information. It is expected that the internet of things is going to transform the world by monitoring and controlling the phenomenon of environment by using sensors/devices which are able to capture, process and transmit weather parameters. Cloud is availability of computer system resources like data storage, computing power without direct active management of user. The data captured is transmitted to the cloud so that the data could be further displayed .Besides this, the system consists of components such as Arduino UNO board which is a microcontroller board consisting of 14 digital pins, a USB connection and everything used to support microcontroller; DHT11 is Temperature and humidity sensor which is used for detecting these mentioned parameters; WIFI module is used to convert the data collected from the sensors and then send it to the web server. So, in this way weather conditions of any location can be monitored from any remote location in the world. A web page is created which can have access to the cloud and display and organize the required results. Climate plays an important role in human life the unprecedented growth of industries and vehicular traffic have seriously affected the purity of clean air and environment [1]. Satellite weather report system gives condition of present which does not give the exact condition of the particular place. The building sector offers a great potential for the energy savings, where it is necessary to have accurate weather data in the exact location where the building is being built in order to improve the calibration of energy simulation programs [2]. By develop a controlling local weather reporting system with ESP32 and WeMo's D1 mini microcontroller can minimize the error in weather forecast system at exact location. A precision agriculture and farming can be defined as the art and science of using technology to improve crop production [3]. Even though water is a scarce resource, overall 50% of water is wasted in agriculture due to the improper scheduling of irrigation [4]. In this context, the realtime monitoring of water usage in the fields can prevent misuse of water [4]. Use of technology in the field of agriculture plays important role in increasing the production as well as in reducing the extra man power efforts, some of the researches tried for betterment of farmers and provides the systems that use technologies which are helpful for increasing the agriculture yield [5]. Difficulty to monitor weather parameters through offline system such as agriculture zone during certain hazardous envy and critical situations where the people need to check manually the weather condition at the places and it will take time unless it is online system. In the evolving generation of wireless technology, the concept of smart cities and IOT has given a new remark in the world. One such remark leads towards the online smart weather station system [6]. The weather parameters should be able displaying, analysing and monitoring system using ThingSpeak that connect user with internet that visible anywhere in the world. To analyse and monitoring system using ThingSpeak that connect user with internet that visible anywhere in the world. Internet of Things (IoT) is playing a leading role in providing solutions to many applications with the support of software, internet and embedded systems [7]. There is a necessity in security or alarming system that give warning and alerting when there is a bad condition at the place.

The existing technologies are developed using microcontrollers like Arduino, Node MCU etc. and ARM processors like Raspberry Pi [7]. So, machine learning techniques achieved better performance than traditional statistical methods in learning without being expressly customized [8]. Data measured by the stations could be used for various purposes, such as: air quality management to reduce pollutant gases in the local atmosphere and climate monitoring for a better yields of the region crops [9]. To making alarming system this project has uses the Blynk apps to send a notification when the weather at bad condition to the user and also the buzzer sound at the weather station to put the user at home alert about the situation outside. The internet of Things (IoT) is viewed as an innovation and financial wave in the worldwide data industry after the Internet. The IoT is a wise system which associates all things to the Internet with the end goal of trading data and conveying through the data detecting gadgets as per concurred conventions. It accomplishes the objective of keen recognizing, finding, following, observing, and overseeing things . It is an augmentation and extension of Internet-based system, which grows the correspondence from human and human to human and things or things and things. In the IoT worldview, many articles encompassing us will be associated into systems in some shape . It is a current correspondence paradigm that envisions a near future, in which the objects of regular day to day existence will be outfitted with microcontrollers, handsets for computerized correspondence, and reasonable convention stacks that will make them ready to speak with each other and with the clients, turning into a vital piece of the Internet. The IoT idea, consequently, goes for making the Internet much more immersive and unavoidable. Moreover, by empowering simple get to and association with a wide assortment of gadgets, for example, for example, home apparatuses, reconnaissance cameras, checking sensors, actuators, showcases, vehicles, et cetera, the IoT will encourage the advancement of various applications that make utilization of the possibly gigantic sum and assortment of information. Administrations to subjects, organizations, and open organizations. 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). When the objects like environment equipped with sensor devices, microcontroller and various software applications becomes a self-protecting and self monitoring environment and it is also called as smart environment. In such environment when some event occurs the alarm or LED alerts automatically. The effects due to the environmental changes on animals, plants and human beings can be monitored and controlled by smart environmental monitoring system. By using embedded intelligence into the environment makes the environment interactive with other objectives, this is one of the application that smart environment targets. Human needs demands different types of monitoring systems these are depends on the type of data gathered by the sensor devices. Event Detection based and Spatial Process Estimation are the two categories to which applications are classified. Initially the sensor devices

are deployed in environment to detect the parameters (e.g., Temperature, Humidity and CO etc.)while the data acquisition, computation and controlling action (e.g., the variations in the temperature and CO levels with respect to the specified levels). Sensor devices are placed at different locations to collect the data to predict the behaviour of a particular area of interest. The main aim of the this paper is to design and implement an efficient monitoring system through which the required parameters are monitored remotely using internet and the data gathered from the sensors are stored in the cloud and to project the estimated trend on the web browser. A solution for monitoring the temperature, humidity and CO levels i.e., any parameter value crossing its threshold value ranges, for example CO levels in air in a particular area exceeding the normal levels etc., in the environment using wireless embedded computing system is proposed in this paper. The solution also provides an intelligent remote monitoring for a particular area of interest. In this paper we also present a trending results of collected or sensed data with respect to the normal or specified ranges of particular parameters. The embedded system is an integration of sensor devices, wireless communication which enables the user to remotely access the various parameters and store the data in cloud. Weather Monitoring Systems are used to keep track of the ever-changing weather conditions. The information obtained by such sensors is used to report weather and maintain track of environmental changes in a given location. Such information is particularly useful in the study of the earth as well as the analysis of changing climatic and environmental conditions in a given location. Furthermore, the collected data and analytics can be used in a range of applications, including agriculture, geology, mining, and building weather forecasting models. A simple weather monitoring system is built in this project, which can monitor the temperature, humidity, barometric pressure and rain condition of a location. This project's weather monitoring system is an IoT gadget based on Node MCU. Node MCU is an IoT board that works with Arduino. To write the program code for any Node MCU board, we can use Arduino IDE or we can first create an account on the Arduino Cloud Platform and link his user account to the Node MCU board. The program code can then be developed on the Arduino website's Web IDE and sent over the internet to a registered IOT board. If the selected board, in this case NodeMCU, is turned on and connected to the Arduino cloud service, the code is burned to the board over the air via an internet connection, and the board begins to operate according to the transferred code. In our project we have interfaced four sensors for temperature, humidity, barometric pressure, rain and light intensity measurement those are DHT11, BMP180, FC-37, LDR module respectively.

2. LITERATURE REVIEW

1. Hammi, B., Khatoun, R., Zeadally, S., Fayad, A., &Khoukhi, L. (2018). IoT technologies for smart cities

The large deployment of Internet of things (IoT) is actually enabling smart city projects and initiatives all over the world. Objects used in daily life are being equipped with electronic devices and protocol suites in order to make them interconnected and connected

to the Internet. According to a recent Gartner study, 50 billion connected objects will be deployed in smart cities by 2020. These connected objects will make the authors' cities smart. However, they will also open up risks and privacy issues. As various smart city initiatives and projects have been launched in recent years, they have witnessed not only the expected benefits, but the risks introduced. They describe the current and future trends of smart city and IoT. They also discuss the interaction between smart cities and IoT and explain some of the drivers behind the evolution and development of IoT and smart city. Finally, they discuss some of the IoT weaknesses and how they can be addressed when used for smart cities.

2.S. Zafar, G. Miraj, R. Baloch, D. Murtaza, and K. Arshad, "An IoT Based Real-Time Environmental

Monitoring System Using Arduino and Cloud Service Internet of Things (IoT) is expected to play a major role in our lives through pervasive systems of sensor networks encompassing our environment. These systems are designed to monitor vital physical phenomena generating data which can be transmitted and saved at cloud from where this information can be accessed through applications and further actions can be taken. This paper presents the implementation and results of an environmental monitoring system which employs sensors for temperature and humidity of the surrounding area. This data can be used to trigger short term actions such as remotely controlling heating or cooling devices or long term statistics. The sensed data is uploaded to cloud storage and an Android application accesses the cloud and presents the results to the end users. The system employs Arduino UNO board, DHT11 sensor, ESP8266 Wi-Fi module, which transmits data to open IoT API service ThingSpeak where it is analyzed and stored. An Android application is developed which accesses the cloud and displays results for end users via REST API Web service. The experimental results show the usefulness of the system.

3.Md. Mehedi Islam, Md. Al-Momin, A.B. M. Tauhid, Md. Kamal Hossain, SumontoSarkerIot and Weather Based Smart Irrigation Monitoring and Controlling System for Agriculture

This work is primarily about the improvement of current agricultural practices by using modern technologies for betterment of agriculture and modernization the traditional agriculture system. Internet of Things(IoT) plays a crowning role in smart agriculture. The project will help root level farmers to get into smart irrigation in term of agriculture. Which provide greater service in less cost in irrigation and lowest man power. Smart irrigation is an empirical concept because IoT sensors capable of providing information about their agriculture fields and making irrigation automated by Internet of Things. The feature of this paper includes monitoring temperature, humidity, pH and water level in agricultural field through sensors. The data from sensors are sent to Web server database using wireless transmission. Controlling of all these operations will be through any remote smart device or computer connected to internet and rain condition is also applied to the operations. It will be performed by interfacing sensors, IFTT app, Smart agriculture app, Wi-Fi and raspberry pi.

4. Firdhous, M., &Sudantha, B. {Cloud, IoT}-powered smart weather station for microclimate monitoring

Microclimate monitoring is important in many practical situations involving agriculture, archaeology and other environments. Microclimate is defined as the environmental conditions that differs from that of surrounding areas. In certain situations, these different conditions are artificially generated for creating a conducive environment for achieving better results. Environments such as greenhouses and climate controlled beehives require to maintain their environments within close variations for optimum results. Similarly archaeological sites including show caves, frescos and parks get disturbed easily by the changes in their immediate environments. Hence monitoring and managing these environments is a must for the proper maintenance of them. In this paper, the authors present an IoT enabled microclimate monitoring weather station that can be installed anywhere and monitor the required parameters from remotely. The modular design enables the station to be easily modified to suit any environment. The weather station collects and transmit data at fixed intervals to the cloud powered processing system over the mobile communication network . The sensors have been calibrated using the standard calibration methods using conventional devices as references. The results obtained from the prototype shows that the weather station works satisfactorily reading the real environment conditions.

3. METHODOLOGY

This project will focus on development of the Thing Speak an IoT platform that to show the data of the sensor. The method divided into two parts which are hardware and software development part. The hardware development involves the circuit construction and develops the prototype. Meanwhile, the software part involves the IoT coding, circuit schematic diagram, circuit simulation and data acquisition. By using three (3) types of sensor to monitoring the weather parameter that are temperature, humidity, rain, and air quality the system will be able to display the weather condition by an analysis about the current weather with the sensor value data. All the data will be control by a microcontroller ESP32 and Wemos as the client that will receive the sensor data from ESP32 and display it on OLED. Furthermore, this system will also be seen on ThingSpeak channel that has been created to simplify user to check online and also an android application that is Blynk to display the sensor data. The data collected will be analyse and compare it with Jabatan Meteorologi Malaysia to ensure the precise of data and weather condition on current condition. The Internet of Things (IoT) will connect the system with the user wireless and online without the need of checking manually.

Components Used

- ARDUINO UNO
- Temperature Sensor
- Humidity Sensor
- Gas Sensor
- Rain Sensor
- LCD

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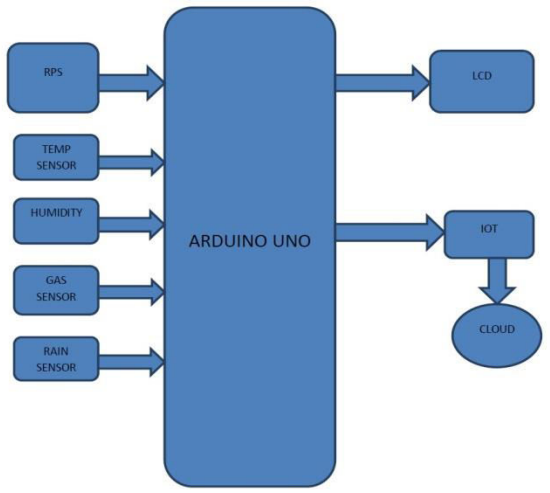

Fig 1 Circuit diagram For Proposed System

4. IMPLEMENTATION

The item for the proposed system is executed utilizing the Arduino IDE.

Integrated Development Environment (IDE) for Arduino: A substance chief for composing code, a message region, a message terminal, a toolbar with buttons for normal undertakings, and a progression of menus are totally expected for the Arduino IDE. It talks with the Arduino equipment and sends dares to it.

File

New creates a new supervisor instance with all of the essential features of the drawing present.

allows you to browse the envelopes and papers on your PC to create a sketch record.

At the point when you open Later, a rundown of the latest drawings that might be gotten to is shown.

Within the envelope structure of Sketchbook, the corresponding representation is displayed in a different proofreading case whenever any name is mentioned.

Models All models provided by the Arduino Programming (IDE) or library are displayed when this menu option is selected. The models are arranged in a tree, making it simple to search by library or subject.

closes the Arduino Programming instance clicked.

Save The current name is used to save the artwork. A name will be proposed for the record in a "Save as..." exchange on the off chance that it has not as of now been named.

You can save the current drawing under a different name by selecting "Save as..."

It shows the printing-explicit Page Setting window.

In accordance with the Page Arrangement limits, Print sends the ongoing drawing to the printer.

By clicking Inclinations, you can change many IDE settings, like the language of the IDE interface.

All IDE windows are closed by Stop. The next time you start the IDE, the open drawings that were open when Stopped was selected will be restored immediately.

Edit

- Record at least one stage of modification as a fix or retry; You can use retry again when you come back.

- Cut The chose text is replicated to the clipboard and eliminated from the editor.
- After reproducing the text from the proofreader, duplicate copies the selected text and copies it to the clipboard.
- Copy the code for your sketch to the clipboard in a format that is suitable for presenting on the discussion with punctuation shading. Duplicate for Collection
- Duplicate as HTML recovers the code from your sketch and copies it to the clipboard as HTML, ready for use on websites.
- Glue the contents of the clipboard into the supervisor by copying them there from the clipboard.
- The entire selection made by the manager is included in Select All.
- Remark/Uncomment Inserts the /remark tag at the beginning of each line or removes it altogether.
- Indent adds or subtracts a space at the beginning of each selected line, moving the text one space to the side or removing a space.
- When you click "Find," the "Find and Supplement" window opens. Here, you can use a few models to figure out the text you need to look for in the ongoing plan.
- Depending on where the cursor is, Find Next will highlight the following event, if any, of the string that was entered in the Find window as the pursuit object.
- Based on where the cursor is, Find Earlier highlights the preceding event of the string in the Track down window.

Sketch

Verify or arrange your drawing after checking for errors while it was being made. In the control center section, it will show the factors and the amount of memory used by your code.

Transfer stacks the parallel record onto the designated board via the predefined Port after aggregation.

Using a software engineer to transfer This will replace the board's bootloader; Go to Devices > Consume Bootloader to reactivate the option to transfer to the USB sequential port. Nevertheless, it enables you to make use of the entire Blaze RAM for your artwork. Keep in mind that following this advice will not result in the wires lighting up, assuming it isn't too much work. Navigate to Apparatuses > Consume Bootloader to accomplish this.

Send Out Completed Double produces a.hex file that can be filed or sent to the board using a variety of tools.

In the ongoing representation organizer, open the Presentation the Sketch Envelope order.

Add a library to your drawing by using the #include instruction at the beginning of your code. For more details, see the libraries listed below. From this menu item, you can also import new libraries from.zip files and launch the Library Director.

A new document is added to the drawing using Embed Document... it will be duplicated from its current location). As is customary for assets like documentation, the record is saved in the sketch's data subfolder. The sketch programming excludes the objects in the information envelope because they have not been gathered.

Tools

Your code is precisely arranged by Auto Arrangement by indenting it so that the declarations contained within the wavy supports are also indented and the opening and closing wavy supports line up.

The current drawing is saved as a.zip file using Document Sketch. The chronicle and the artwork are kept in the same envelope.

Reload the page and resolve the encoding issue. The proofreader's single map encoding and the roast guides of other functioning frameworks are unaffected by this.

Screen for Successive beginnings the information exchange with any connected board on the at present chosen Port and opens the comparing screen window. On the off chance that the board upholds it, this for the most part resets it. Perform a reset to prevent the sequential port from opening.

Board Select your preferred board. The various sheets are depicted in the following image.

All of your PC's real and simulated sequential devices are stored in this menu. You should feel immediately energized as soon as you enter the high level gadgets menu.

Software developer: Programming a board or chip without using the USB-sequential connection that is already installed is done with a hardware developer. In any case, if you want to modify a brand-new microcontroller, you will require this.

Consume Bootloader You can embed a bootloader into the microcontroller of an Arduino board by utilizing the options in this menu. This is useful if you buy a different ATmega microcontroller, which sometimes doesn't have a bootloader, but it doesn't affect how the Arduino board works on its own. Make sure that the appropriate board has been selected from the Sheets selection before eating the bootloader on the goal board. The necessary wiring was also installed as a result of this direction.

5. RESULTS AND DISCUSSION

Ease of monitoring your local weather conditions in real time from anywhere in the world. For storing weather and environment data for short and long term for studying weather pattern changes and to understand how human induced climate change affected your local weather. Easy deployment of the setup for monitoring local atmospheric conditions and microclimates for weather forecasting and prediction. Farmers need to know the temperature, relative humidity, soil moisture, rain fall etc. to enhance their crop production and the following type

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of sensors are utilized to obtain the data: Temperature sensor, Humidity sensor, Soil moisture sensor, Rain sensor, Gas Sensor etc.

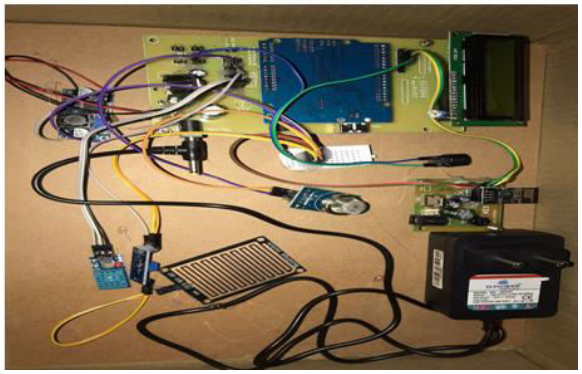

Fig 2 Hardware Circuit

Real Time Experimental Results

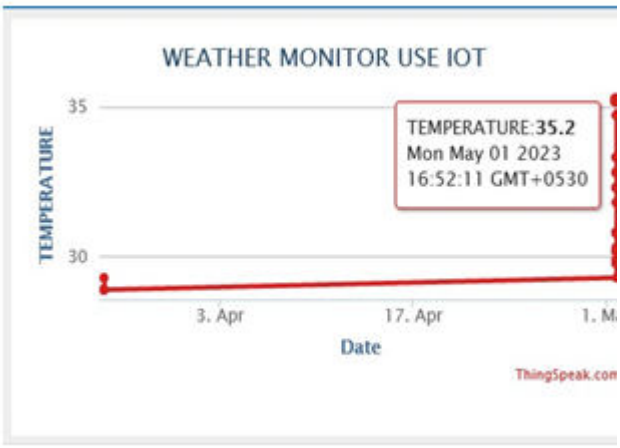

Fig 3 Output Screen

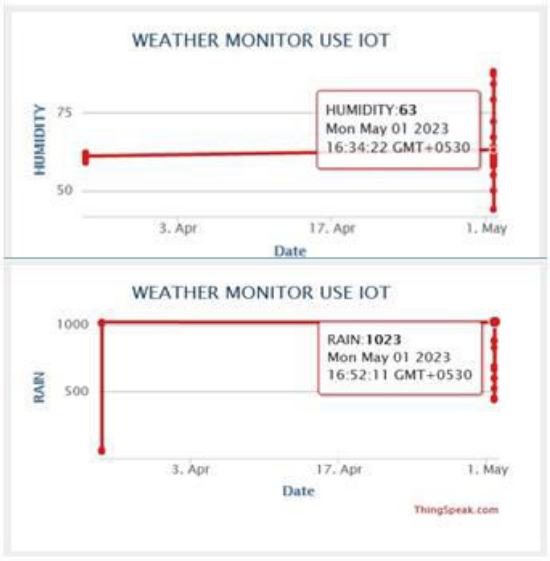

Fig 4 Output Screen

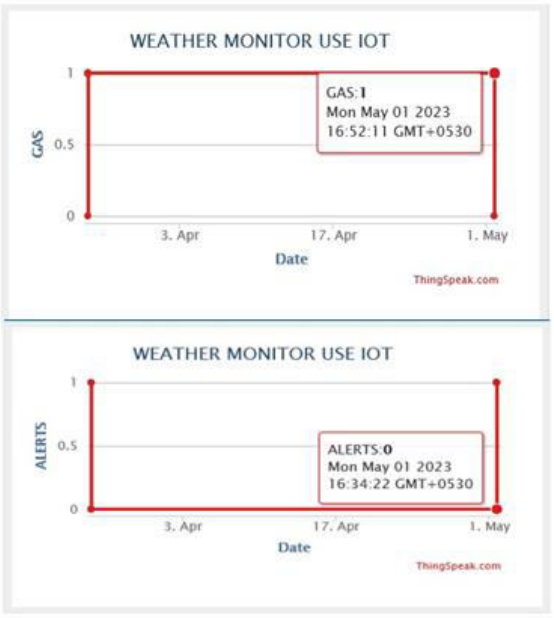

Fig 5 Output Screen

Date	Humidity	Temperature	Rain	Gas
May 01 2023	63%	35.2	1023	1
May 01 2023	44%	29.3	1019	0
May 01 2023	63%	28	1023	1

Table Real Time Experimental Results

6. CONCLUSION

This paper finally concludes that traditional way of agriculture and greenhouse monitoring has lot of defects, following traditional way in this present scenario does not result any fruitful result. To overcome this problem we derived a solution, that is nothing but merging the traditional way of greenhouse monitoring system with a technology called IOT. It provides the comfort of remote monitoring and automation. By keeping the weather station in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to use the sensor devices in the environment for collecting the data and analysis. By using sensor devices in the environment, we can bring the environment into real life. Then the collected data and analysis results will be available to the user through the Wi-Fi. The smart way to monitor the environment an efficient, low-cost embedded system is presented in this paper. It also sent the sensor parameters to the cloud. This data will be helpful for future analysis and it can be easily shared to other users also. This model can be 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.

7. FUTURE SCOPE

One can implement a few more sensors and connect it to the satellite as a global feature of this system. Adding more sensors to monitor other environmental parameters such as CO2, Pressure and Oxygen Sensor. In aircraft, navigation and the military there is a great scope of this real-time system. It can also be implemented in hospitals or medical institutes for the research & study in "Effect of Weather on Health and Diseases", hence to provide better precaution alerts. An alarm can be added to the circuit to notify the user in case of excess smoke conditions i.e. Smoke alarm. An SMS can be sent to clients notifying them with the temperature/humidity/smoke parameters.

REFERENCES

[1] Subhashree Ghosh, Sumaiya Sayyed, Kanchan Wani, Mrunal Mhatre, Hyder Ali Hingoliwala, "Smart Irrigation: A Smart Drip Irrigation System using Cloud, Android and Data Mining" 2016 IEEE International Conference on Advances in Electronics, Communication and Computer Technology (ICAECCT) Pune India. Dec 2-3, 2016.

[2] S. Darshna, T.Sangavi,Sheena Mohan, A.Soundharya, Sukanya Desikan "Smart irrigation System" IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) , Volume 10, Issue 3, Ver. II (May -Jun.2015).

[3] Chandan kumarsahu, pramiteebehera "A low cost smart irrigation control system" IEEE sponsored 2nd international conference on electronic and communication system 2015.

[4] M. Srbinovska, C. Gavrovski, V. Dimcev, A. Krkoleva, V. Borozan, "Environmental parameters monitoring in precision agriculture using wireless sensor networks" J. Clean. Prod., 88 (2015), pp. 297-307.

[5] Srishti rawal "IOT based smart irrigation system" international journal of computer application, Volume 159 – Feb 2017.

[6] Pranita A. Bhosale, Prof. V. V. Dixit, "Water SavingIrrigatio Automatic Agricultural Controller", International Journal of Scientific & Technology Research volume 1, Issue 11, December 2012.

[7] Pavitra D.S and M.S Srinath "GSM based automatic irrigation control system for efficient use of resources and crop planning by using an android mobile" IOSR journal of mechanical and civil engineering Volume 11, Issue 4 ver. I (Jul-Aug 2014).

[8] Prabhu, Boselin and Pradeep, M. and Gajendran, E., "An Analysis of Smart Irrigation System Using Wireless Sensor Network" Star Vol.5 Issue 3(3), March (2017).

[9] P. Divya Vani and K. Raghavendra Rao "Measurement and Monitoring of Soil Moisture using Cloud IoT and Android System" Indian Journal of Science and Technology, Vol 9(31), DOI: 10.17485/ijst/2016/v9i31/95340, August 2016.

[10] E.Sowmiya, S.Sivaranjani "Smart System Monitoring on Soil Using Internet of Things (IOT)" International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 02 | Feb (2017).

[11].MaryNsabagwaa,MaximusByamukamab,EmmanuelKondelaa,"TowardsarobustandaffordableAutomaticWeatherStation",journalhomepage:

[12]www.elsevier.com/locate/deveng.

[13]. Ravi Kishore Kodali and Snehashish Mandal "IoT Based Weather Station" 2016InternationalConferenceonControl,Instrumentation, CommunicationandComputationalTechnologies(ICCICCT)978-1-5090-5240-0/16/$31.00,IEEE,(2016).

[14]. Ravi Kishore Kodali and Archana Sahu "An IoT based Weather Information PrototypeUsing WeMos" 2016 2nd International Conference on Contemporary Computing andInformatics(ic3i),978-1-5090-5256-1/16/$31.00,IEEE,(2016)

[15]. Zi-Qi Huang, Ying-Chih Chen and Chih-Yu Wen, "Real-Time Weather Monitoring andPrediction Using City Buses and Machine Learning", Vols. 3 to 21 Published 10 September(2020)

[16].KavyaLadi,AVSNManoj,GVNDeepak,"IOTBasedWeatherReportingSystemtoFind Dynamic Climatic Parameters", International Conference on Energy, Communication,Data Analytics andSoftComputing(ICECDS-2017)

[17]. P. Susmitha, G. Sowmyabala "Design and Implementation of Weather Monitoring andControlling System", International Journal of Computer Applications (0975 – 8887) Volume97–No.3,(July2014)

[18]. Tanmay Parashar1, Shobhit Gahlot2, Akash Godbole3, Y.B. Thakare4 "WeatherMonitoring System Using Wi-Fi", (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value(2015):78.96,2015

[19]. Nutant Sabharwal, Rajesh Kumar, Abhishek Thakur, Jitender Sharma "A LOW-COSTZIGBEE BASED AUTOMATIC WIRELESS WEATHER STATION WITH GUI ANDWEBHOSTINGFACILITY"e-ISSN:1694-2310|p-ISSN:1694-2426,Vol.1,Spl. Issue2 (May2014)

[20]. M. Prasanna, M. Iyapparaja, M. Vinothkumar, B Ramamurthy, S.S. Manivannan," AnIntelligent Weather Monitoring System using Internet of Things", International Journal ofRecent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue4, November(2019)