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IoT Based Weather Monitoring System with Data Logger System

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Abstract: *In this system, a network of IoT sensors is strategically deployed to capture a comprehensive range of weather parameters such as temperature, humidity, atmospheric pressure, wind speed, and rainfall. These sensors transmit their data wirelessly to a central data processing unit, which includes a robust data logger system capable of handling extensive datasets. This historical data not only supports real-time monitoring but also facilitates in-depth trend analysis and climate studies. The proposed system aims to create a comprehensive solution for real-time weather data acquisition and logging. Leveraging the Internet of Things (IoT) technology, the system incorporates various sensors to collect essential weather parameters such as temperature, humidity, and atmospheric pressure. These sensors are strategically deployed in different locations to ensure a diverse and accurate representation of weather conditions. The collected data is transmitted wirelessly to a central server, facilitating remote monitoring and analysis. The inclusion of a data logger system ensures the archival of historical weather information, allowing users to access and analyze trends over time. This project not only provides valuable insights for meteorological applications but also showcases the potential of IoT in creating efficient, data-driven solutions for environmental monitoring. The IoT-based weather monitoring system addresses the growing need for reliable and accessible weather data in diverse applications, including agriculture, infrastructure planning, and disaster management. By combining sensor technology, wireless communication, and data logging capabilities, the system offers a scalable and adaptable solution for both real-time monitoring and long-term data analysis.*

Keywords: Internet of Things (IoT), IoT Sensors (Temperature, Humidity, Atmospheric Pressure, Wind Speed, and Rainfall), Network, Data Acquisition and Logging, etc

I. INTRODUCTION

The importance of weather monitoring is existed in many aspects. The weather conditions are required to be monitored to maintain the healthy growth in crops and to ensure the safe working environment in industries, etc. 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.

An automated weather station is an instrument that measures and records meteorological parameters 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. If the data is stored in a data logger, recorded data must be physically downloaded to a computer at a later time for further processing. Therefore, the communication system is an essential element in an automated weather station. Today, automated weather stations are available as commercial products with variety of facilities and options. Although automated weather stations can be built and implemented in remote parts of Sri Lanka to bring down the cost of maintaining weather stations, until recently, not much emphasis has been given for

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building and using such instruments locally. Automated weather stations have been developed in universities by interfacing meteorological parameter monitoring sensors to microcomputer/commercially available data loggers with communication devices or through serial and parallel ports to obtain hard copies of weather data.

II. LITERATURE SURVEY

In this paper [2], the author elaborates how the weather prediction system is becoming a crucial challenge in every Weather extreme event that causes an adverse effect of the system on lives and property as well. Hence the accuracy of weather data is being one of the critical challenges to enhance the weather prediction skills and build up the resilience to effect of detrimental weather report condition. The author describes that Uganda and various other developing countries have looked challenges in developing timely & accurate weather data due to scarce weathers observation. The scarce weather monitoring is a part of the high cost of developing automatic weather situations. The restricted funding is available to national meteorological services of the respective countries. In this proposed system the author firstly takes care of the problems and then applies them. The author proposed an Automatic weather monitoring Station based on a wireless sensor network. The planning of the author is to develop three generations of Automatic weather stations or AWS prototypes. In this research, the author evaluates the 1st-generation AWS prototype to improve the 2nd generation depending upon the need and generation. The author provides a suggestion to improve the nonfunctional requirement such a power consumption, data accuracy, reliability, and data transmission in order to have an Automatic Weather Station. The non-functional requirement collapsed with cost reduction in order to produce a robust and affordable Automatic Weather Station (AWS) Therefore the proposed work, like developing countries like Uganda will be able to acquire the AWS in suitable quantities. So that it can improve the weather forecasting

The author in [2], presents an IoT-based weather monitoring system. n this research, the environmental parameter can be retrieved through sensors. The author uses a different sensor to scale the various parameter like humidity, temperature, pressure, rain value & the LDR sensor is used. The system also calculates the dew point value from the temperature prototype. The temperature sensor can be used to measure the value of the particular area, room, or any place. With the help of the LDR sensor, the light intensity can be used as described by the author. The author in this used an additional functionality of the weather monitoring as SMS alert system based on the exceed the value of the sensing parameters as temperature, humidity, pressure, light intensity, and rain value. The author also adds an email and tweet post alerting system. The author in this system uses node MCU 8266, and various sensors.

In this paper [3], the author represents a low-cost live weather monitoring system using OLED display, in which the author displays the various fields where the IoT has produced innovative things in the system. The author described A new revolutionary system. This measures the real-time Weather's condition. The monitoring weather situation is very much helpful for everyone either for farmer or industry or daily working people or for school as well. So, the author by developing a live weather monitoring system reduced the difficulty level for farmers and industry as well. In this paper, the author uses an OLED display that will display the weather conditions and In the proposed model, the author uses an ESP8266-EX microcontroller-based WeMos D1 board executed on Arduino, that retrieved the data from the cloud. WeMos D1 is a wifi module that is developed on ESP- 8266EX microcontroller. It has a 4MB flash memory. It one of the Excellent which is programmed with node MCU and Arduino ide. In this paper Author uses only two gadgets to measure the weather conditions i.e., Wemos and OLED, After the connection, it will store the data on the cloud for storing data a thingspeak website is used to display the data regarding weather. The system displays the data on OLED and thing speak cloud. The author's aim is to obtain live information on weather conditions on OLED display.

The author in [4], proposed a system that monitors and predicts the weather condition by which anyone can plan for our day-to-day life. This activity became helpful in every field either in agriculture or industry. So as to achieve monitoring and predicting weather info, the author uses 2 stages of the weather management system. In which they amalgamated the information from the sensors, bus mobility, and deep learning technology is used to allow a weather reporting system in stations and buses in real-time. Forecasting of weather is achieved through the friction model. Depending upon the sensing measurement from vehicles like buses, the work incorporates the strength of local information processing. The author talks about in stage-I, sensing of weather's condition, multilayer perception model and long-term memory are trained and then it will verify using temperature data, humidity, air pressure of test environment. In Stage-II, the training is applied to learn the time series of weather information. To get accurate data or not, to check the

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system performance, the author comparing the predicted weather data and actually obtained data from the environment Protection Administrator and central Baeuro of Taichung observation system that calculate the prediction of accuracy. The author finally talks about the proposed system has reliable performance on monitoring of weather. And this model also proposed a one-day weather forecast or prediction via the training model. So finally, the author demonstrates that this system presents a real-time weather monitoring and prediction system using bus information management. The author represents 4 basic components 1- Information management. 2- Interactive bus stop 3-achine learning predictive model 4- weather information platform. In this, information shown via dynamic chart.

The author [5], implement an IoT-based weather monitoring system, in this research paper, the author describes that how with the help of IoT technology, the weather can be monitored. And which provide the info of climate-changing conditions. With the help of this project, people can be aware of the climate condition changes. It gives an accurate and efficient output and the algorithm as the swarm is used to implement for further improving the accuracy. So, in this project, the author aims to make a weather monitoring with the help of IoT. In this project, the hardware and software are used which makes it easy to implement. In the project, the author uses a different sensor to collect the information of the climate and stored it in the cloud. For this storage, the website www.thingspeak.com is commonly used for Internet of things projects. And from the cloud storage space, it extracts the whole weather data and uploads it to the android mobile application using an API key. Tools which detect the rain drops, is called rain sensor. Once the plague reveals the raindrops on the strips and the voltage is considered from that.

III. PROPOSED SYSTEM

The proposed system introduces a novel approach to gathering and managing weather data using Internet of Things (IoT) technology. The system incorporates a network of weather sensors strategically placed in different locations to capture diverse and accurate meteorological information, including temperature, humidity, and atmospheric pressure. These sensors are connected to a central hub, facilitating real-time data transmission to a cloud-based server.

The key innovation lies in the integration of a robust data logger system, enabling the archival of historical weather data for further analysis. This historical data repository not only supports long-term trend analysis but also enhances the system's capacity for predictive modeling. Users can access real-time weather updates and retrieve historical data through a user-friendly interface, making the system valuable for a range of applications, from agriculture to urban planning.

The proposed system is poised to provide a scalable and efficient solution for weather monitoring, leveraging the power of IoT to enhance data accuracy, accessibility, and usability. By combining real-time updates with historical records, it caters to the needs of diverse users, fostering informed decision-making in areas heavily influenced by weather patterns.

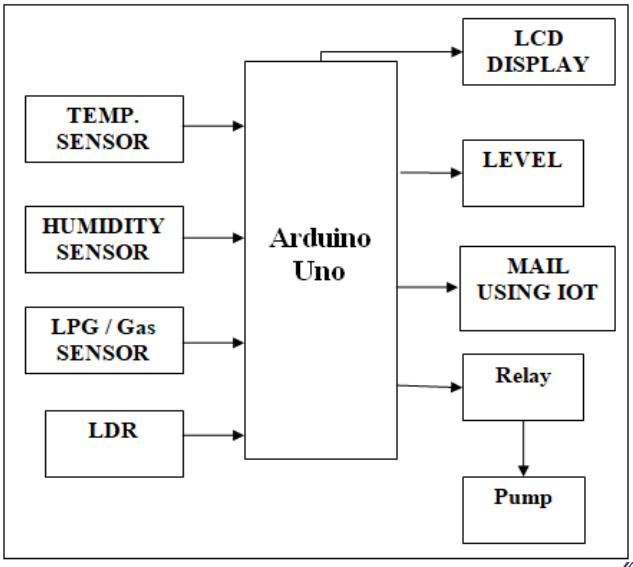

Fig.1: Block Diagram

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The system functionality includes the working process of the entire system after integrating all the peripherals along with software. The system works in three phases, one is reading the data from the sensors, and another one is sending the data to the Atmega 328 pi and finally controlling the devices as per the data obtained.
In This Project We Are Using four Sensors are LPG gas Sensor, humidity sensor, Temperature Sensor, CO2 Sensor. The Related Strings are show on LCD. If any value goes beyond limit then alert notify by buzzer and send related email to the user. Also if temperature goes beyond settled limit and LPG gas detected then FAN will get ON.

IV. CONCLUSION

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.

V. 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.

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