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Thalavapalayam, Karur – 639 113.

WEATHER MONITORING SYSTEM

A MINOR PROJECT - II REPORT

Submitted by

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BACHELOR OF ENGINEERING

in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

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BONAFIDE CERTIFICATE

Certified that this **18ECP104L - Minor Project II** report "**WEATHER MONITORING SYSTEM"**is the bonafide work of "**ATIF SAFIQ .M (927621BEC017), KATHIRVEL .S (927621BEC078), KISHOR .J.K (9276221BEC092), LOGESH BABU .B (927621BEC105)** " who carried out the project work under my supervision in the academic year 2022-2023 / EVEN Semester.

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This Minor project-II report has been submitted for the **18ECP104L – Minor Project-II**

Review held at M. Kumarasamy College of Engineering, Karur on ……

PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to full fill the industrial expectations.

Abstract	**Matching with POs, PSOs**
WMS,IoT,PWS,AWS, UV,IRS,INSAT	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PO9,PSO1

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ABSTRACT

The system proposed for monitoring weather conditions in a particular place like temperature, humidity, CO Level using sensors, sensors detect changes in environment and send it to the users for making statistical analysis, IoT is the technology used for monitoring, collecting, controlling and connecting the system to worldwide, which is the more efficient and advanced solution for accessing the information in the world. In this post we are going to construct an IoT based weather monitor system using Arduino which can report us weather status like atmospheric pressure, temperature, humidity, air quality, light intensity etc. of your locality in real time and the data from the sensors are logged to an IoT cloud service called Thing speak for monitoring and analysis. It is a system that involves in acquiring weather and environment data using advanced electronic sensors and sending them to a web server via internet for real time weather monitoring and storage of data for future analysis and study Farmers need to know the temperature, relative humidity, soil moisture, rain fall etc. to enhance their crop production and the following type of sensors are utilized to obtain the data. For an airplane pilot he/she needs to know wind speed, wind direction, atmospheric pressure, precipitation, visibility etc. before they takeoff and they use the following sensors.

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LIST OF ABBREVIATIONS

ACRONYM		ABBREVIATION
WMS	-	Weather Monitoring System
IoT	-	Internet Of Things
PSW	-	Present Weather Sensor
AWS	-	Automatic Weather System
UV	-	Ultra Violet
INSAT	-	Indian National Satellite System
NWS	-	Numerical Forecast Models

CHAPTER 1

INTRODUCTION

1.1. THE BACKGROUND

The WMS uses high accuracy sensors for the measurement of radiation, albedo, wind speed, wind direction, air temperature, humidity, module temperature, soiling, and other parameters. There is a wide range of sensors available with us for selection from global sensor manufacturers

1.2. THE PURPOSE

We are aware that the projects of different sizes have different requirements and one size fits all approach does not work. Therefore, we research and test a large number of sensors before recommending you the most optimum combination from the performance as well as the cost point of view. The weather sensors connect with a high-reliability data logger manufactured by Aeron for precision and reliable data collection from the sensors.

1.3. THE SCOPE

The Scope of 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.

CHAPTER 2

LITERATURE SURVEY

2.1. SURVEY AMPLIFICATION

Event Detection-based and Spatial Process Estimation are the two kinds to which applications are classified. We are aware that the projects of different sizes have different requirements and one size fits all approach does not work. Therefore, we research and test a large number of sensors before recommending you the most optimum combination from the performance as well as the cost point of view.

This ecosystem consists of a microcontroller which acts as the main processing unit for the entire system and where all the sensors (e.g., Humidity Sensors and Temperature Sensors) and devices are connected. When a proper connection is established with the server device, the data collected from various sensor devices implanted in specific areas of interest is immediately relayed to the webserver. Using any Wi-Fi module such as Node-MCU, this processed sensor data is then uploaded and stored on a website to serve as a database.

We will be able to monitor and control the system using the webserver page. It provides information on the variations in humidity, temperature, and CO levels in the exact region where the embedded monitoring device is installed. The data collected will be saved on the cloud. The cloud data can be used for parameter analysis and continuous monitoring. Temperature, humidity, and carbon monoxide levels in the air are recorded at regular intervals. All this information will be stored in the cloud, allowing us to monitor temperature, humidity, and CO levels at a given place at any time.

2.2. SURVEY ON SINGLE BOARD STEREO AMPLIFIER

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 data collected will be saved on the cloud. The cloud data can be used for parameter analysis and continuous monitoring. Temperature, humidity, and carbon monoxide levels in the air are recorded at regular intervals.

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.

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. Especially if you are using a substantially different process, please consult with the teaching staff early on about what an appropriate set of specs to target would be. We will be able to monitor and control the system using the webserver page

CHAPTER 3

METHODOLOGY

In this part, you will develop a design methodology for the TIA given gain-bandwidth constraints, with the goal of minimizing power. To prove that your design methodology is flexible with input specifications, you will need to submit two instances of your TIA targeting the following two sets of specifications. Note that the phase margin specification is only applicable if you use a feedback-based topology, this particular set of specifications may or may not be feasible. Especially if you are using a substantially different process, please consult with the teaching staff early on about what an appropriate set of specs to target would be. We will be able to monitor and control the system using the webserver page. It provides information on the variations in humidity, temperature, and CO levels in the exact region where the embedded monitoring device is installed. The data collected will be saved on the cloud. The cloud data can be used for parameter analysis and continuous monitoring.

3.1. TOOLS USED HARDWARE REQUIREMENT

- Raspberry Pi,
- Ardunio Mege,
- DTH11,
- Light Intensity,
- Sensor BH1750,
- MQ-135,
- BME-280,
- Rain drop Sensor.

3.2. POWER SUPPLY

Precise weather monitoring system for assessment and system operations are a requirement for Renewable projects and other Industrial applications. In Solar Plants, Weather Monitoring stations are the key in the initial assessment to finding optimal locations for solar radiation and improving plant efficiency. It provides end-to-end solutions in hardware and software for Renewable Plants and other Industrial applications. One our offering is “Surya”, high precision weather monitoring stations with long term stability for the most critical parameters of power plants along with collecting information, transferring it back to the control site, carrying out necessary analysis and control, and then displaying this data to a central database.12V input power supply for the WMS circuit.

3.3. SOURCE OF THE WMS

The integration of real-time data into supply chain plans is assisting in the transportation of perishable commodities across the country, resulting in increased productivity and efficiency. The environment where a manufacturing plant is located can have an unnoticed but significant impact on the final product. Small changes in temperature and humidity, for example, might impact the way industrial glues adhere, affecting product quality directly. A machine, for example, is built to run at a temperature of 100°F. If it runs in much hotter or colder areas, it will have a completely different life cycle.

Businesses may have a more accurate perspective of the condition of their important business assets with an IoT weather reporting system, allowing them to optimize their maintenance and efforts in the event of asset breakdown. With the current trend of technology, cars are increasingly becoming digital computers on wheels. They are constantly gathering data about driving behaviour and component

conditions. Its compilation with advanced analytics of real-time weather data gives a complete picture of how weather conditions impact driver behaviour and safety in different scenarios

An accurate weather report is forecasted directly or indirectly to influence other sectors of the economy to raise the need for a system that facilitates higher accuracy of real-time monitoring and future weather prediction. But what exactly are the different sectors that benefit from the IoT weather station well, let's have a look at them. With the current global trends for agriculture and the depletion of natural resources, the demand has increased. Preparation of soil, sowing, irrigation, and harvesting of crops are directly dependent on weather conditions

Logics Power AMR Automated Weather Monitoring Station (WMS) automatically monitors site meteorological conditions in real-time, transmitting weather sensor's data to our IoT based monitoring platform. It is a fully computerized, digital and self contained power source system, fitted with data logger and battery charging solar panel along with sensors mounted on Tripod stand with sealed water proof enclosure for data logger, solar charger and battery.

CHAPTER 4

EXPERIMENT PROCESS

4.1. EXPERIMENT RESULT 1

Table no :4.1 Experiment result(27-Apr-2023)

SI NO.	TIME	WEATHER	TEMPERATURE VALUE	HUMIDITY VALUE	PRESSURE VALUE	RAIN VALUE
I	9:00am	Fog	14°C	87%	101mbar	38%
II	12:00pm	Cloudy	13°C	78%	1018mbar	32%
III	2:00pm	Partially sunny	14°C	72%	1019mbar	34%
IV	5:00pm	Fog	15°C	73%	1018mbar	39%

4.2.EXPERIMENT RESULT 2

Table no:4.2 Experiment result (28-Apr-2023)

SI NO.	TIME	WEATHER	TEMPERATURE VALUE	HUMIDITY VALUE	PRESSURE VALUE	RAIN VALUE
I	10:00am	Fog	12°C	88%	1018mbar	30%
II	11:00am	Fog	14°C	78%	1019mbar	32%
III	12:30pm	Cloudy	16°C	70%	1133mbar	30%
IV	2:00pm	Partially sunny	15°C	70%	101mbar	28%

4.2. GRAPHICAL REPRESENTATION OF WMS

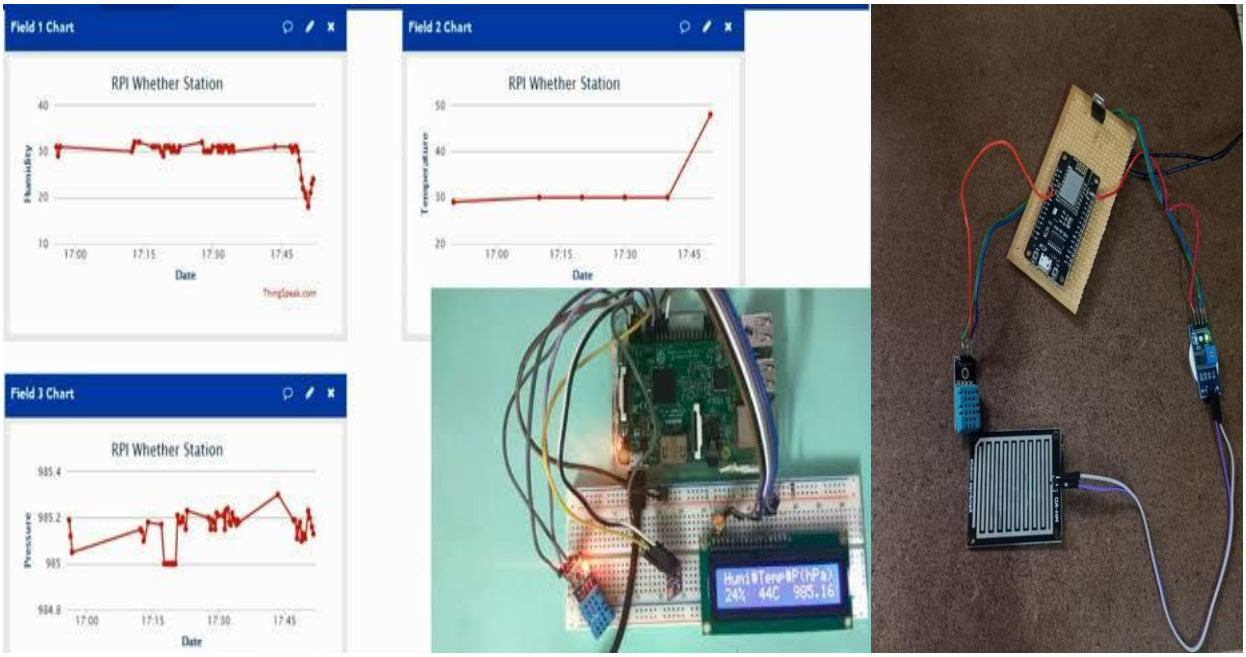

Fig. 4.1 Graphical representation of WMS

4.3. BLOCK DIAGRAM OF WMS

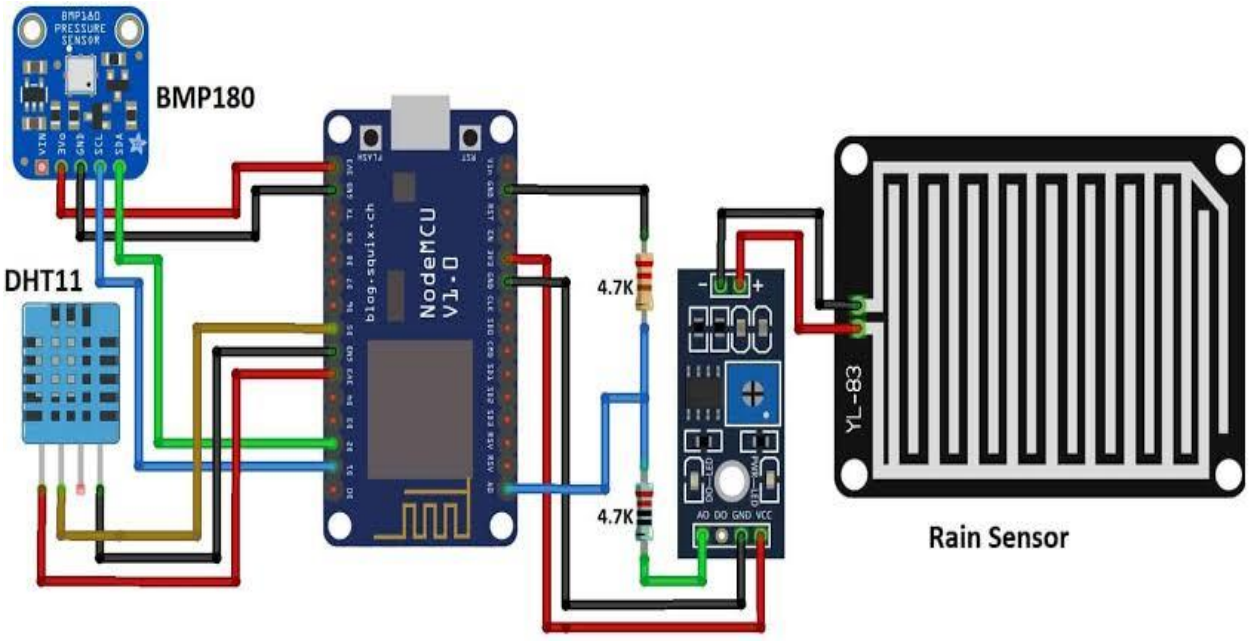

Fig .4.2 Block diagram of WMS

4.4. CIRCUIT VIEW OF WMS

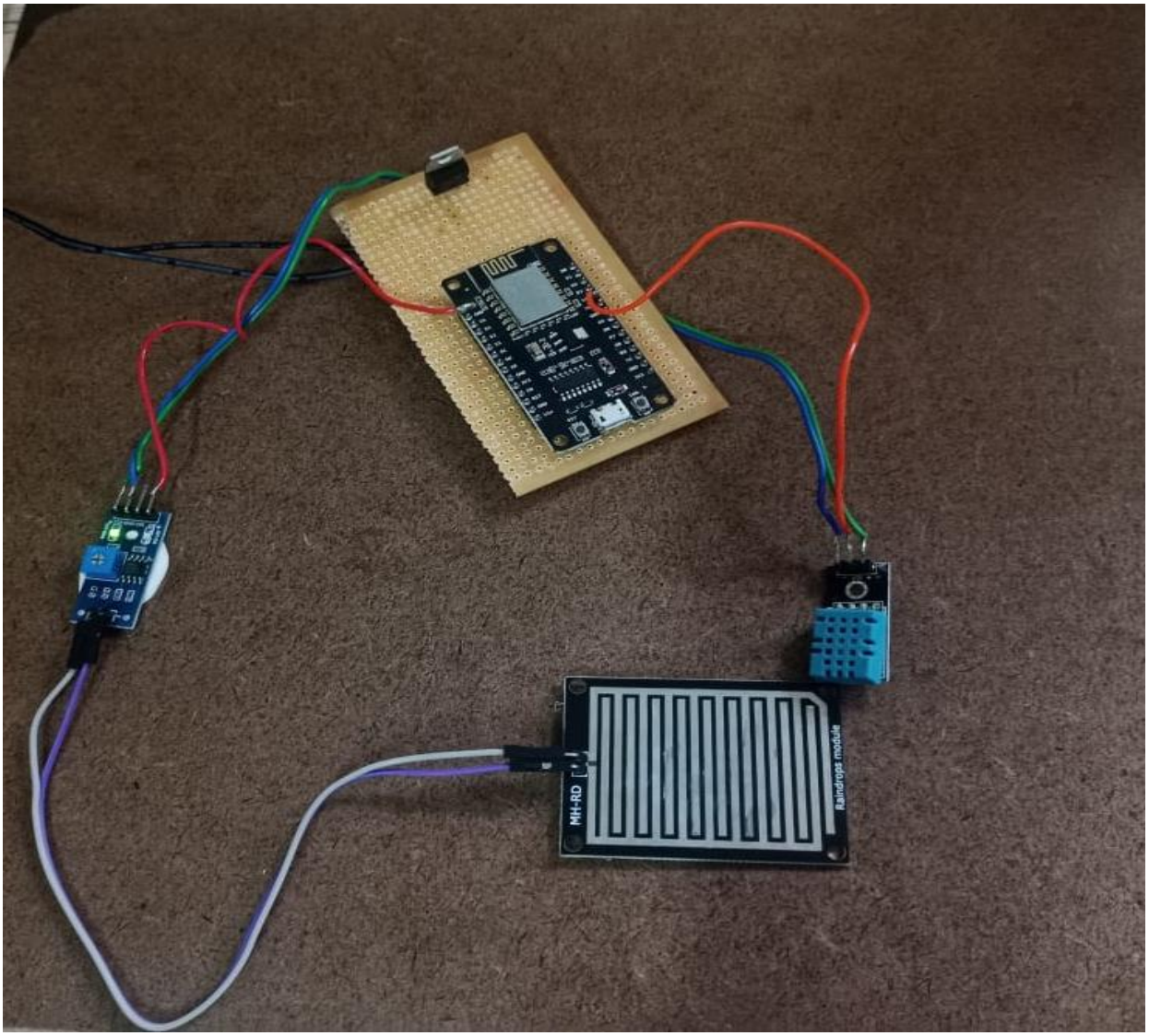

Fig .4.3 Circuit view of WMS

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

CHAPTER 5

FEATURES

This ecosystem consists of a microcontroller (e.g., Arduino UNO or ESP8266) which acts as the main processing unit for the entire system and where all the sensors (e.g., Humidity Sensors and Temperature Sensors) and devices are connected. When a proper connection is established with the server device, the data collected from various sensor devices implanted in specific areas of interest is immediately relayed to the webserver. Using any Wi-Fi module such as Node-MCU, this processed sensor data is then uploaded and stored on a website to serve as a database.

We will be able to monitor and control the system using the webserver page. It provides information on the variations in humidity, temperature, and CO levels in the exact region where the embedded monitoring device is installed. The data collected will be saved on the cloud. The cloud data can be used for parameter analysis and continuous monitoring. Temperature, humidity, and carbon monoxide levels in the air are recorded at regular intervals. All this information will be stored in the cloud, allowing us to monitor temperature, humidity, and CO levels at a given place at any time.

Because 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..

CHAPTER 6

APPLICATIONS

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 created by such questions give new 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 of 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.

CHAPTER 7

RESULT AND DISCUSSION

The temperature and humidity levels and CO levels in air at regular time intervals. All the above information will be stored in the cloud, so that we can provide trending of temperature and humidity levels and CO levels in a particular area at any point of time

7.1. RESULT SURVEY

After sensing the data from different sensor devices, which are placed in particular area of interest. The sensed data will be automatically sent to the web server, when a proper connection is established with sever device. The web server page which will allow us to monitor and control the system. The web page gives the information about the temperature, humidity and the CO level variations in that particular region, where the embedded monitoring system is placed. The sensed data will be stored in cloud . The data stored in cloud can be used for the analysis of the parameter and continuous monitoring purpose.

7.2. SYSTEM ARCHITECTURE

The implemented system consists of a microcontroller (ESP8266) as a main processing unit for the entire system and all the sensor and devices can be connected with the microcontroller. 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 Wi-Fi module connected with it.

CHAPTER 8

CONCLUSION AND FUTURE WORKS

8.1.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. In the proposed architecture functions of different modules were discussed. The temperature, humidity and CO value can be monitored with Internet of Things (IoT) concept experimentally tested for monitoring three parameters.

8.2.FUTURE WORKS

This model can be further expanded to monitor the developing cities and industrial zones for weather monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment. 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 .

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