

DESIGN & DEVELOPMENT OF WEATHER STATION MONITORING SYSTEM USING IOT

ABSTRACT

The system which will be proposed in this project will be an advanced solution for monitoring the weather conditions and make the information visible anywhere in the world. The technology behind this is Internet of Things (IoT), which is an advanced and efficient solution for connecting the things to the internet and to connect the entire world of things in a network. Here things might be whatever like electronic gadgets, sensors and automotive electronic equipment. The system deals with monitoring the environmental conditions like temperature, relative humidity and CO level with sensors and sends the information to the web page. The data updated from the implemented system can be accessible in the internet from anywhere in the world.

INTRODUCTION:-

OVERVIEW- In the global data sector, the internet of Things (IoT) is seen as an innovation and financial wave following Internet. The Internet of Things (IoT) is a sophisticated system that connects everything to the Internet in order to exchange data and transmit through devices that can detect it in accordance with established norms. It succeeds in achieving the goal of keenly identifying, tracking, following, monitoring, and supervising things. It is an expansion and augmentation of an Internet-based system that increases communication between people or between people and things or between things and things. According to the IoT vision, many objects around us will be connected to systems in some way.

CLIMATE CHANGES- 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 Wemos 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 real-time 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 Thing Speak that connect user with internet that visible anywhere in the world. To analyse and monitoring system using Thing Speak 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.

PROBLEM DEFINITION:-

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 then it is monitored via internet accessibility. The effects due to the environmental changes on animals, plants and human beings can be monitored and controlled by smart environmental monitoring system

OBJECTIVE:-

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.

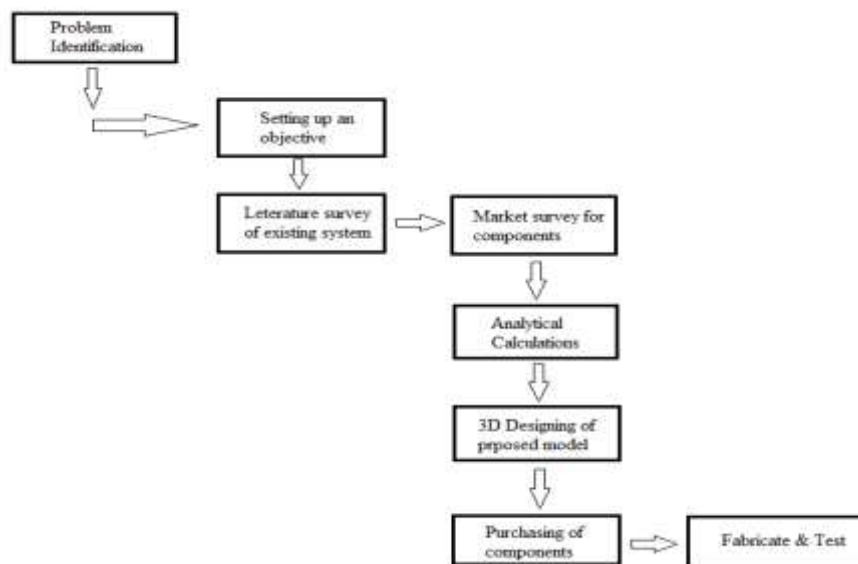
Event Detection based and Spatial Process Estimation are the two categories to which applications are classified. Initially the sensor devices are deployed in environment to detect the parameters (e.g., Temperature, Humidity and CO etc.)while the data acquisition, computation and controlling action (e.g., the variations in the temperature and CO levels with respect to the specified levels).

To monitor environment condition with the help of External devices so called sensors.

To make utilization of the embedded system to empower the environment condition by predicting it.

To design & develop a complete air-ship Weather monitoring system

METHODOLOGY:-



Step 1: - We started the work of this project with literature survey. We gathered many research papers which are relevant to this topic. After going through these papers, we learnt about ideology.

Step2: - After that the components which are required for Weather reporting airship using IoT are decided.

Step 3: - Design and analytical calculation will be prepared with Pin Configurations of each embedded are made.

Step 4: - Programming will be done

Step 5: - The components will be assigned with each pin specifications.

Step 6: - The testing will be carried out and then the result and conclusion will be drawn

DESIGN:-

The proposed work has external sensors to measure the environmental weather situation up on the data can be accessed from anywhere with the help of IoT ESP 32 CAM + Wi-fi Module.

The camera is used to monitor the environmental by image processing it.

It has three different sensor temperature, humidity & Co sensors which will be connected to the Arduino a 6v battery will be used to provide the supply for the controllers to operate.

The working is as simple as bellowed explained figure.

All the three sensors measure the environmental values and sends the signal to Arduino via ESP 32 Camera image + sensors values are singled via wi-fi through it from which one can access the data over anyplace.

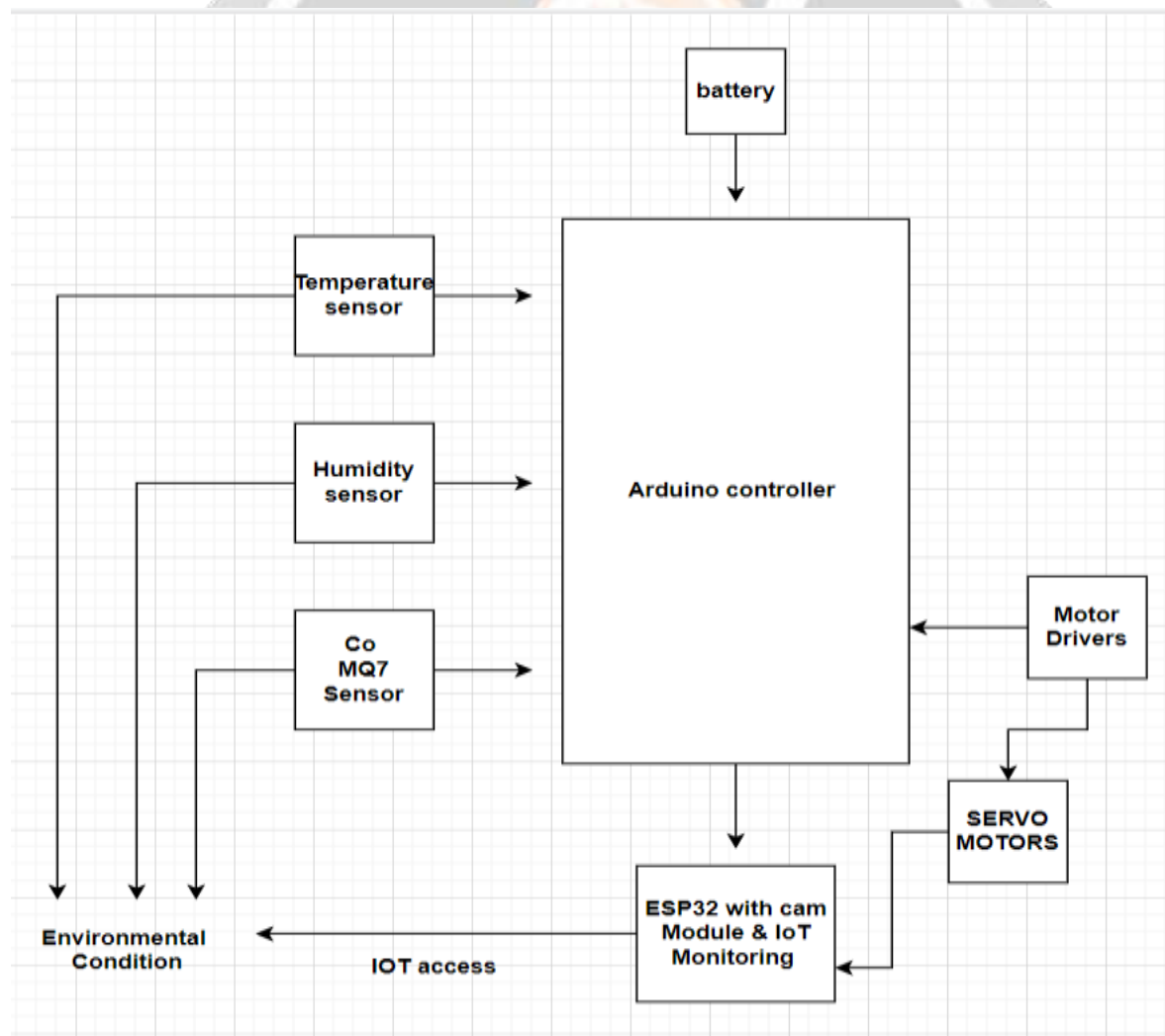


Figure schematic diagram

LITERATURE REVIEW:-

In today's world many pollution monitoring systems are designed by different environmental parameters. Existing system model is presented IOT based Weather monitoring and reporting system where you can collect, process, analyze, and present your measured data on web server. Wireless sensor network management model consists of end device, router, gateway node and management monitoring center. End device is responsible for collecting wireless sensor network data, and sending them to parent node, then data are sent to gateway node from parent node directly or by router. After receiving the data from wireless sensor network, gateway node extracts data after analyzing and packaging them into Ethernet format data, sends them to the server. Less formally, any device that runs server software could be considered a server as well. Servers are used to manage network resources. The services or information provided through the Internet that are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient.

[1]Mary Nsabagwaa, Maximus Byamukamab, Emmanuel Kondelaa, proposed a "robust and affordable Automatic weather station". In this paper, 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. 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 2ndGeneration depending upon the need and generation. The Author provides a suggestion to improve the non-Functional requirement 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.

[2]Ravi Kishore Kodali and Snehashish Mandal presents an "IoT-based weather Monitoring system". In 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.

[3]Ravi Kishore Kodali and ArchanaSahu 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. Which 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 microcontrollerbased 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 things peak 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.

[4]Zi-Qi Huang, Ying-Chih Chen and Chih-Yu Wen, 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. 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. 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- Machine learning Predictive model 4- weather information platform. In This, information shown via dynamic chart.

[5]Carl Hartung and Richard Han -They proposed a paper called "FireWxNet, a multi-tiered portable wireless system for monitoring weather conditions in rugged wildland fire environments". In which they explained about FireWxNet provides the fire fighting community the ability to safely and easily measure and view fire and weather conditions over a wide range of locations and elevations within forest fires. This previously unattainable information allows fire behaviour analysts to better predict fire behaviour, heightening safety considerations. Our system uses a tiered structure beginning with directional radios to stretch deployment capabilities into the wilderness far beyond current infrastructures. At the end point of our system we designed and integrated a multi-hop sensor network to provide environmental data. We also integrated web-enabled surveillance cameras to provide visual data. This paper describes a week long full system deployment utilizing 3 sensor networks and 2 web-cams in the Selway-Salmon Complex Fires of 2005. We perform an analysis of system performance and present observations and lessons gained from our deployment.

[6]Nitant Sabharwal, Rajesh Kumar, Abhishek Thakur, JitenderSharma- They proposed "A low cost zigbee based automatic wireless weather station I with GUI and web hosting facility"-In this paper work, they have proposed and developed a low cost hardware module based on Arduino Uno Board, which measures the meteorological data, including air temperature, atmospheric pressure, relative humidity, dew point temperature, wind speed and wind direction. It sends this information to the Graphical User Interface (GUI) application running on a PC through Zigbee wireless link. The user friendly GUI, a standalone application for windows, is developed in LabVIEW. The application displays the current conditions graphically, logs the data in a format accessible by MS Excel and has a facility to host the same information through a webpage on the internet. This system is also a mathematical model which is capable of generating short time local alerts based on these weather parameters. This gives on line and real time effect. The idea behind this program is to monitor, condition mapping, weather forecasting and further to warn the people from its disastrous effects. It will be highly useful in increasing the resolution of high accuracy low cost weather stations on the land for a better forecasting model, landing the aircraft, navigational and the ship borne effects, tornado, tsunami, cloud bursts and in healthcare alerts etc. In future we are going to link with satellite system as a global feature of this system. It can be permanently located at one location or transported to another location where localized weather measurement is needed. Such a system with lower cost has been proposed in this thesis

[7]Yashaswi Rahut, Rimishaafreen, Divyakamini- They represents a "smart weather monitoring and real time alert system using Iot" -In which the paper describes. The system proposed is an advanced solution for weather monitoring that uses IoT to make its real time data easily accessible over a very wide range. The system deals with monitoring weather and climate changes like temperature, humidity, wind speed, moisture, light intensity, UV radiation and even carbon monoxide levels in the air; using multiple sensors. These sensors send the data to the web page and the sensor data is plotted as graphical statistics. The data uploaded to the web page can easily be accessible from anywhere in the world.

red in these web pages can also be used for future references. The project even consists of an app that sends notifications as an effective alert system to warn people about sudden and drastic weather changes. For predicting more complex weather forecast that can't be done by sensors alone we use an API that analyses the data collected by the sensors and predicts an accurate outcome. This API can be used to access the data anywhere at any time with relative ease and can also be used to store data for future use. Due to the compact design and fewer moving parts this design require less maintenance. The components in this project don't consume much power and can even be powered by solar panels. Compared to other devices that are available in the market the Smart Weather monitoring system is cheaper and cost effective. This projection be of great use to meterological departments, weather stations, aviation and marine Industries and even the agricultural industry.

[8] Gaurav jadhav, Kunaljadhav and Kavitanadalmani they proposed a paper and named it as “Environment monitoring System using Raspberry-pi” In this paper The development in wireless sensor networks can be used in Environmental monitoring with various parameters in weather station . Due to uneven and natural distribution of gas leakage and temperature it is very difficult for pollution to monitor and control the distribution of smoke pollution at industries in the population. Tracking the environmental parameters’ variation is essential in order to determine the quality of our environment. The collected data encompass important details for a variety of organizations and agencies. With the results of monitoring, governments can make informed decisions about how the environment will affect the society and how the society is affecting the environment .

CONCLUSION:-

Until now we had studied several research papers from which we had concluded the idea of this project. Finally, we have designed & calculated the proto type modal using CAD CATIA v5 software. Now we had also purchased the component required to proceed with the flow. Then we had taken a help of small work shop and we had provided the blue print and fabricated & assembled the project. Finally, we had developed model and coded using Arduino IDE software and tested the system for the working of requirement.

This project is based on Embedded to monitor the weather station report for the surrounding. All the sensors respective to temperature, humidity & ESP Cam are working as per the requirement.

