Embedded Microcontroller based Weather Monitoring System

Mr. Gowari Aniket[1], Mr. Golait Ashavit[2], Mrs. Kasare Samidha[3]

[1]Mr. Gowari Aniket Pradeep, Department of Computer Engineering, MGMCET, Kamothe, Maharashtra
[2]Mr. Golait Ashvit Shyam, Department of Computer Engineering, MGMCET, Kamothe, Maharashtra
[3]Mrs. Kasare Samidha Arun, Department of Computer Engineering, MGMCET, Kamothe, Maharashtra

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Abstract - *The concept of weather plays an important part in our lifestyle, hence designing a wireless system to watch weather which successively is often used as a useful tool to impact human life daily. Currently, the solution used is expensive to install and maintain and requires a high operating cost. In this system, we design a wireless system to watch the present environmental conditions like humidity, temperature, wind direction, rainfall levels instantaneously additionally thereto storing the collected data and comparing its data with the past gathered data to predict the longer-term changes within the weather. According to our design, we will provide a low-cost reliable alternative to every sector to use.*

Key Words: **Arduino, Embedded, NodeMCU, DHT11, Microcontroller**

1. INTRODUCTION

In the 21st century, weather monitoring & pollution monitoring is very important and has been used in many areas from monitoring the climatic & pollution conditions of agricultural fields to monitoring industrial conditions. Weather monitoring will help keep track of a variety of climatic conditions including Barometric Pressure, Humidity, and Air Quality. The Weather Monitoring System can be a Standalone wireless system or a wired one. In the case of a wireless standalone system, the connectivity will be convenient and monitoring would not require the physical presence of the person at the location

Climate conditions play a vital role in our day-to-day life in many areas Such as the agricultural sector to the industrial sector etc. Weather monitoring permits us to observe different climates' behavior such as temperature, humidity, atmospheric pressure, light intensity, rainfall, wind speed, and wind direction. The problem driving us to select a project on wireless weather monitoring system is that most of the developed existing systems are designed to sense the limited number of weather parameters which are humidity, temperature, and wind speed, restricting the system to an exact application that reduces its functionality.

1.1 Providing a Low Cost Solution

This paper aims to create a reliable, low-cost, weather monitoring standalone system, which can access the internet and send data to users, and record data. The proposed system has four sensors that measure the temperature, relative humidity and pressure, air quality respectively. The analog outputs of the sensors will be converted to digital signals and further processed by a microcontroller, acting as a data logger. The logged data can then be transferred to nodeMCU which sends the data via Wi-Fi to the blynk app which displays the data. Using easily available components and simple circuitry, the system should be beneficial in providing portable and low-cost remote weather and pollution monitoring.

2. MOTIVATION

The motivation behind taking up this project is the large utility of wireless standalone weather and pollution monitoring in varied areas ranging from agricultural growth and development to industrial development. The weather and pollution conditions of a field or industry, road, a city can be monitored from a distant place by governments or individuals and won't require them to be physically present there in order to know the climatic behavior and pollution at the location by using wireless communication. It will be of great use in monitoring pollutions in industrial areas and weather in fields, forests, as it would be time-consuming for a person to visit and collect data daily to visit their farms regularly, instead, now they could monitor it from any location.

3. LITERATURE SURVEY

3.1 Existing System

In today's world many fields depend upon proper weather fore casting in India which majorly is an agricultural country which is highly dependent on private sector and government for proper weather monitoring, A farmer can't determine what the weather is like any time he requires the solution available are bulky which require someone experienced to operate it and a experienced person to interpret the old system and the new solution that are available are expensive which are not feasible

3.2 Proposed System

Our proposed system consists of various units that structure the system: the power supply unit, microcontroller unit, temperature/humidity sensing unit, the air pollution unit this section outlines the varied design stages and a few of the techniques employed in each phase while completing the

research work. The modular approach was used in this work where the entire system was subdivided into simpler functional blocks (stages) for convenience purposes.

The entire work was completed in four stages as listed below:

Stage one (Hardware component and design)

Stage two (Software design)

Stage three (simulation with hardware)

Stage four (physical construction)

4. Methodology

Our proposed system is developed on an IoT Platform to provide a low-cost alternative for various sectors with interchangeable modules that can do various tasks ranging from weather monitoring to air pollution monitoring.

It will have the following steps.

Step 1: Arduino Gathers the data from all the sensors and calculated the values according to the sensor output based on the code dump in Arduino.

Step 2: Arduino then displays this data on LCD and Serial Monitoring for debuting purposes.

Step 3: Arduino then sends the data in a string to nodeMCU, using serial communication.

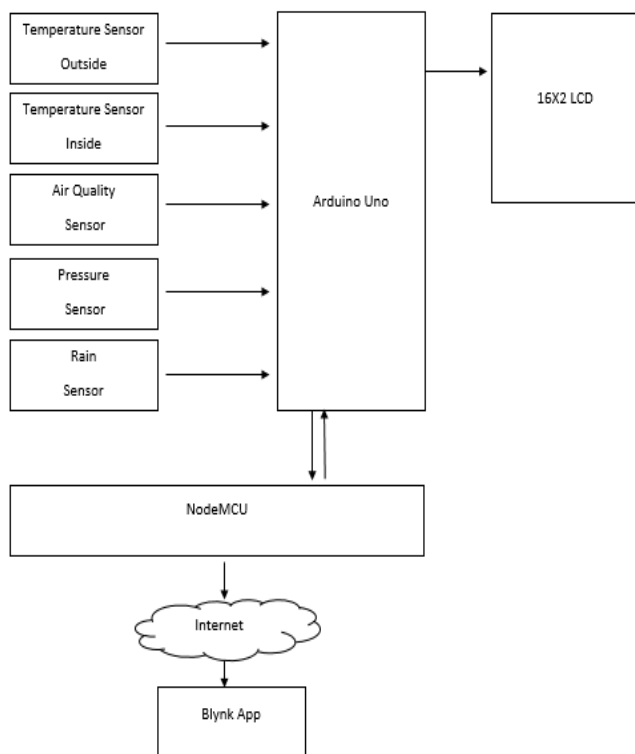Step 4: nodeMCU which is connected to Wi-Fi, or a Cellular network sends the data to the app
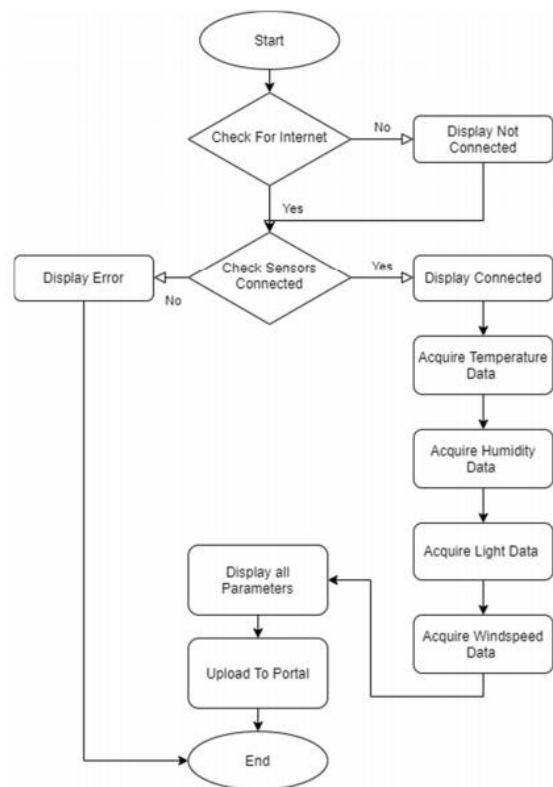

Fig-1: Block Diagram

5. Flowchart

Fig -2: Flowchart

6. Advantages & Applications

6.1 Advantages
• Affordable cost.
• High efficiency.
• Low error probability.
• Reduces human tensions.
• Ease of installations.
• Display accurate information.
• Guarantees instant handover of information.
• Weather Information is distributed at considerable scale.

6.2 Applications
This project can be used by:
• Meteorological sector.
• Weather stations.
• Individuals.
• Farmers.
• Civil engineers.
• Agricultural sectors.

7. CONCLUSIONS

A study on weather monitoring based on Arduino microprocessors with Wi-Fi has been done. The proposed system integrates the uses of sensors in developing a low-cost, high-accuracy weather monitoring system, using analog and digital components. The proposed will have great reliability and ease of use than the conventional system.

The proposed system can be helpful in monitoring the temperature, light intensity, and relative humidity of industrial, and home processes applications that have various parameters. The advantage of this technique is that it does not require anyone to maintain the system thereby making the approach to be economical. It is thereby evident that the proposed system is better in terms of cost, portability, connectivity, and adaptive capability. In the future, different sensors as NOX, CO_2 sensors to analyze air quality using gas detectors can also be interfaced with the microcontroller to fetch various information about pollution.

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BIOGRAPHIES

Mr. Gowari Aniket is final year student of Department of Computer Engineering, MGM College of Engineering and Technology , Mumbai University

Mr. Golait Ashavit is final year student of Department of Computer Engineering, MGM College of Engineering and Technology , Mumbai University

Mrs. Kasare Samidha is final year student of Department of Computer Engineering, MGM College of Engineering and Technology , Mumbai University