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Weather Monitoring System

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***Abstract*—Weather monitoring plays an important role in human life, which is why gathering information on the temporal dynamics of climate changes is very important. In any industry, during certain hazards, it is very important to monitor the weather. The basic objective of this article is to develop an integrated system to develop a meteorological monitoring system that allows the monitoring of meteorological parameters in an industry. Such a system contains two sensors such as temperature, gas and humidity that are monitored and a microcontroller LPC1768 (ARM9). The data from the sensors is collected by the microcontroller and the microcontroller also sends the data from the sensor to the LABVIEW via serial communication with the help of the GSM module. The system uses a compact circuit based on the LPC1768 (ARM9) microcontroller. Programs are developed in Embedded C using the Keiluvision4 IDE. JTAG is used to load programs into the microcontroller.**

***Keywords*— Arduino UNO, Humidity sensor, Temperature Sensor, LABVIEW, Wi-Fi Module**

INTRODUCTION

Weather conditions need to be monitored to maintain healthy plant growth and safe working environment in industry, etc., cloud storage where they can be analyzed even in real time. This means that the measured data can be viewed from anywhere in the world with internet-enabled devices. This can be monitored even in difficult geographical terrain. It can also reduce labor requirements and therefore the risk of visiting inhospitable places. The main motivation to start this project is the great benefit of wireless weather monitoring in various areas ranging from agricultural growth and development to industrial development. The data from the sensors is collected by the microcontroller and also sends the data from the sensors to the remote server using the SIM900A modem. The systems were primarily focused on monitoring the room temperature and humidity status up or down and sending data to a remote server. It is the future technology that connects the entire world in one place.

PROBLEM DEFINITION

The expense of a weather monitoring system, which is essential for greater solar plant performance, is prohibitive. The hard drive-based data logging function needs a separate computer configuration for operation, and the data saved is frequently inaccessible.

When it comes to weather, these two 'issues are the most important considerations. We've developed a cost-effective, creative method to monitor the system, and we've come. up with a cost-effective, unique 'approach to supply a weather monitoring system for the average person.

REVIEW OF LITERATURE

a) **A Smart Weather Monitoring System Using Internet of Things**: The proposed system is an advanced solution for monitoring the weather conditions at a particular place and makes the information visible anywhere in the world. The technology behind this is the Internet of Things (IoT). The system deals with monitoring the environmental conditions like temperature, humidity with respect to its measured time with a microcontroller interfaced with sensors and GSM module to send the information wirelessly to remote server and then plot the sensor data as graphical statistics.

b) **Design and Implementation of Weather Monitoring and Controlling System**: Weather monitoring plays an important role in

human life, so the collection of information about the temporal dynamics of weather changes is very important. In any industry, during certain hazards, it is very important to monitor the weather. Such a system contains a pair of sensors like temperature, Gas and humidity will be monitored and LPC1768 microcontroller (ARM9). The data from the sensors are collected by the microcontroller and also microcontroller sends the sensors data into the LABVIEW by using Serial Communication and this module will keep the data on the excel page & also we can get the SMS on the mobile with the help of GSM module. The system uses compact circuitry built around LPC1768 (ARM9) microcontroller Programs developed in Embedded C using the IDE Keiluvision4. JTAG is used for loading programs into Microcontrollers.

PROPOSED DESIGN

The fundamental components of an IoT device are Control Unit, Power Supply, Input Devices, Output Devices, and Internet Mechanism etc. This system has got almost all things automated so that it gets an advantage of the real time direct measurement of the parameters through GSM. Maintaining backup of sent data is easy and can be done within a few seconds. This model uses a DHT11, GSM module (SIM900A), and an Arduino Uno. The data is stored inside a database with a timestamp. That data can be seen in visualization by the help of html, JavaScript, and PHP language. The data updated from the implemented system can be accessible on the internet from anywhere in the world.

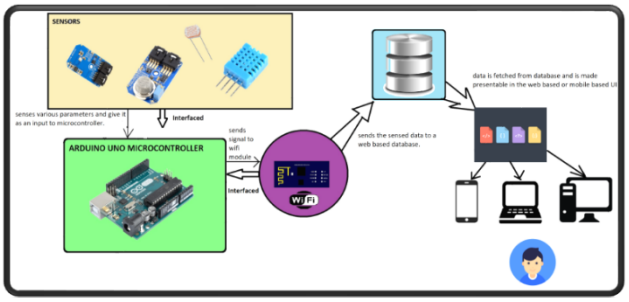

Fig1: Proposed Methodology

1.0 ARDUINO UNO

Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with digital and analog input / output (I / O) pin sets that can be connected to various extension boards (shields) and other circuitry. The board has 14 digital pins and 6 analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a Type B USB cable. It can be powered by a USB cable or a 9-volt external battery, although it accepts voltages between 7 and 20 volts. You have the Atmega16U2 programmed as a USB serial converter (Atmega8U2 to version R2). The Arduino UNO is widely regarded as the most popular and user-friendly board or the Arduino board series

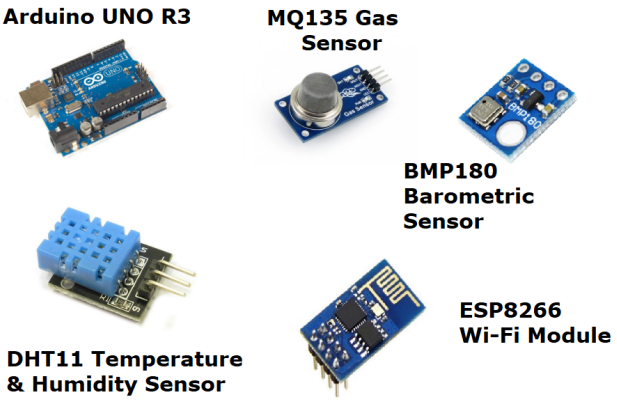

Fig2: Components

1.1. DHT 11

The DHT 11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if we are looking to measure in this range then this sensor might be the right choice

1.2 BMP180

BMP180 is one of the sensors of BMP XXX series. They are all designed to measure Barometric Pressure or Atmospheric pressure. BMP180 is a high precision sensor designed for consumer applications. Barometric Pressure is nothing but the weight of air applied on everything. The air has weight and wherever there is

air its pressure is felt. BMP180 sensor senses that pressure and provides that information in digital output. Also the temperature affects the pressure and so we need temperature compensated pressure reading. To compensate, the BM180 also has a good temperature sensor.

BMP180 MODULE Features

- Can measure temperature and altitude.
- Pressure range: 300 to 1100hPa
- High relative accuracy of ±0.12hPa
- Can work on low voltages
- 3.4Mhz I2C interface
- Low power consumption (3uA)
- Pressure conversion time: 5msec
- Potable size

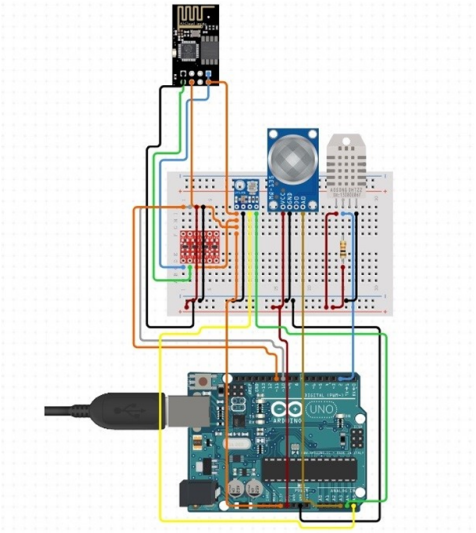

Fig3: Circuit Diagram

1.3 MQ-135

The MQ-135 Gas sensors are used in air quality control equipment and are suitable for detecting or measuring of NH3, NOx, Alcohol, Benzene, Smoke, CO2. The MQ-135 sensor module comes with a Digital Pin which makes this sensor operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. If you need to measure the gases in PPM the analog pin needs to be used. The analog pin is TTL driven and works on 5V and so can be used with most common microcontrollers.

1.4 Wi-Fi Module

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for the development of the Internet of Things (IoT) embedded applications.The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack.The ESP8266 is capable of either hosting an application or offloading all the Wi-Fi networking functions from another application processor.Each ESP8266 Wi-Fi module comes pre-programmed with an AT command set firmware, now you can simply hook this up to your Arduino device and get as much Wi-Fi ability as a Wi-Fi Shield offers.The ESP8266 module is an extremely cost-effective board with a huge, and fastest ever growing, community.

SYSTEM SOFTWARE

The software used in this project will be Arduino IDE. The code used for this project will be in the form of .ino and can be opened in the IDE. The program for running will be C++ programming language. In the code the wifi Module will be alternated by our personal private network. The sensors will be interfaced with their respective packages. The result when uploading through the IDE will be displayed on a static webpage which will be coded using HTML & CSS. In this project, we will take one Arduino UNO and the inputs are the sensors . The Arduino UNO converts Analog data of sensors to Digital Using ADC pins and we can see the Sensors data in Virtual terminal using Serial Communication.

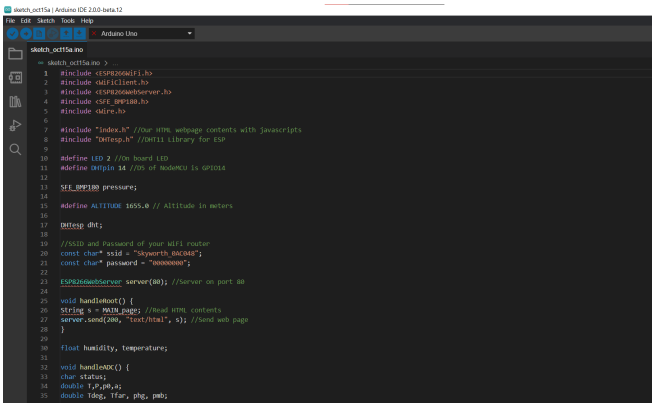

Fig4: Arduino IDE

RESULT & DISCUSSIONS

The environmental monitoring data sensors automatically monitor the temperature, humidity, Accelerometer and other gas concentrations. It can realize the remote access of sensor monitoring data and download of the environmental monitoring data to the client according to requests. In this project, we have to acquire all the environmental parameters like temperature, humidity, gas and accelerometer sensors and measure these sensor values using Arduino UNO. Here in the above figure we use Multi sensor Board for placing the sensors, and accelerometer sensor for checking the earthquake condition. Also for future purpose we are going to make the following changes:

•Removal of the Wi-Fi module will make it more cost efficient and easy to design

•Making a static web-page to display the readings given by the sensors

•Making a cumulative display with graphical analysis

•Trying to design a weather prediction system

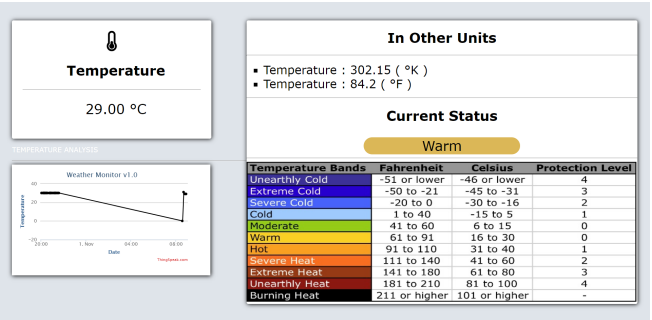

Fig5: Temperature Analysis

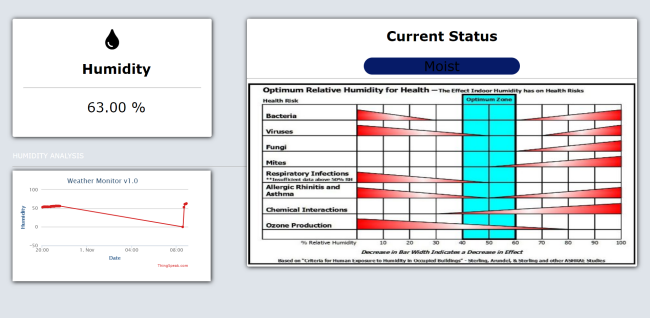

Fig6: Humidity Analysis

CONCLUSION

This paper exhibits Design and Implementation of Weather Monitoring System utilized for controlling the gadgets just as observing the ecological boundaries. Installed controlled sensor networks have shown themselves to be a solid arrangement in giving controllers and detecting ecological observing frameworks. The sensors have been coordinated with the framework to screen and figure the degree of presence of Accelerometer, gas, temperature and mugginess in the environment utilizing data and correspondence advancements. The sensors can transfer the information in Lab see utilizing sequential Correspondence.

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