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Wireless Weather Monitoring System using Adruino DUE and GSM Technology

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ABSTRACT - *The concept of weather play important part in our daily life, hence designing wireless system to monitor weather conditions which in turn it can be used as useful tool to impact the human life daily. In this system we design a wireless system to monitor the current environmental conditions such as humidity, temperature, wind direction, rainfall levels instantaneously in addition to that storing the collected data and comparing it data with the past gathered data to predict the future changes in the weather conditions. According to our design we will set a clear recommendations and precautions that help in escalating the adverse effects of changes in weather conditions and helping to sustain healthy and hygienic environment. To develop such project we will use Adruino DUE as the heart of the system and GSM-module (SIM900A) as a wireless counterpart and other supportive sensors. Finally achieving high degree of reliability, compactness, modularity, and cost effectiveness for our design is the aim and final goals targeted.*

Key Words: **Wireless1, Weather2 Arduino DUE3, GSM4, Sensors5, Environment6, Nokia5110 LCD7.**

1. INTRODUCTION

Climate conditions play vital role in our day-to-day life in many areas Such as agricultural sector to industrial sector etc. Weather monitoring permit 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 project on wireless weather monitoring system is that most of developed existing systems are designed to sense limited number of weather parameters restricting the system to an exact application and reducing its functionality.

2. LITERATURE REVIEW

The need of this review to provide us with an idea about the accomplished work and the recent state of research in this arena, it also picture us to see how enormous this area is and how faraway it can go in the future, hence only selected research, based on their significance and inspiration to our project, are presented in this section:

[1]Bulut F. Ersavas survey concluded A wireless system can be used provided monitoring of environmental, soil, or climate conditions and controlling irrigation or climate control systems at an agricultural or landscape site.so it focus on the importance of the environment monitoring for agricultural field.

[2]Kirankumar G. Sutar, "Low Cost Wireless Weather Monitoring System." This survey discuss, the use of many sensors that are able to continuously read some factors that indicate the weather conditions such as temperature, humidity and light intensity in an industrial environment.

[3]ZigBee based weather monitoring system by Nisha Gahlot, Varsha Gundkal, Sonali Kothimbire, Archana Thite it is based on the fact of reduction of agricultural output and designing a system that help in reducing the effects of weather changes on agricultural output for the benefits of framers.

[4] Wireless Portable Microcontroller based Weather Monitoring Station: this paper discussed about designing and implement inexpensive Wireless Moveable Weather Monitoring Station using PIC16F887 microcontroller. The implemented Weather Monitoring Station is armed with sensors to measure weather parameters such as comparative humidity, atmospheric pressure, rainfall, solar radioactivity, wind speed, surface and ambient temperature. Similarly of these competences, the considered Weather Monitoring station also contains some exceptional features like Modbus communication protocol, which provides flawlessly announcement of real time weather quantities to the BS over both guided (wires) and unguided interfaces. Additionally, at the BS, the received information is recorded and uploaded to an internet data server to permit universal access to the weather information.

3. SYSTEM BLOCK DIAGRAM

The System block diagram gives an overall system operations and functionality. Noting that the Arduino due micro-controller is the core of the system that gives the instructions and makes all the decision as per prerequisite, the data flow from the sensors to the Arduino are conditioned and analyzed then it's delivered to the far end users. The system stores each and every data that pass through the micro controller. The sensor cloud makes the data available to be viewed or monitored for the authorized people. The user can take actions upon receiving the notifications via GSM-Module.

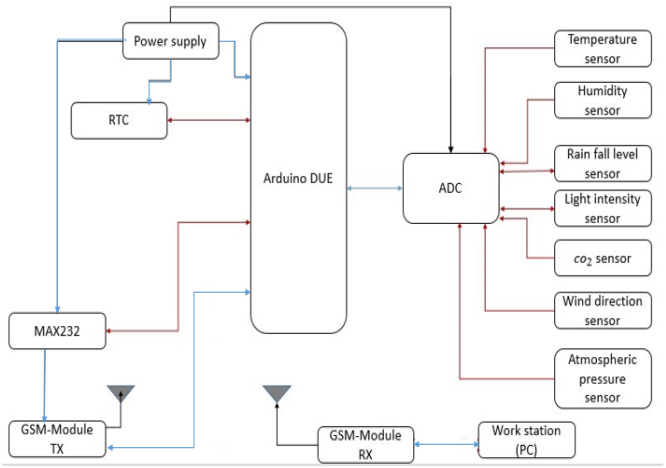

Fig1. Block Diagram

3.1 ARDUINO DUE

The Arduino Due is the famous new microcontroller board in the Arduino intimate. It's the first board based on a 32 bit processor Atmel SAM3X8E ARM Cortex-M3, which upgrade and improves all the standard Arduino functionalities and adds too many new features. The Arduino DUE offer 54 digital input and output pins , 12 analog inputs with 12 bits of resolution, 4 UARTs, two digital to analog converter outputs, an 84 MHz crystal oscillator chip, two USB connections, a power jack, an ICSP header, and a reset button. The Due has two micro USB ports: one designated for repairing purposes and a second one wished-for for acting as a USB host, allowing external USB peripherals such as mouse, consoles, smartphones, etc. to be connected to the Arduino Due.

Fig2. Arduino DUE

3.2 SIM900A MODULE

GSM is a cellular communication module; it is stands for global system for mobile communication (GSM). The concept of GSM was developed by Bell Laboratories. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands, so for our project the GSM module is used to send the collected weather information over the air interface to the desired user.

Fig3. GSM Module

3.4 SENSORS USED

a- DHT11.

b- BMP20.

c- Anemometer.

d- DS3231.

e- BH1750.

f- Rain Sensor.

g- MQ-9.

4. CIRCUIT DIAGRAM

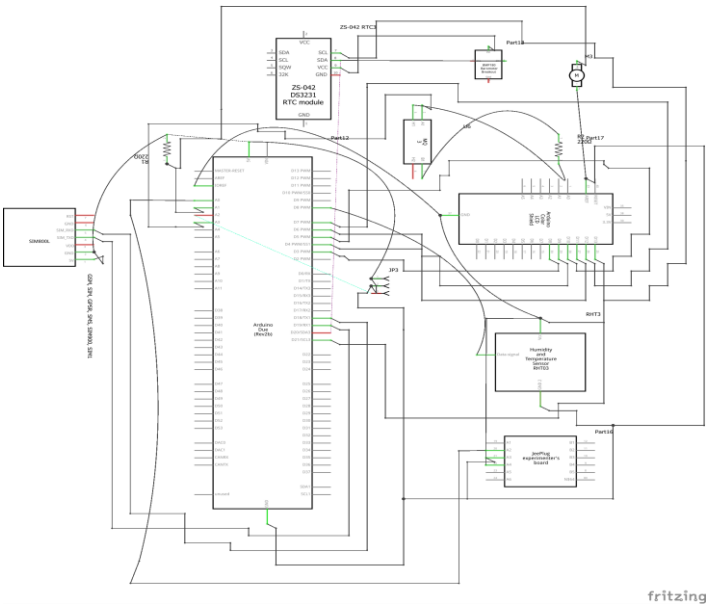

Fig4. Circuit diagram

The above circuit diagram shows that we can read weather parameters such as temperature, carbon dioxide levels, wind speed, rainfall and humidity. After that, a time from the RTC, the averaged results and the values of the rain gauge and wind speed counters are sent to the end user or to the internet-cloud.

4.1 SIMULATION

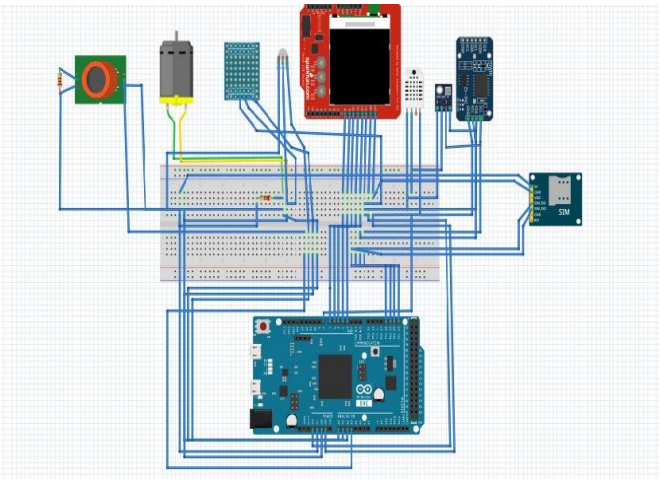

Fig5. Simulation diagram

4.2 OPERATION FLOW CHART

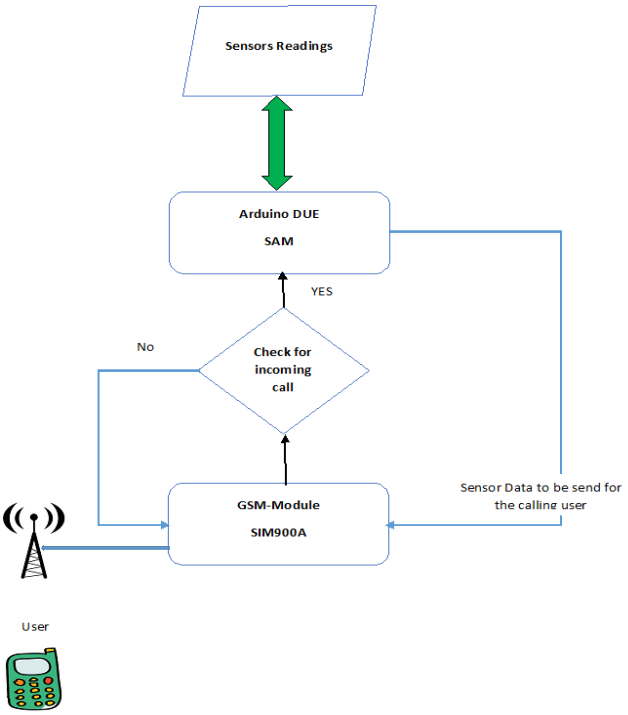

Fig6. Simulation diagram

When a user calls the weather monitoring system the message is received by the GSM module (SIM900A) and as we know that the GSM module is connected to the heart of the system which is ARDUINO DUE. Thus as the microcontroller receives the incoming call through the serial pin Tx1 & Rx1 it will immediately issue to commands one says terminate the incoming call by ATH0 command and the second one is to gather the data or readings from the sensors and transmit these reading to the GSM module via the same serial pin, then GSM module transmit these data to the desired user via the cellular network.

4.3 CORE IMPLEMENTATION

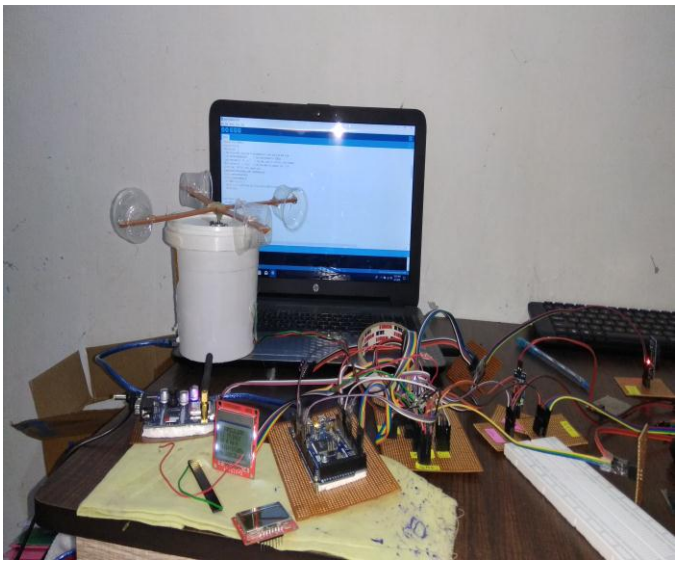

Fig7. Core Circuit diagram

4.4 FINAL MODEL IMPLEMENTATION

Fig8. Model

5. RESULT

In this project the user can track location parameters such as current temperature, humidity, rain condition on demands so he can call the system from any location remotely to request the status of that location and by location we meant farm, factory, or even house. This system reduce the human effort hence result in high efficiency and accuracy as the sensor measured data can be sent instantly based on requirement and demands, the same data measured is used and analyzed for future prediction purposes.

6. TESTING AND VERIFICATION

The following figure shows practical output or result obtained from this project which indicate the proper working and verification of this project hence here the user calls the system and the system reply by sending SMS containing all the sensors readings.

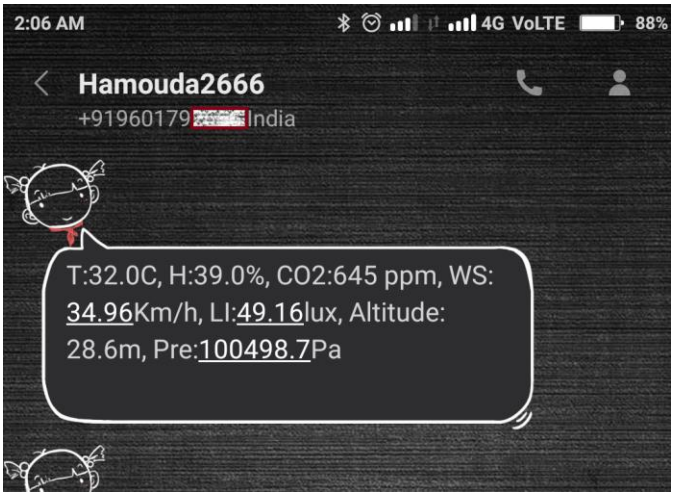

Fig9. Testing Result

7. Program sample

```
void setup() {

void vset_proj();
     vset_proj();

  }

void loop() {

 void title_proj();
      title_proj();
                          //CO2 Sensing CODE
 void co2_proj();
      co2_proj();

                          //HUMIDITY+TEMP Sensing CODE
 void H_T_proj();
      H_T_proj();

                          //Rain Sensing CODE
void rain_proj();
     rain_proj();


                           //Lightsensing CODE
 void title_proj();
      title_proj();

 void li_proj();
                         //WIND SPEED CODE

void winsp_proj();
     winsp_proj();
                          //BMP CODE
void bmp_proj();
     bmp_proj();
                          //RTC_DS3231 CODE

void title_proj();
     title_proj();

void rtc_proj();
     rtc_proj();
                           //RX_call+SMS_response CODE
void call_sms_proj();
     call_sms_proj();
}
```

8. CONCLUSION

The paper implement a simple and low price wireless weather monitoring system by means of temperature sensor DHT11, Nokia5110 LCD , GSM-Modem 900A and Arduino Due board & other sensors to observer weather surrounding parameters of an anticipated location and transmit this data to a cellular phone or monitoring computer station (user) at distant locality over cellular network. Then the overall operation cost per month is estimated to be about 20 rupees.

9. 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.

10. APPLICATIONS

This project can be used by:

- Meteorological sector.
- Weather stations.
- Individuals.
- Farmers.
- Civil engineers.
- Agricultural sectors.

11. ACKNOWLEDGEMENT

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12. REFERENCES

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13. BIOGRAPHY

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