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Automatic Weather Prediction System Powered by ARM Micro Controller

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Abstract - Monitoring the weather plays a very crucial role in every human's daily life, so gathering the information regarding the climatic changes is also very essential .It is very crucial to monitor the environmental changes in any situation. In any industry during certain atmospheric threats, it is very crucial to monitor weather. This paper's main aim is to establish an embedded system that helps us in overseeing the weather changes in any industry. This kind of a system contains sensors like Gas, Temperature, humidity and it mainly has LPC1768 as micro controller. In this, the micro controller receives data from the sensors and it assists the same data into the LABVIEW with the help of serial communication and this section will keep the data in excel page and we will also receive the SMS in the mobile via GSM module. The system uses a compact circuitry built around LPC1768 micro controller. In Embedded C, the programs are advanced using the IDE Keiluvisison4.Here we use JTAG for loading the programs into Micro controller.

Key Words: LPC1768, LABVIEW, IDE Keiluvision4, GSM module, Gas sensor, Temperature sensor, Humidity sensor, JTAG.

1. INTRODUCTION

This weather controlling device determines and files the data of the climatic changes with having no involvement of any individual. The data which is recorded by this device is stored in an implanted data logger or it can also be transferred to an obscure location through a communication link. If this information is stored in an inbuilt data logger, then the data which is recorded can be downloaded into a computer for future processing. Therefore, the communication system is considered as the crucial element in an automatic weather controlling system. Present-day, automatic weather controlling systems are accessible as profitable products with variety of facilities and opportunities. Although, weather controlling systems can be assembled and implemented in obscure areas of SriLanka to lower the maintenance cost of weather stations, until recently, not much significance has been given for building and using such instruments locally. Automatic weather controlling systems have been advanced in universities by interfacing meteorological parameter monitoring sensors to microcomputer having communication devices. Recently, a weather monitoring system with USB communication and built in data logging facility was enhanced in university of Colombo. For transmitting the data to the auditing station this device uses a cabled communication. The current work which we are doing is the enhancement of the previous development.

This paper's fundamental aim is to establish a weather controlling system with a remote configuration to find and transfer climatic parameters.

In different applications and mechanical processes it is very crucial to monitor the climatic changes through a remote configuration. The weather controlling systems had a dip in efficiency due to poor durability, poor rigidity, parallax errors observed in mechanical and electromechanical machineries. A weather controlling system was developed using sensors to monitor the climatic changes by Kang and Park in 2000.To monitor the temperature and relative humidity the better access is the mixture of these sensors with data procurement and it was given in 2005.Temperature sensor can be modeled using devices which sense the acoustic waves on the surface as proposed by Vlassov 2 1/2 decades ago. This expects the establishment of micro controller based weather controlling systems. This system is expected to monitor the environment changes and provide the same data for remote examining. In order to make analysis of the information, the data which is collected by the weather monitoring system is passed on to a computer through a serial port.

2.2. EXISTING & PROPOSED SYSTEM

The communication of a single multi slave micro controller has been enhanced earlier. By using unicast communication, micro controller can be communicated. The master slave network with star topology allows the master to give orders to a slave address.

Then the slave which has the same address which is requested will respond accordance with the command of the master. The rules of the data communication is Mod

bus. It has one master and several slave. Master does communication only at a time but slave communicates if there is a command from the master. There are two types of address modes. They are

1. Unicast
2. Broadcast

Weather monitoring system can be able to data acquisition on temperature, gas, humidity, accelerometers attached to it. And it gives this data to ADC of LPC1768.

3. BLOCK DIAGRAM

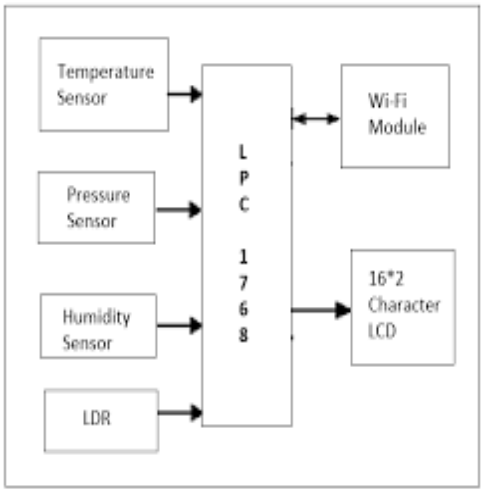

Fig -1: Block Diagram

3.1 Humidity Sensor

Humidity sensor senses, measures and reports both moisture and air temperature. Relative humidity is stated as the ratio of precipitation in the air to the highest amount of precipitation at particular air temperature. When it comes to comfort, Relative humidity becomes an important factor. This sensor is based on the principle of relative humidity and the output is in the form of voltage. This analog voltage gives the information about the percentage of relative humidity present at the atmosphere. Humidity sensors works by detecting the changes that alter electrical currents or temperature in the air. All the three types of sensors monitors the changes in the atmosphere every minute in order to calculate the presence of humidity in the air. The Humidity sensor is shown in the below fig2.

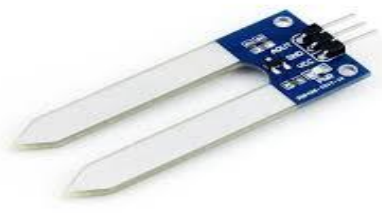

Fig -2: Humidity Sensor

3.2 Temperature Sensor

The LM35 is a temperature measuring device having analog output voltage proportional to the temperature. It provides the output voltage in centigrade. Any external calibration circuitry is not required. The sensitivity of LM35 is 10mv/degree Celsius. As temperature increases, output voltage also increases.

E.g.250mv means 25 degree Celsius. It is a three terminal sensor used to measure surrounding temperature ranging from -55 degree Celsius to 150 degree Celsius. The temperature sensor is shown in below fig3

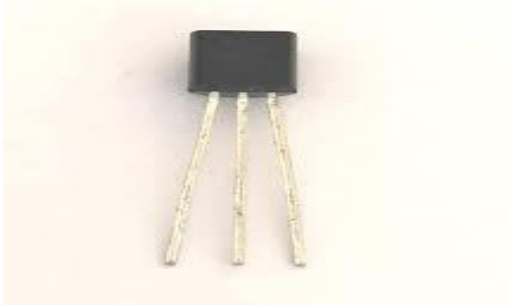

Fig -3: Temperature Sensor

3.3 Gas Sensor

A Gas sensor is used to detect the existence of concentrated gases in the atmosphere. Depending upon the concentration of the gases, this sensor produces a corresponding potential difference by varying the resistance value of the material which is inside the sensor, and it can be measured as output voltage. Depending upon the value of this voltage, the type and concentration of the gas can be predicted.

Fig -4: Gas Sensor

3.4 LPC1768

The LPC1768 is a cortex M3 micro controller for embedded applications featuring a high level of integration and low power consumption at a frequencies of 100MHz.The features of LPC1768 include 64 KB of data memory,512 KB of flash memory, USB/Device/Host/OTG, Ethernet MAC,4-UARTs,8-channel DMA controller,3 SSP/SPI,2 CAN channels,I2S,I2C,8-channel 12-bit ADC,10-bit DAC, Quadrature Encoder interface, motor control PWM,4 general purpose timers,6 output general purpose PWM, ultra-low power Real-Time Clock with separate battery supply, and up to 70 general purpose I/O pins. The

LPC1768 is pin-compatible to the 100 pin LPC2368 ARM7 MCU.

4. SYSTEM SOFTWARE

We use 2 software's in this project. They are

- For C programming we use KEIL software
- LABVIEW

µVision4 is an Integrated development Environment (IDE) which helps you in writing, compiling and debugging embedded programs.

4.1 FLOWCHART

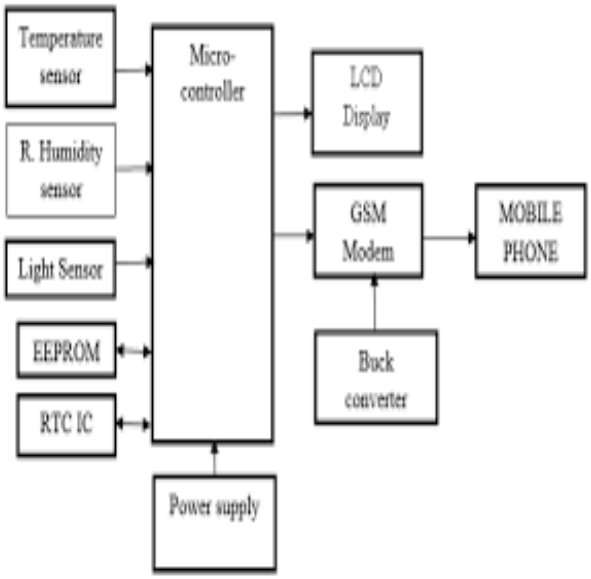

Fig -5: Flow Chart

5. APPLICATIONS & ADVANTAGES

5.1 Applications

1. Used in bio gas manufacturing and coal mine centers.
2. Used in power plant generation.
3. Agriculture field monitoring.
4. Home automation.
5. Industrial purpose.

5.2 Advantages

1.Security purpose.
2.Offers high efficiency.

6. CONCLUSION

The Implementation and Design of Weather monitoring and controlling system is explained in this paper. Embedded controlled sensors has proved their reliability by providing remote control sensing for environmental monitoring systems. Many sensors have like humidity, gas, temperature are integrated into the monitoring system using information and communication technologies. Serial connection is used to transfer and upload the data from the sensors to the lab view.

7. FUTURE SCOPE

If wider range of measurement is desired, sensors like soil PH sensor, CO2 and Oxygen sensor can be added to the monitor other than environmental sensor.WI-FI camera can be integrated to the monitor for additional growth of agricultural products. This leads to uploading the data directly to the web server continuously.

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