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Design and Implementation of Weather Monitoring System

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Abstract: ***Weather observation plays an important role in human life. Collecting information about temporary dynamics, climate change is very important. Due to risk factors involves in each sector, it is important to monitor even the slight changes in temperature. The main purpose of this article is to develop a system that allows us to create a weather monitoring system to observe the industrial weather parameters. This system has a pair of temperature, gas sensors and humidity sensors by which moisture will be monitored. Along with this, we have LPC1768 microcontroller (ARM9) which collects the sensor data, transmits the sensors data to LABVIEW with the use of series communication and this module will save information in excel and we can get alert SMS with the help of GSM module. This system uses dense circuits built around LPC1768 (ARM 9) microcontroller. Program development is done in embedded C with the use of IDE Keil uvision4. Application of JTAG is to load the programs into microcontroller.***
Keywords: LPC1768 (ARM9), Humidity Sensor, Temperature Sensor, LABVIEW, GSM Module.

I. INTRODUCTION

This 'Weather Monitoring System' is an automated weather station which gradually measures and records meteorological parameters using the ideal sensors without any human intervention. The built-in data logger is used to store the measured parameters and can be tracked to a distant location through a communication link. If the information is saved in information logger, recorded information must be downloaded physically. Therefore the communication link plays a vital role in sharing the information and data in an automated weather station. Many universities have developed automated weather stations through interfacing. Weather parameters monitoring sensors are interfaced to micro Computer/ logger through communication devices or serial and parallel ports to receive hard copy of data. Recently, the Colombo University has developed an automated weather station with USB communication facilities and a built-in data logging facility used in wired communication systems to transfer information to the monitoring station through the computer built-in USB Interface. Main purpose of this work is to develop a distinct modular weather station, capture and transmit the weather parameters with a remote communication facility. Monitoring remotely the environmental changes is vital in various applications and industrial purposes. In comparison to previous weather monitoring systems which are planted on mechanical, electromechanical instruments which tolerate parallax errors, less durability, less rigid and many a times human intervention was required. Information collected by weather monitoring system can be easily exported to a PC via a serial port for the analysis of data in a subsequent way.

II. EXISTING AND PROPOSED SYSTEM

In previous studies, there is single master-multi slave .The microcontroller communication system has been improved. Microcontroller is able to communicate using Unicast Communication, that is, the master commanded one slave ,Star topology is the master-slave network address. Then that slave is requested to have the same address, respond or master must take action accordingly. In this Communication is only one master and one or a few slaves form a network.. Master is only one Communications at a time. The slave only communicates. There is a command (question) from the master and cannot contact with another slave. The mode used by Modbus has 2, such as, Unicast and Broadcast [8]. Implementation of weather monitoring and its design Model has the ability to perform data collection and control system Temperature, gas and humidity, connected Accelerometer Sensors and it can give this sensor data to ADC Port of LPC 1768. It can upload information in LABVIEW sheet excel with continuous help of GSM and RS232.

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III. BLOCK DIAGRAM DESCRIPTION

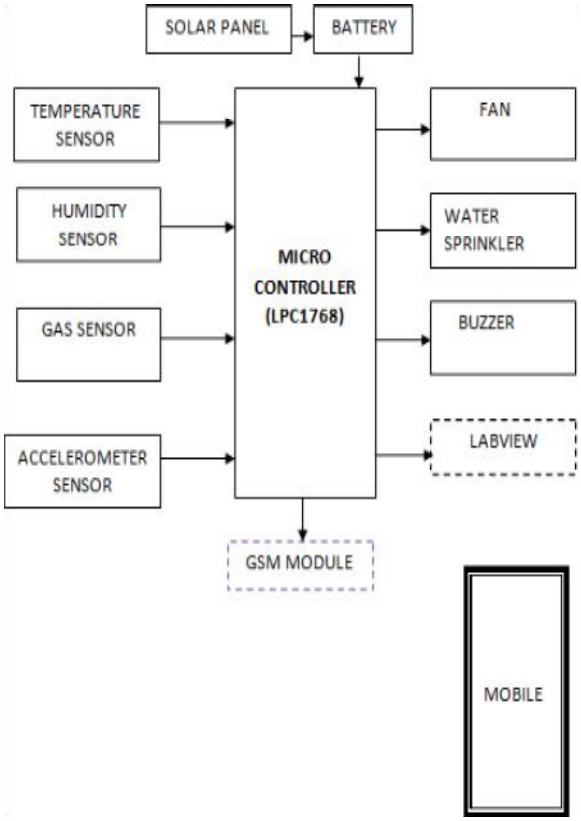

Figure No. 1

A. Humidity Sensor

Humidity sensor works on relative humidity principles and gives output in voltage form. This analog returns the information about percent relative humidity present in the environment. A small sensor composed of an RH-sensitive material Level senses AC resistance (impedance) as relative humidity changes

B. Temperature Sensor

The LM35 is an integrated circuit sensor that provides electrical output in proportion to temperature(°C). The scale factor is 0.01V / ^{0}C. The LM35 does not require anything like calibration and it is highly accurate at low temperature.

C. Gas Sensor

MQ-6 gas sensor is used which contains SnO whose conductivity is low in clean air. The MQ-6 gas sensor is Sensitive to propane, butane and LPG natural gas. Using a sensor other Combustible gases, especially methane is detected at a low cost and is suitable for other applications.

D. LPC1768

LPC1768 is a ARM Cortex-M3 based microcontroller used in Highly-embedded application requiring integration and Low Power consumption. ARM Cortex-M3 CPU integrates three-layer pipelines. Construction by individual local commands and information buses and also having peripherals buses for peripheral devices. LPC 17xx contains peripheral Flash memory 512 kb, up to 64 kb Data memory, Ethernet Mac, host, Device or OTG, 8-channel universal DMA controller, 4 URLs, 2 cans, 2 SSP controllers, SPI interfaces, 3 12S interfaces, 2 inputs, and 2 output 12 interfaces, 8Channel 12 bit ADC, 10 bit DAC, motor control PWM, Quadrilateral environmental encoder interface, four
universal timers, Output Normal Purpose PWM, Ultra Low Power RTC Independent battery power supply and up to 70 standard I / O pins.

IV. FLOW CHART

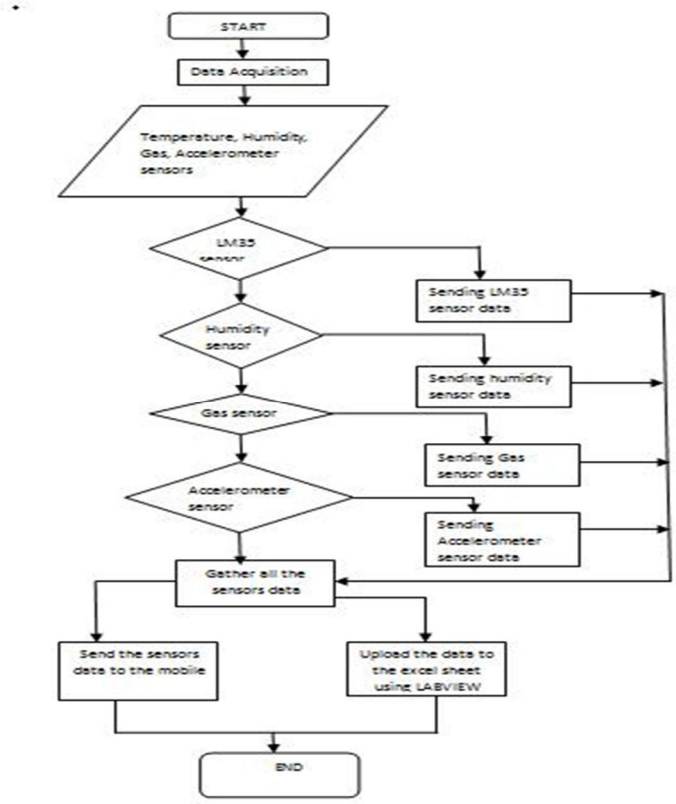

Figure No. 2

V. CIRCUIT DIAGRAM

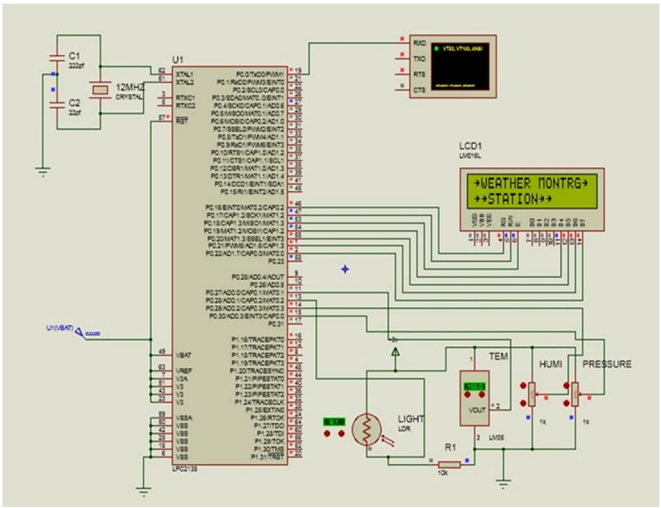

Figure No. 3

VI. SYSTEM SOFTWARE

In this project, two types of software are used. They are

A. KEIL software for C programming
B. LABVIEW

µVision4 is IDE (Integrated Development Environment). This is useful for creating, compiling, and debugging integrated programs.

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VII. HARDWARE

In this project, we must acquire all environmental knowledge parameters such as temperature, humidity, gas and accelerometer Measure the value of this sensor using ADC pin In LPC1768. Here, in the above figure, we use multi-sensor board or maps to install accelerometer sensors for check earthquake status. 12V battery is used as power supply. The Max board is used for transmission of information using serial communication and sensor values is displayed wirelessly on a mobile using GSM Module.

VIII. LAB VIEW

LABVIEW (abbreviation for virtual laboratory instrumentation Engineering Workbench) is a system designed platform and development environment for a visual programming language from National Instruments. The graphic language is known as "G". The information sent by the hardware can be accepted using serial communication. Read the channel displays for information . Also different sensors providing indications are displayed in labview.

IX. APPLICATIONS AND ADVANTAGES

A. Applications

1) Coal mine and used in biogas plants.
2) Used in the generation of plants.
3) Monitoring the field of agriculture.
4) Home Automation.
5) Industrial purpose

B. Advantages

1) This project can be used to conserve energy.
2) Security Target.
3) Improved for monitoring and control Atmosphere condition.

X. CONCLUSION

This paper demonstrates how weather monitoring and controlling system is designed and implemented and how they are used for monitoring and controlling the environmental parameters. For environmental monitoring systems the embedded controlled sensor network have proven themselves to be a dependable solution in providing remote control and sensing. The sensors are interspersed with system to monitoring device and take account of existence of gas, temperature and humidity in atmosphere using various information and communication technology. Using serial communication sensors can upload data in LABVIEW. It also describes justification of project and working scopes in real life.

XI. FUTURE SCOPE

In future this project can be developed further and it can also give more effective result in real life application. From 1 week observation, the weather parameters value can be used for weather prediction for upcoming days. Increasing sensors for more effective results. To develop mobile application for forecasting weather from anywhere in the world.

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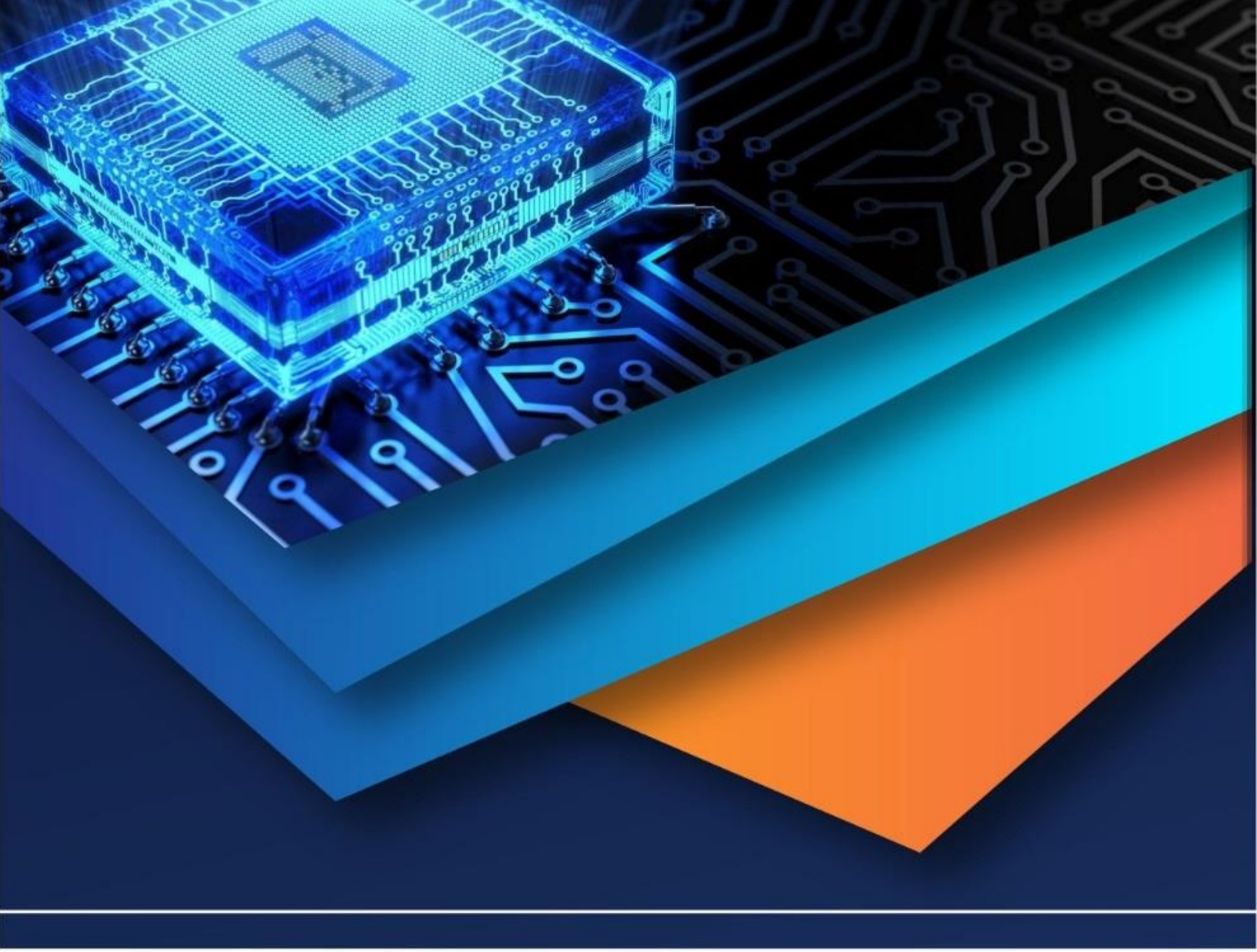

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