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ENVIRONMENTAL MONITORING FOR APPLICATIONS

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Abstract -

Embedded controlled sensor network is the technology used to implement environmental solutions effectively. Many researchers have been making attempts to develop the embedded controlled sensor network. While wireless sensor networks have been extensively studied in the past few years, most results are of the oretical nature and were obtained outside of a practical context. This can be problematic for real applications, especially in the area of environmental monitoring where many factors, such as harsh weather conditions, can greatly influence the performance of such a network, while reliable delivery and high-quality measurements are required. Sensor Scope is an interdisciplinary project. The system analyzes the particular requirements of environmental monitoring and how these requirements have been met in the Sensor Scope project. In the proposed system Renesas based microcontroller and wireless sensors are used to control the various devices and to monitor the information regarding the environment using GPS and GSM technologies.

Keywords-GPS,GSM, Temperature sensor,humiditysensor,micro controller.

I. INTRODUCTION

The environmental changes will effects on human activity. This project focus on the particularities of environmental monitoring through our experience with Sensor Scope. Most of these studies are of theoretical nature and may not apply, depending of the considered application Environmental monitoring, in particular, is demanding due to harsh outdoor conditions that may greatly impact hardware performance.

In Sensor Scope, There are many challenges, and they are described here and how it overcame. As a case in point, it is already able to deploy several networks as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. All monitoring strategies and programmers have reasons and justifications which are often designed to establish the current status of an environment or to establish trends in environmental parameters. In all cases the results of monitoring will be reviewed, analyzed statistically and published. The design of monitoring programmers, must therefore have regard to the final use of the data before monitoring starts.

II. PROJECT SYSTEM

A. BLOCK DIAGRAM

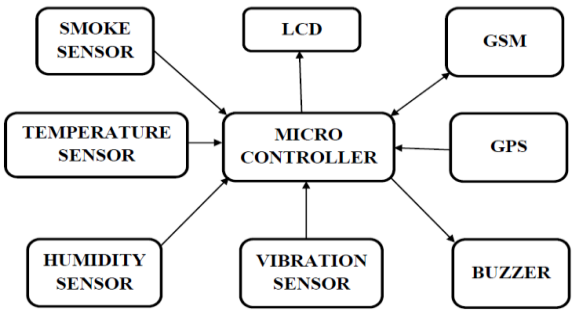

Fig.1 Block Diagram of Proposed System

The micro controller is a heart of the project. This implementation of this project, uses some sensors for giving the information about the environment. In this system we are using temperature sensor is used for calculate the present temperature of the environment, monitoring and characterize some circumstances and the variation in the temperature and Humidity sensor is used for detect the humidity. We are also monitor the vibration of the earth by using vibration sensor, Smoke sensor is used for monitoring the smoke or air in the environment. These are all parameters can be sent directly to the main server. By using those environmental parameters we can monitor the levels. In this project we are using GSM module as a communication module and the information of those parameters are stored in server and GPS module is used for fetch the exact location and send to the latitude and longitude to server through GSM module. If the threshold level of the parameters cross then displayed on the LCD and buzzer will get alarm.

The project system is cost effective and controlled by user friendly embedded systems. The. In this proposed system, there is one master module which consists of microcontroller, GSM module and GPS module. The various devices of home for short distance communication. GSM module is used for long distance and also fetch the location purpose GPS module is used.

III. HARDWARES USED

A. RL78/R5F100LE

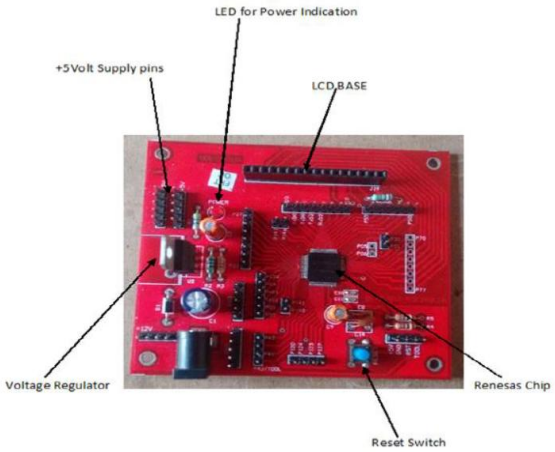

Fig.2 Reneses microcontroller having 64 pins

Features

o General-purpose register: 8 bits × 32 registers (8 bits × 8 registers × 4 banks)

o ROM: 512 KB, RAM: 32 KB, Data flash memory: 8 KB

o On-chip high-speed on-chip oscillator

o On-chip single-power-supply flash memory (with prohibition of block erase/writing function)

o On-chip debug function

o Ports Total 11 ports with 58 Input/Output Pins

 Port 0 0 to 6 Total 7 pins in port 0

 Port 1 0 to 7 Total 8 pins in port 1

 Port 2 0 to 7 Total 8 pins in port 2

 Port 3 0 to 1 Total 2 pins in port 3

 Port 4 0 to 3 Total 4 pins in port 4

 Port 5 0 to 5 Total 6 pins in port 5

 Port 6 0 to 3 Total 4 pins in port 6

 Port 7 0 to 7 Total 8 pins in port 7

 Port 12 0 to 4 Total 5 pins in port 12

 Port 13 0, 7 Total 2 pins in port 13

 Port 14 0, 1, 6, 7 Total 4 pins in port 14

o On-chip power-on-reset (POR) circuit and voltage detector (LVD)

o On-chip watchdog timer (operable with the dedicated low-speed on-chip oscillator)

o I/O ports: 16 to 120 (N-ch open drain: 0 to 4)

o Timer 16-bit timer: 8 to 16 channels, Watchdog timer: 1 channel

o Different potential interface: Can connect to a 1.8/2.5/3 V device

o 8/10-bit resolution A/D converter (VDD = EVDD =1.6 to 5.5 V): 6 to 26 channels

o Power supply voltage: VDD = 1.6 to 5.5 V

B. GSM MODULE.

GSM stands for Global System for Mobile Communications formerly called as “GroupeSpécial Mobile”.

This is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second generation (or "2G") digital cellular networks.

The GSM standard initially was used originally to describe switched circuit network for full duplex voice telephony to replace first generation analog cellular networks

The standard was expanded over time to include first circuit switched data transport, then packet data transport via GPRS(General packet radio service). Packet data transmission speeds were later increased via EDGE. The GSM standard is succeeded by the third generation (or "3G") UMTS standard developed by the 3GPP. GSM networks will evolve further as they begin to incorporate fourth generation (or "4G") LTE Advanced standards. "GSM" is a trademark owned by the GSM Association.

C. ALPHA-NUMERIC LCD DISPLAY

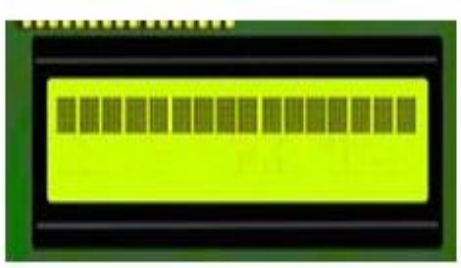

Fig.3 LCD display

A **liquid crystal display** (**LCD**) is a flat panel display, electronic visual display, based on on Liquid Crystal Technology.A liquid crystal display consists of an array of tiny segments (called pixels) that can be manipulated to present information. Liquid crystals do not emit light directly instead they use light modulating techniques.

LCDs are used in a wide range of applications, including computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones.

LCDs are preferred to cathode ray tube (CRT) displays in most applications because of

1. The size of LCDs comes in wider varieties.
2. They do not use Phosphor; hence images are not burnt-in.
3. Safer disposal
4. Energy Efficient
5. Low Power Consumption

D. SMOKE SENSOR (MQ 2)

Sensitive material of MQ-2 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is more higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration.

MQ-2 gas sensor has high sensitity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application.

E. TEMPERATURE SENSOR - LM 35

In general, a temperature sensor is a device which is designed specifically to measure the hotness or coldness of an object.LM35 is a precision IC temperature sensor with its output proportional to the temperature (in °C).With LM35,the temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from **-55°C to 150°C**.The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It has find its applications on power supplies, battery management, appliances.

F. GPS MODULE

GPS-"634R" is a highly integrated smart GPS module with a ceramic GPS patch antenna. The module is with 51 channel acquisition engine and 14 channel track engine, which is capable of receiving signals from up to 65 GPS satellites and transferring them into the precise position and timing information that can be read over either UART port or RS232 serial port. Small size and high end GPS functionality are at lower power consumption, both of the LVTTL-level and RS232 signal interface are provided on the interface connector.

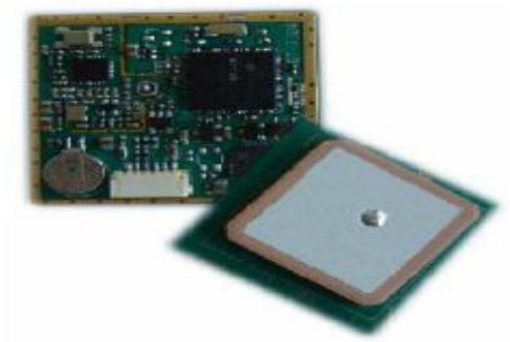

Fig.4 GPS Module

G. HUMIDITY SENSOR (HR202L)

Humidity sensors work by detecting changes that alter electrical currents or temperature in the air, according to Sensors Online. There are three basic types of humidity sensors: capacitive, resistive and thermal. All three types of sensors monitor minute changes in the atmosphere in order to calculate the humidity in the air.

A capacitive humidity sensor measures relative humidity by placing a thin strip of metal oxide between two electrodes. The metal oxide's electrical capacity changes with the atmosphere's relative humidity. These types of sensors are used for weather, commercial and industrial applications.

The reason these detection methods work is that humidity changes with air temperature, according to Tech-FAQ. Humidity sensors are vital to weather stations, industrial processes and HVAC systems.

H. COMPARATOR (LM358)

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package and applications of this op amp include conventional op-amp circuits, DC gain blocks and transducer amplifiers. LM358 IC is a good, standard operational amplifier and it is suitable for your needs. It can handle 3-32V DC supply & source up to 20mA per channel. This op-amp is apt, if you want to operate two separate op-amps for a single power supply. It's available in an 8-pin DIP package.

I. ACCELEROMETER (GY61)

GY-61 is a small, thin, low power, complete three-axis accelerometer voltage output through the signal conditioning at a minimum of full scale ± 3 g measurement range acceleration. It can measure the tilt-sensing applications in the static acceleration of gravity, and movement, shock or vibration due to dynamic acceleration. User CX, CY and CZ pin capacitance X OUT, Y OUT and Z OUT choose the bandwidth of the accelerometer. You can select the appropriate bandwidth depending on the application, X-axis and Y-axis bandwidth of 0.5 Hz to 1600 Hz, Z-axis of the bandwidth of 0.5 Hz to 550 Hz. ADXL335 offers small size, thin, 16-pin, 4 mm × 4 mm × 1.45 mm plastic lead frame chip scale package (LFCSP_LQ).

IV.SOFTWARE USED

A. MICROSOFT HYPER TERMINAL

Microsoft HyperTerminal is a small program that comes with Microsoft Windows. You can use it to send AT commands to your mobile phone or GSM/GPRS modem. It can be found at Start -> Programs -> Accessories -> Communications-> HyperTerminal. If you cannot find it and you are using Windows 98, then probably you have not installed it. You can go to Control Panel -> Add/Remove Programs -> Windows Setup tab -> Communications list box item -> Details button to install MS HyperTerminal.

Before start programming your SMS application, check the mobile phone, GSM/GPRS modem and SIM card are working properly first. The MS HyperTerminal is a handy tool when it comes to testing your GSM devices. It is a good idea to test your GSM devices beforehand. When a problem occurs, sometimes it is difficult to tell what causes the problem. The cause can be your program, the GSM device or the SIM card. If you test your GSM device and SIM card with MS HyperTerminal and they operate properly, then it is very likely that the problem is caused by your program.

B. CUIBESUITE+

The CS+ integrated development environment provides simplicity, security, and ease of use in developing software through iterative cycles of editing, building, and debugging.

The basic software tools are used for developing software for Renesas MCUs immediately after the initial installation. CS+ is also compatible with Renesas hardware tools including the E1 on-chip debugging emulator (sold separately), which facilitates advanced debugging. Abundant extensions and functions for user support ensure a dependable environment for all users.

C. RENESAS FLASH PROGRAMER

Renesas Flash Programmer is a software package used to program the on-chip flash memory of Renesas microcontrollers. It provides usability and functionality optimized specifically for flash programming.

The further revisions of the Renesas Flash Programmer with V.2.05.03 is discontinued, concerning the additions of new functions and MCUs support.However, our technical support for the commercial edition of the Renesas Flash Programmer is continued.

D. EMBEDDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations.

In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing.

A Technical Report was published in 2004 and a second revision in 2006.

V. RESULT

In this project introducing an environment monitoring system. It consist of Micro controller (R5F100LE), LCD display, Smoke sensor, Temperature sensor, Humidity sensor, vibration sensor (accelerometer), GSM module, GPS module and a Buzzer. Datas collected from the sensors and GPS were transferred to the microcontroller. The microcontroller sends the data to the mobile by GSM module, also the values were displayed on the LCD. In the developed system, sensor values were monitored continuously with an interval of one minute. If any parameter exceeded the threshold value, an immediate alert message was received on mobile.

It can be implemented in factories, Bridge monitoring and agricultural areas.

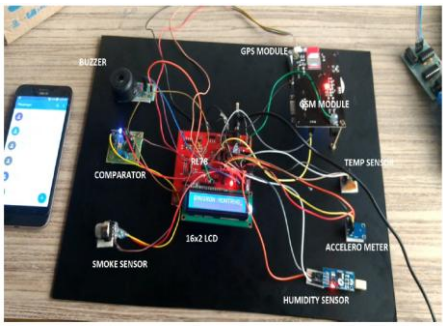

Fig.5 Project System

VI.CONCLUSION

The project is designed using structured modeling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications.

Science is discovering or creating major breakthrough in various fields, and hence technology keeps changing from time to time. Going further, most of the units can be fabricated on a single along with microcontroller thus making the system compact thereby making the existing system more effective. To make the system applicable for real time purposes components with greater range needs to be implemented.

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