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An Efficient Monitoring Station and Data Collection Network Based on Wireless Sensor Network

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ABSTRACT:*In the context of ubiquitous wireless sensor network,this paper presents a framework for wireless sensor networks(WSNs) designed to observe impacts of climate change in cropfields. It transmits the information of the sensor modules to the intermediates station with gsm interface, like the focus of, gas and temperture (MQ2 and LM35) sensor. And most of the collected information will be passed back again to the server (IOT) through WSN (GSM). Therefore, the ideal aspects of indoor atmosphere might be modified and controlled nicely with proper air quality, like temperture, etc. It will regulate a far more comfortable surroundings of a particular location and then made a more efficient energy saving system. With this particular safety-critical area monitoring program we are going to have much more practical significance as well as application worth in enhancing the greater living environment. Modern protection crucial places monitoring system must offer real-time monitoring of setting for individuals to enhance safety and lifetime.*

KEYWORDS: Wireless Sensor Network, Gas Sensor,Internet of Things, GSM Network

I. INTRODUCTION

A weather station is a facility, either on land or sea, with instruments and equipment formeasuring atmospheric conditions to provide information for weather forecasts and to studythe weather and climate. The measurements taken include temperature, pressure, humidity, gas,rain fall detection and pressure. An automatic weather station (AWS) is an automated version ofthe traditional weather station, either to save human labour or to enable measurements fromremote areas.Many crop management decisions are based on weather-crop development relationships.Daily weather data is currently used in most crop development research and applied models.Present weather and computer technology now makes possible monitoring of crop developmenton a real-time basis.

Remotely monitoring of environmental parameters is important in various applicationsand industrial processes. In earlier period weather monitoring systems are generally based onmechanical, electromechanical instruments which suffer from the drawbacks like poor rigidity,need of human intervention, associated parallax errors and durability. With the inclusion ofelectronics the instruments were made compact and cheaper. However, these systems lackflexibility of remote monitoring

II. RELATED WORK

To reduce power consumption using Zigbee protocol.Also in applications which require sensors that consume asmuch (or even more) energy as a wireless transceiver. SCAmonitoring is one of these applications. Gas sensors consumetypically 60–70 mW when they are active. Thus, thechallenge we face in the system design is the incorporation ofpower management techniques that schedule both energyconsuming sensors and the wireless transceiver. Animportant feature indicating quality of service in system isable to predict the behavior and the diffusion of a gas leakageand to adjust the frequency of the measurements to promptlysend alarm messages if necessary. Also, actuators in a formof ventilation control can be included to the WSN as gridpowered nodes. We perform simulations and powerconsumption assessments for two typical monitoringscenarios: Detection and displaying of contamination due to adangerous events like a pipe leakages.

- Analysis of the gas concentration due to contaminationproduced by a person during longer periods.
- We put forwarded a monitoring system which contains bothenvironment monitoring and personal positioning monitoringbased on WSN.

III. PROPOSED SYSTEM

The implemented system consists of amicrocontroller (LPC2148) as a main processing unitfor the entire system

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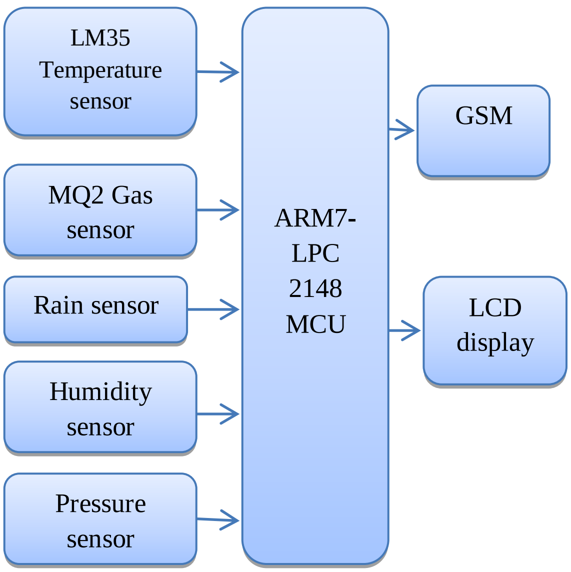
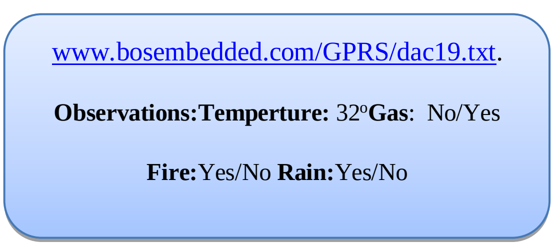
and all the sensor and devices canbe connected with the microcontroller. The sensors canbe operated by the microcontroller to retrieve the datafrom them and it processes the analysis with the sensordata and updates it to the internet through GSM module connected to it.In the above block diagram, there it isshowing the main elements in the proposed system.To design an embedded system the first an important step is hardware selection.



(a)



(b)

Fig.1(a) Block diagram (b)Server section

The hardwarecomponents should be chosen carefully to obtain high accuracy with minimum hardware and cost.Fig. 1(a), (b) show the block diagram of an embedded environment monitoring system. The hardwaresystem development is divided in major parts, viz. the gas sensor, signal conditioning circuit,ARM microcontroller on-board system, display system, GSM network and power supply. Provisionis also made to interface the unit to a personal computer through serial port for system programmingof ARM microcontroller as per requirement.

This project is developed to reduce the work load of human beings and to sense theparameters like Gas, Temperature, Humidity, Rain and Pressure. After sensing thoseparameter depending on the scenario the ARM controller will take appropriate action. Themain modules in this project are Sensors (Temperature Sensor LM 35, Humidity Sensor, GasSensor, Rain detection Sensor and Pressure Sensor), ARM controller unit with LCD displayand output device.This whole model can be placed anywhere. This model has five Sensors as an inputdevice to sense the Weather condition and depending on the parameter measured thecontroller will take appropriate action. This module continuously monitors the weathercondition of the place where it is placed. If the temperature varies, Gas detected, Rain falldetected, Humidity varies and Pressure of the weather varies, then the ARM controller willactivates the buzzer to convey the information.

A. HARDWARE IMPLEMENTATION:

ARM Microcontroller: The microcontroller used in the present study is the LPC2148. Deploying LPC2148 series for the designing of an embedded system for dedicated application is reported by various investigators.Fig.4 depicts the pin configuration of microcontroller LPC2148.

The LPC2148 are based on a 16/32 bit ARM7TDMI-S CPU with real time emulation and embeddedtrace support, together with 128/512 kilobytes (KB) of embedded high speed flash memory. A 128 bitwide memory interface and unique accelerator architecture enable 32 bit code execution at maximumclock rate. For critical code size applications, the alternative 16 bit thumb mode reduces code by morethan 305 with minimal performance penalty with their compact 64 pin package, low powerconsumption, various 32 bit timers,4 channel 10 bit ADC,USB port, PWM channels and 46 GPIOlines with up to 9 external interrupt pins [6].Due to tiny size and low power consumption, LPC2148 are ideal for applications whereminiaturization is a key requirement. It has attractive features and is suitable for a wide range ofapplications. The important features are :

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- 8 to 40 kB of on-chip static RAM and 32 to 512 kB of on-chip flash program memory.
- 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- It has In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software. Single flash sector or full chip erase in 400 ms and programming of 256 bytes in 1ms.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high speed tracing of instruction execution.
- Two 10-bit A/D converters provide a total of 6/14analog inputs, with conversion times as low as 2.44 µs per channel.
- Single 10-bit D/A converter provide variable analog output.
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power real-time clock with independent power and dedicated 32 kHz clock input.

Rain drop detection:A rain sensor or rain switch is a switching device activated by rainfall. There aretwo main applications for rain sensors.

Temperature Sensor: LM35 IC which was manufactured by National Semiconductors is used to measure temperature. The temperature sensor has three terminals as shown in figure 1. The V_{cc}pin is given a supply voltage of 5V DC. The ground pin is grounded. The data pin is connected to the chanel-1 of the inbuilt ADC using port pin. The sensor gives electrical output proportional to the temperature (^{0}C). The general equation used to convert output voltage to temperature is

$$T\ (^oC) = V_{out}*(100^o\ C/V_{cc})$$

Pressure sensor:A potentiometer informally a pot, is a three-terminal resistor with a slidingcontact that forms an adjustable voltage divider.[1] If only two terminals are used, one endand the wiper, it acts as a variable resistor or rheostat. A potentiometer measuringinstrument is essentially a voltage divider used for measuring electric potential (voltage);the component is an implementation of the same principle, hence its name.Potentiometers are commonly used to control electrical devices such as volume controlson audio equipment.

Gas sensor: Gas sensor is a device that is normally made up of metal oxides that senses the gas molecules. It sendselectrical signals as the output which is proportional to the gas concentration. Selection of a sensor isof prime importance as it decides the overall performance of the pollution monitoring system. Todetect CO gas generally SnO2 gas sensor is used. The SnO2 gas sensor has high sensitivity andselectivity towards CO gas. In the present study, a commercially available SnO2 gas sensor (MQ6) isused.

LCD Interfacing to Microcontroller: A liquid crystal display (LCD) is a thin, flat panelused for electronically displaying information such astext and integers. Its major features are its lightweightconstruction, and portability. Date and time arecontinuously displayed on LCD when the sensor valuesare being stored in EEPROM. Four data lines are usedto send data on to the LCD. When RS=0 and EN pin ismade high to low command is sent to LCD. WhenRS=1 and EN pin is made high to low data is sent toLCD. VEE is used to adjust contrast.

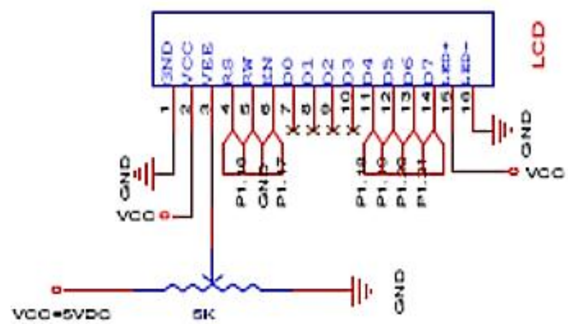

Fig.3. LCD connection to LPC2148

LEDs: The Light Dependent Resistor will monitor thelight intensity of the light intensity of surroundingenvironment. If the light intensity is getting low thenautomatically the LED lights will glow with a requiredintensity. Using the LED bulbs will save the energy inhomes and industries. Here we are controlling theintensity of the LEDs based on the outside light, so thatwe can save more power.

GSM module: It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. The use of GSM to send health information to webpage. This gives patient the ability to leave the hospital but still he has to stay in some known places to ensure the ability to reach him in emergency cases. Even with this solution the patient can't move freely and be far from his home.

B. SOFTWARE IMPLEMENTATION

In the proposed system, the softwareimplementation plays a major role while retrieving thesensor data and updating it to the server. Here twosoftware tools we used mainly. They are, Keil uVisionIde and Flash Magic.The Keil uVision IDE is an embeddedprogramming platform which supports variousmicrocontrollers and provides a completeprogramming environment for the microcontrollers.We used this IDE for programming the LPC2148which is a microcontroller with ARM7 TDMIprocessor.Flash magic is a tool used for writing themachine language code into the microcontroller‟sflash memory. This tool also facilitates the additionalfeatures like terminal window for the hardwaredevices.

Advantages:
1. All the components required are easily available.
2. It is accurate [Errors are nullified] & precise as it is Digital.
3. It is much Economical compare to other analogue systems.
4. Manual errors can be avoided to some extent.
5. Automatically controlled & Easy to use.
6. Unnecessary wastage of electricity can be controlled to a greater extend.

Disadvantages:
1. In this project usage of relays leads to consume more power.

Applications:
1. This project can be implemented in Home, School, Colleges, and Companies etc…
2. Where we have to reduce the work load of human and to sense the parameters like Gas,Temperature, Humidity, Rain and Pressure there we can implement this project.

IV. CONCLUSION

This work main concept of a WSN capable of monitoringsafety critical areas air quality and dangerous situations. Themain goal of our approach is the energy consumptionreduction on node level and sensor level.The research and implementation of a systemfor monitoring the environmental parameters usingIoT scenario is accomplished. The system providesa low power solution for establishing a weatherstation. The system is tested in an indoorenvironment and it is successfully updated theweather conditions from sensor data.

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BIODATA

Kommu Renuka completed M.Tech (Embedded Systems).

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