# Energy efficient environment monitoring station and data collection network based on wireless sensor network

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***Abstract*-Wireless Sensor Networks (WSNs) belongs to a new trend in technology in which tiny and resource constrained devices are wirelessly interconnected and are able to interact with the surrounding environment by collecting data such as temperature and gas.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.**

***Index Terms*- Wireless Sensor Network, Gas Sensor, Internet of Things, GSM Network**

## I. INTRODUCTION

The impacts of climate change lead to worldwide averagetemperature rise, flood increasing, salinity intrusion, lack of water is able to affect badly to crop yields. To researchall consequences of climate change on human activities, as well as toa solution for a man to adjust to climate change a look for a look forcontinuous and automatic monitoring of climatic parameters is actually an essential requirement.Recently, wireless sensor network (WSN) improvethe agricultural decision making and apply coping strategiesto fight the threats from climate change by utilizing sensornodes which one node is able to get several climatic parameters from a certain area in time that is real. For a long time, scientists haveproposed automatic environmental monitoring methods based on WSN [1], [2].Nevertheless, the network created by WSN is just a local areanetwork since it utilized one wireless transceiver which supportsonly one communication interface and couldn't inter connect with various other networks. Hence, it can make hard formonitoring areas where are really much from a data center withrequire an inter networking with various communication technologies.Climate change monitoring software calls for some other typesof networks to link all monitoring aspects to one data server facility. For recent years, by pairing General PacketRadio Service (GPRS) networking with the WSN infrastructure[3], [4], [5], the issue of network control is solvedand so that climate change monitoring may be done anywhere at any time. For that reason, the most effective solution to climate changemonitoring would be accomplished by integrating WSN withGPRS/3G network by making use of a gateway, which provides a morefull set of measurements in addition to telecommunication for remote access.

For practical deployment of an instant monitoring network, the life time of sensor station is vitally important.This lifetime is almost determined by the power consumptionof WSN correspondence nodes as well as GPRS modems whose radio transceivers are actually large energy consumer. Hence, keepingtransceivers on all of the time might result in a dilemma of energy lacking. Thus, for hardware look of climate monitoringstation grounded on WSNs, numerous research types have suggested.The concept of utilizing a solar cell to perform for the issue of energyusage so that battery could be charged up again automaticallywithout changing a brand new one [6], [7].

## II. RELATED WORK

The survey has firstly accomplished on wireless technologies to build a Wireless sensor network. The

study went on selecting the appropriate wireless technology. It must be ideal in all elements like technological and economic. The main concern we have to make while picking the communication strategy is actually a range of interaction. Right here we have chosen 802.11 b/g Wi-Fi. When we're providing an online source, the information may be replaced anyplace in the planet through its IP address. The additional study done on choosing the microcontroller. The system implementation is found with a concealed goal of obtaining very low power consumable solution. The microcontroller must be also small power consuming alongside all of the remaining sensors additionally small energy consuming. We've selected LPC2148 which is low power microcontroller and also works with just 3.3v.

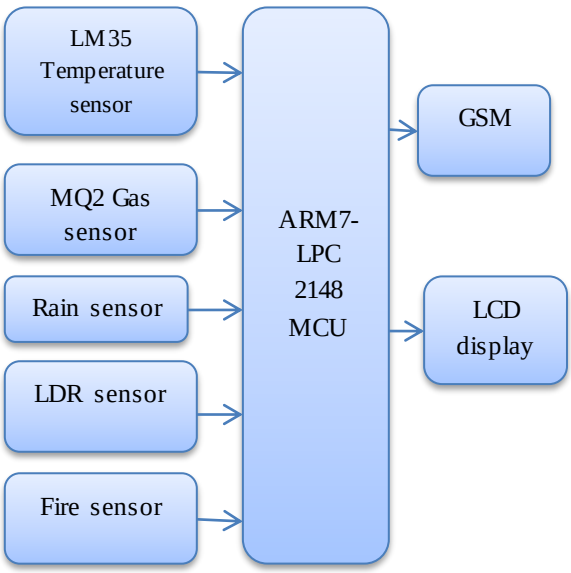
The ensuing study went on the information logger techniques on the web page. The information collected from the sensors are generally in the type of integer values representing the worth of the environmental parameter. The web page showing the information of sensors directly won't make a simpler opinion for the users. It must be in a graphical representation for quick comprehension of the visitors. The information hosted on an own web page is going to be a lot more costly and also have to pay for this on a rented basis. In order to come up with the program less expensive, we preferred some free information hosting sites who offer a cloud room for our sensor information to make it common as well as makes the program less expensive.

It is the future technology of connecting the entireworld at one place. All the objects, things and sensorscan be connected to share the data obtained in variouslocations and process/analyses that data for coordinating the applications like traffic signalling, mobile health monitoring in medical applications and industrial safety ensuring methods, etc. As per the estimation of technological experts, 50 billion objects will be connected in IoT by 2020. IoT offers a wide range of connectivity of devices with various protocols and various properties of applications for obtaining the complete machine to machine interaction.

The traditional technologies like home automation,wireless sensor networks and control systems willbecome more efficient and smarter due to involvementof IoT. IoT is having a wide range of application areas.Such as Medical applications for monitoring the healthof a patient and sends the information wireless.

## III. PROPOSED SYSTEM

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




(a)

www.bosembedded.com/GPRS/dac19.txt.
**Observations:Temperture:** 32°**Gas**: No/Yes
**Fire:**Yes/No**Rain:**Yes/No**Lightintensity**: Day/Night.

(b)

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

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 power consumption, 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 where miniaturization is a key requirement. It has attractive features and is suitable for a wide range of applications. The important features are :

- 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

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

Light Sensor:LDR is Light Dependent Resistor which is used a slight sensor. It gives output in terms of voltage which indicates the light intensity of the surroundings. The cell resistance falls with increasing light intensity. Its operating voltage is 320V AC or DC peak. LDR is having two terminals as shown in the figure 3. The data pin is interfaced with the trim pot which has variable resistance. The other pin of the LDR is grounded. The other pin of the trim pot is given to 3.3V power supply. The data pin is given to the inbuilt ADC of the microcontroller.

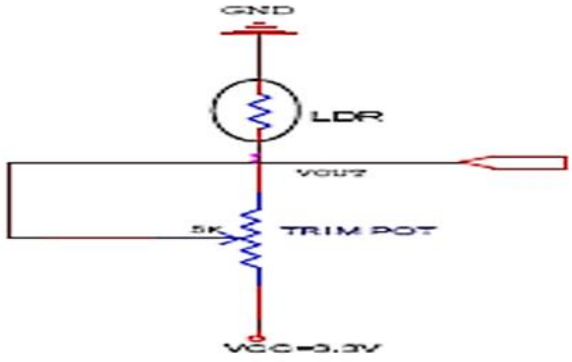



Fig.2. *Light Sensor*

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.

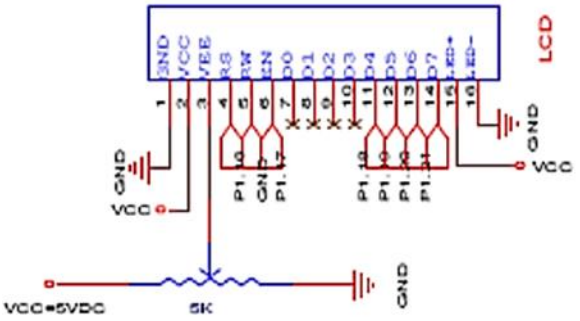



Fig.3. *LCD connection to LPC2148*

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.

## IV. CONCLUSION

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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