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AIR POLUTANT MONITRING USING SENSOR NETWORKS

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Abstract:-Sensor networks are currently an active research area mainly due to the potential of their applications. In this paper we investigate the use of Wireless Sensor Networks (WSN) for air pollution monitoring. With the fast growing industrial activities, the problem of air pollution is becoming a major concern for the health of the population. The basic aim of this project is the design wireless sensor network and control of inter–node data reception for use in the real time acquisition and communication of air pollutants such as CO2, CO, CH4 etc. The network consists of end devices with sensors, routers that propagate the network over long distances, and a coordinator that communicates with the computer. The design is based on ARM 7 based LPC 2148 microcontroller and Tarang-F4 ZigBee module to process communicate the data effectively with low power consumption. Also, extensive studies were performed to reduce data packets loss and Priority is given to power consumption and sensing efficiency, which is achieved by incorporating various smart tasking and power management protocols.

The main objective is achieved by interfacing various sensors to measure the common air pollutants. The measured data is displayed on the monitor using the hyper terminal .We proposed an innovative system named Wireless Sensor Network Air Pollution Monitoring System (WAPMS).

Keyword:-Environmental, ARM processor, wireless sensor networks, Zigbee module, Air pollutant, Sensor nodes pollutant, Sensor nodes

I. Introduction:

The unprecedented growth of industries and vehicular traffic has seriously affected the purity of clean air and environment. The world health organization announced that nearly 2.4 million people die every year due to this air pollution. So, the air pollution has become one of the greatest challenges for human health in the world so need to monitor the air pollutants and need to control it .To get a good environment and better future monitoring and controlling both are plays important role. [1]

This paper presents a network for indoor and outdoor air quality monitoring. Each node is installed in a different room and includes tin dioxide sensor arrays connected to an acquisition and control system. The nodes are hardwired or wirelessly connected to a central monitoring unit. To increase the gasConcentration measurement accuracy and to prevent false alarms, two gas sensor influence quantities, i.e., temperature and humidity,are also measured. Advanced processing based on multiple-input–single-output neural networks is implemented at the network sensing nodes to obtain temperature and humidity compensatedgas concentration values. Anomalous operation of the network sensing nodes and power consumption are also discussed [2].An online GPRS-Sensors Array for air pollution monitoring has been designed, implemented, and tested. The proposed system consists of a Mobile Data-Acquisition Unit (Mobile-DAQ) and a fixed Internet-Enabled Pollution Monitoring Server (Pollution-Server). The Mobile-DAQ unit integrates a single-chip microcontroller, air pollution sensors array, a General Packet Radio Service Modem (GPRS-Modem), and a Global Positioning System Module (GPS-Module). The Pollution-Server is a high-end personal computer application server with Internet connectivity. The Mobile-DAQ unit gathers air pollutants levels (CO, NO2, and SO2), and packs them in a frame with the GPS physical location, time, and date. The frame is subsequently uploaded to the GPRS-Modem and transmitted to the Pollution-Server via the public mobile network. A database

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server is attached to the Pollution- Server for storing the pollutants level for further usage by various clients such as environment protection agencies, vehicles registration authorities, and tourist and insurance companies. The Pollution-Server is interfaced to Google Maps to display real-timepollutants levels and locations in large metropolitan areas. The system was successfully tested in the city of Sharjah, UAE. Thesystem reports real-time pollutants level and their location on a 24-h/7-day basis.[3]

A remote online carbon dioxide (CO2) concentration monitoring system is developed, based on the technologies of wireless sensor networks, in allusion to the gas leakage monitoring requirement for CO2 capture and storage. The remote online CO2 monitoring system consists of monitoring equipment,

a data center server, and the clients. The monitoring equipment is composed of a central processing unit (CPU), air environmentsensors array, global positioning system (GPS) receiver module, secure digital memory card (SD) storage module, liquid crystal display (LCD) module, and general packet radio service (GPRS) wireless transmission module. The sensors array of CO2, temperature, humidity, and light intensity are used to collect data andthe GPS receiver module is adopted to collect location and timeinformation. The CPU automatically stores the collected data in the SD card data storage module and displays them on the LCD display module in real-time. Afterwards, the GPRS module continuously wirelessly transmits the collected information to the data center server. The online monitoring Web GIS clients are developed using a PHP programming language, which runs on the Apache web server. My SQL is utilized as the database because of its speed and reliability, and the stunning cross browserweb maps are created, optimized, and deployed with the Open Layers JavaScript web-mapping library. Finally, an experiment executed in Xuzhou city, Jiangsu province, China is introduced to demonstrate the implementation and application.[4]

III Implementation: - The system can be used for monitoring the concentration of gases both at the indoor as well as at the outdoor environment.

The main objective of this project is the usage of the semiconductor sensors adds several advantages to the system such as low cost, quick response, low maintenance, ability to produce continuous measurements, etc. But they also suffer from lack of selectivity and sensitivity as well as higher

Another important objective behind this work is also to develop a low power embedded design, which is successfully achieved. The power consumption measurement is considered only for the end devices as the coordinator is constantly powered at the base station. In the design two aspects are considered seriously. One is using the ZigBee module which consumes very less power during its operation .Actually this ZigBee module Tarang- F4 is meant for battery operated devices. The second aspect is the ARM processor, which is also a low power device. The ARM architecture can work in four powers down modes.

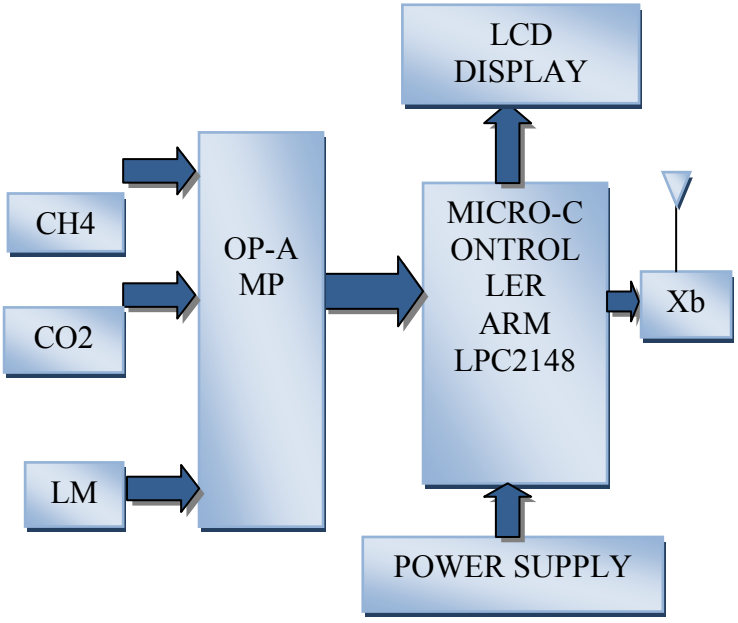


Fig.1 Block Diagram of Transmitter

RECEIVER:

Fig. 2 Block Diagram of Receiver

The purpose of designing this project is to monitor the air pollution.The components of this project are ARM7(LPC2148),Zigbee and different sensor for sensing

the gases (CO2,CH4,CO) also we are sensing the Temperature. Here we are using MQ series semiconductor sensors for sensing different gases like MQ2 for CO2, MQ6 for CH4 and LM35 for temp sensing.

Each circuitry required power supply; First 230V AC supply is down converted to 12V by 12-0-12 transformer. Rectifier circuit is used to convert AC to DC. After filtering and regulating we are getting 5V and 3.3V supply. The ARM7 required 3.3V and other circuit 5V, to achieve this constant voltage 7805 regulator is used.

After giving supply to sensor circuit, the sensors are starting sensing operation. Semiconductor sensors sense the gases in analog form,which is converted into digital form by ADC. ADC is inbuilt in ARM processor.

The ARM processor is the core of the pollution monitoring system. The ARM processor LPC2148 is a high performance, low power device used widely for wireless embedded systems. The LPC2148 ARM processor is based on a 16-bit/32-bit ARM7 TDMI-S CPU with real-time emulation that combines the Microcontroller with 512 kB of embedded high-speed Flash memory.

ARM processor convert digital data into ASCII form to display this data on LCD screen. Here we are using 16x2 character LCD .The 16x2 intelligent alphanumeric dot matrix display is ` capable of displays 224 different characters and symbols.

ARM7 sends data to LCD as well as central server (PC) through wireless network module. The wireless network module is Zigbee of Tarang-F4 .This modules are designed with low to medium transmit power and for reliability wireless network. The module operate within the ISM 2.4-2.4835 GHz frequency band with IEEE 802.15.4 base band.Outdoor line of sight range of Zigbee is 100 meter and indoor nonline of sight range is 30 meter .

At the receiver side, the central server here is the personal computer (PC) with accessibility to the internet. The server (PC) is connected to the ZigBee modem using the RS232 communication standard. The data received from the ZigBee receiver is stored and displayed in the PC.

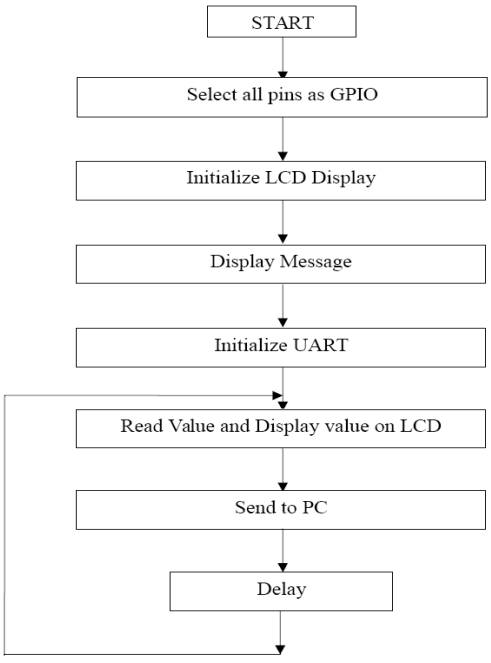
Hardware description:-

IV Designing the program:

Once the problem is known, then the programmer can begin to layout a sketch or overall plan of bow to salve the problem. The plan is called an algorithm. An algorithm is any scheme, such as a list of actions or a diagram, by which the programmer is guided in solving the problem. It can be very precise or quiet general. For instance, the algorithm for finding the square root of a 4 word number can be exactly specified, and in great detail. The algorithm for adding together several sets of numbers in memory can be quiet general. Common technique used to document an algorithm or diagrams called flowcharts. The history of flowcharts goes back to the down the computer age, when they were consider essential in the programming process.

V. Flow charts:

Diagrams of programs are called flowcharts because they visually show the way a program operates or "How" as it runs. These charts are not unique to computer programming and are used in many other fields, such as business and construction planning. We should again note here that large programs are not usually put into flowchart form.



V. a) complete system Routine

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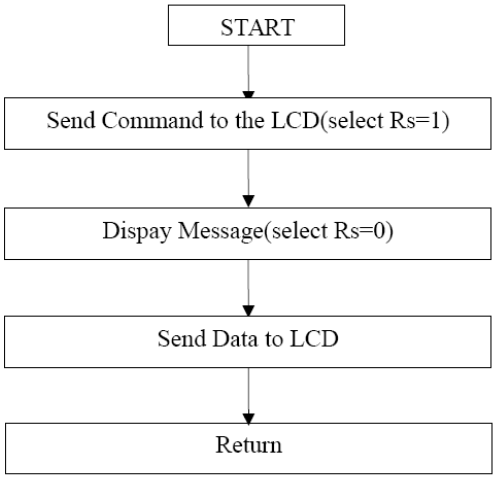
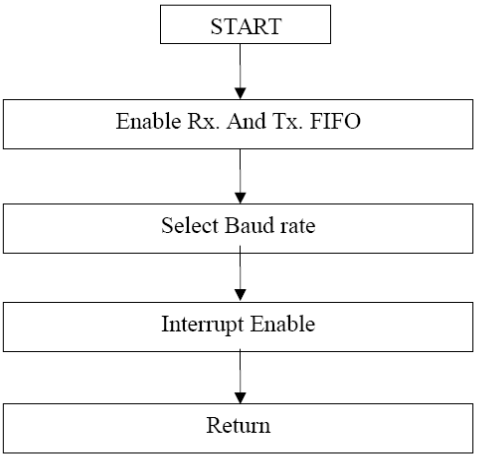


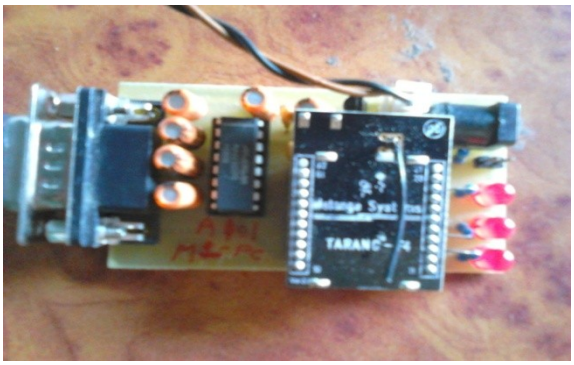
V. b) LCD Routine



V. C) UART Routine

Applications:-In industrial area Maximum area of pollution is industrial area , by using our project we can monitor the air pollution and we can control by manually.

VI. Result:-



VII Conclusion:-

A wireless air pollution monitoring system was designed, implemented and tested using the Zigbee network. The main purpose of this project is that to introduce a new method for air pollution monitoring. Wireless Air Pollution Monitoring System provides real-time information about the level of air pollution in these regions, as well as provides alerts in cases of drastic change in quality of air .The system utilizes remote controlled rover to collect pollutant gases such as CO, CO2, and CH4. The pollution data from sensor array is transmitted to a central server by using Zigbee network. The data shows the pollutant levels and their conformance to local air quality standards. The usage of the semiconductor sensors adds several advantages to the system such as low cost, quick response, low maintenance, ability to produce continuous measurements, etc.

VIII. FUTURESCOPE

In order to make the present design more realistic with low power by replacing the semiconductor sensor, it is possible to use nano sensor, so that the solar power base system design can be made possible. For longer distance communication we can use GSM system also we can control the air pollution by using sensed data as command.

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