GSM TECHNOLOGY BASED WIRELESS SENSOR NETWORK FOR GAS MONITORING

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Abstract: - Sensing technology has been widely investigated and utilized for gas detection. Due to the different applicability and inherent limitations of different gas sensing technologies, researchers have been working on different scenarios with enhanced techniques. This paper reviews the recent developments in existing gas sensing technologies and proposes a new advanced system based on embedded logic.Furthermore, the network is multimodal; it exploits information from auxiliary sensors, such as PIR sensors about the presence of people and from the neighbour nodes about gas concentration to modify the behavior of the node and the measuring frequency of the gas concentration. In this way, we reduce the nodes' activity and energy requirements, while simultaneously providing a reliable service. To evaluate our approach and the benefits of the context ware adaptive sampling, we simulate an application scenario which demonstrates a significant lifetime extension (several years) compared to the continuously-driven gas sensor. In March 2012, we deployed the WSN with 36 nodes in a four-story building and by now the performance has confirmed models and expectations Safety is the most important requirement of home for people. With the development of IT technology, network and automatic control technology, a remote home security monitoring and alarming system becomes more and more practicable today. By combining wireless sensor network (WSN) and GSM technology, this paper designs a low-power consumption remote home security monitoring and alarming system that can detect the theft, leaking of raw gas and fire, and send alarm message to the house owner's mobile phone.

Key words: *Sensors,Mems, Gsm , Zigbee*

I. Introduction

To improve people's comfort, health and safety it is very useful to monitor Indoor Air Quality (IAQ).Headaches, nausea, dizziness, eye and throat irritation are usual symptoms of the so-called Sick Building Syndrome(SBS). Earlier, only CO2 concentration was controlled, but in the recent several years Volatile Organic Compounds(VOCs) are also used as indicators of persons' comfort. Important sources of VOCs in a building are people (bioeffluents), furniture, building materials, paints, etc. Another important task in monitoring IAQ is detection of dangerous situations, like pipe leakage (e.g.CH4 or CO).CH4 (methane) is a principal constituent of the natural gas, used in almost every household for cooking or heating .When it reaches a certain concentration in air (5–15%), it is Flammable and explosive [3]. CO (carbon monoxide) sources are tobacco smoke, gas heaters and stoves, leaking chimneys, etc. It is colorless, odorless and tasteless, hence impossible to notice without a sensing device. In smaller quantities (e.g.100 ppm) it causes headaches and dizziness after a couple of hours of exposure. Higher concentrations cause headaches and dizziness after 5–10 min, and death within 30 min. Very high concentrations (e.g. 12800 ppm) cause unconsciousness after a couple of breaths, followed by death in less than 3 min. `In this project there are environmental sensors which saves

ISSN: 2278 – 7798

energy whenever the person enters then according to that the sensors will work. Basically gas sensors are power hungry s in order to reduce the power we are going for this project. whenever the PIR sensor will activate then only the gas sensor will be activated. In this project we are using the MEMS for the directions purpose and PIR for the person identification .whenever the gas level exceeds then the dc motor will on and the fan will undertake the excess gas and the energy will be saved this is the main concept of this project.

II. The Hardware System

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

III. Design of Proposed Hardware System

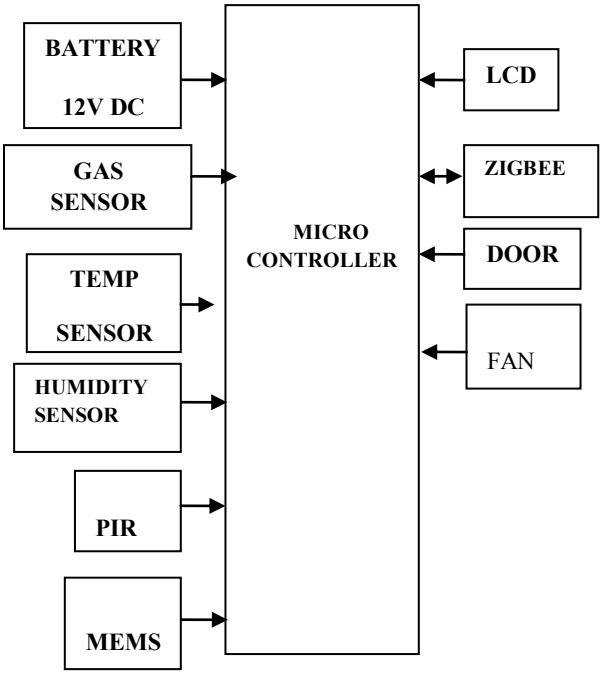

Fig.1.Block diagram

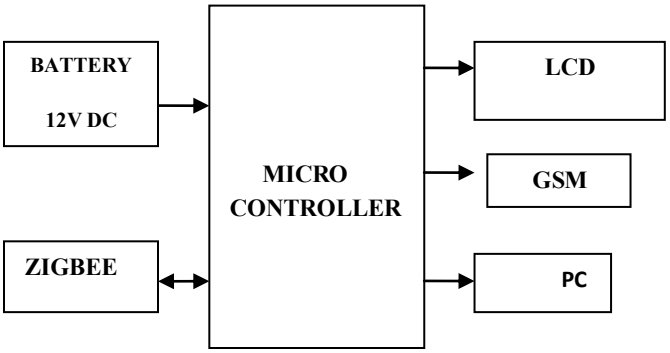

Fig.2.Block diagram

Safety is the most important requirement of home for people. With the development of IT technology, network and automatic control technology, a remote home security monitoring and alarming system becomes more and more practicable today. By combining wireless sensor network (WSN) and GSM technology, this paper designs a low-power consumption remote home security monitoring and alarming system that can detect the theft, leaking of raw gas and fire, and send alarm message to the house owner's mobile phone. In this project there are environmental Sensors which saves energy whenever the person enters then according to that the sensors will work. Basically gas sensors are power hungry s in order to reduce the power we are going for this project. Whenever the PIR sensor will activate then only the gas sensor will be activated. In this project we are using the MEMS for the directions purpose and PIR for the person identification .whenever the gas level exceeds then the dc motor will on and the fan will undertake the excess gas and the energy will be saved this is the main concept of this project.

IV.Board Hardware Resources Features

Gas Sensor :Electrochemical gas sensors are gas detectors that measure the concentration of a target gas by oxidizing or reducing the target gas at an electrode and measuring the resulting current. The sensors contain two or three electrodes, occasionally four, in contact with an electrolyte. The electrodes are typically fabricated by fixing a high surface area precious metal on to the porous hydrophobic membrane. The working electrode contacts both the electrolyte and the ambient air to be monitored usually via a porous membrane. The electrolyte most commonly used is a mineral acid, but organic electrolytes are also used for some sensors. The electrodes and housing are usually in a plastic housing which contains a gas entry hole for the gas and electrical contacts.

Thermistor: A thermistor is a type of resistor whose resistance varies significantly with temperature, more so than in standard resistors. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements.Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range, typically −90 °C to 130 °C.

Humidity Sensor: A humidity sensor also called a hygrometer, measures and regularly reports the relative humidity in the air. They may be used in homes for people with illnesses affected by humidity; as part of home heating, ventilating, and air conditioning (HVAC) systems; and in humidors or wine cellars. Humidity sensors can also be used in cars, office and industrial HVAC systems, and in meteorology stations to report and predict weather.A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature.The most common type of humidity sensor uses what is called "capacitive measurement." This system relies on electrical capacitance, or the ability of two nearby electrical conductors to create an electrical field between them. The sensor itself is composed of two metal plates with a non-conductive polymer film between them. The film collects moisture from the air, and the moisture causes minute changes in the voltage between the two plates. The changes in voltage are converted into digital readings showing the amount of moisture in the air.

PIR Sensor :

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin.

- Single bit output

- Small size makes it easy to conceal
- Compatible with all Parallax microcontrollers

Mems:

Micro electro mechanical systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. Their size range from the sub micrometer (or sub micron) level to the millimeter level and there can be any number, from a few to millions, in a particular system. MEMS extend the fabrication techniques developed for the integrated circuit industry to add mechanical elements such as beams, gears, diaphragms, and springs to devices. Examples of MEMS device applications include inkjet-printer cartridges, accelerometers, miniature robots, micro engines, locks, inertial sensors, micro transmissions, micromirrors, micro actuators, optical scanners, fluid pumps, transducers and chemical, pressure and flow sensors. Many new applications are emerging as the existing technology is applied to the miniaturization and integration of conventional devices.

These systems can sense, control and activate mechanical processes on the micro scale and function individually or in arrays to generate effects on the macro scale. The micro fabrication technology enables fabrication of large arrays of devices, which individually perform simple tasks, but in combination can accomplish complicated functions. MEMS are not about any one application or device, or they are not defined by a single fabrication process or limited to a few materials. They are a fabrication approach that conveys the advantages of miniaturization, multiple components and microelectronics to the design and construction of integrated electromechanical systems. MEMS are not only about miniaturization of mechanical systems but they are also a new pattern for designing mechanical devices and systems.

ZigBee :It is a specification for a suite of high level communication protocols using small, low-power digital radios based on the IEEE 802.15.4-2003 standard for Low-Rate Wireless Personal Area Networks (LR-WPANs), such as wireless light switches with lamps, electrical meters with in-home-displays, consumer electronics equipment via short-range radio needing low rates of data transfer. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking.

ZigBee is a low-cost, low-power, wireless mesh networking standard. First, the low cost allows the technology to be widely deployed in wireless control and monitoring applications. Second, the low power-usage allows longer life with smaller batteries. Third, the mesh networking provides high reliability and more extensive range.It is not capable of powerline networking though other elements of the OpenHAN standards suite promoted by openAMI and zdeal with communications co-extant with AC power outlets. In other words, ZigBee is intended not to support powerline networking but to interface with it at least for smart meeting and smart appliances purposes. Utilities, e.g. Penn Energy, have declared the intent to require them to interoperate again via the openHAN standards.

Gsm: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service).

Conclusion:

This work addressed the concept of a smart WSN capable of monitoring indoor air quality and dangerous

situations. The main goal of our approach is the energy consumption reduction on sensor level, node level and network level. To achieve this goal, the node consumes a very low sleep current (only8μA) and can perform dynamic gas sampling. In addition, we reduce the activity of the node and of the MOX gas sensor using the information about people presence from the PIR sensor and alarm messages from the other nodes in the network. We guarantee the reduction of power consumption without affecting reliability of the service. Simulations on an application scenario with a conservative power management strategy where activity of the gas sensor has been fixed (long enough to reach the asymptotic region of the transient behavior) show how the approach strongly increased lifetime of the network to several years with just 2 AA batteries (in respect to several days when the gas sensor is continuouslydriven). The initial study on the transient behavior of thegas sensor shows that its lowest resistance highly correlates with the asymptotic values and gives an option to further decrease the heating time which indicates power savings of two orders of magnitude. This requires further calibration and validation of the gas sensor in our future work. We should define the minimal time the sensor should be heated and find the threshold values in order to get a reliable information about the monitored gas concentration. Having that information, we can approach the issue of choosing a proper sampling rate set for the gas sensor that satisfies both long network lifetime and low reaction time.

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