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Industrial Safety Security System Based On Gas Sensor with SMS Based Alerts

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Abstract: This project describes a security alarm system that can monitor an industry. This is a simple and useful security system and easy to install. This fire / smoke detector are easily available and can be interfaced with the microcontroller, with one of its many applications are in different offices and shops for security against fire. The detector will sense smoke caused by fire accident and prevent major damage. The aim of this project is to monitor for liquid petroleum gas (LPG) leakage to avoid fire accidents providing industry safety feature where security has been an important issue. The system detects the leakage of the LPG using gas sensor and alerts the consumer about the gas leakage by sending SMS. The proposed system uses the GSM to alert the person about the gas leakage via SMS. When the system detects the LPG concentration in the air exceeds the certain level then it immediately alert the consumer by sending SMS to specified mobile phone and alert the people at home by activating the alarm which includes the LED, Buzzer simultaneously and display the message on LCD display to take the necessary action and switch on the exhaust fan to decrease the gas concentration in the air.

Keywords: Liquid Petroleum Gas (LPG), LED, LCD, GSM, GPS.

I. INTRODUCTION

The LPG or propane which is flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, vehicles because of its desirable properties which include high calorific value, which produce the less smoke, produces less soot, and does not cause much harm to the environment. Natural gas is another widely used fuel in homes. Both gases burns to produce clean energy, however there is a serious problem about their leakage in the air. The gases being heavier than air do not disperse easily and may lead to suffocation when inhaled also when gas leakage into the air may lead to explosion. Due to the explosion of LPgas the number of deaths has been increased in recent years. To avoid this problem there is a need for a system to detect and also prevent leakage of LPG. Gas leak detection is the process of identifying potentially hazardous gas leaks by means of various sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. security of a home and industries when the user is away from the place and industrial areas away from cities if fire occurs during night this system sends the location details by means of sending longitude and latitude angles by using GPS and sends messages to fire station, police station ,and predefined numbers. At the fire and police station received information has a destination address to find route in google map from fire and police station. This system uses fire sensors and gas sensors that finds fire occurred or not if occurred it sends control signal to microcontroller. The microcontroller receives the GPS information by GPS modem connected to the microcontroller and it sends the message using GSM modem containing information of longitude and latitude angle calculated by GPS. The microcontroller also sends signal to the alarm and signal to the emergency window that opens by means of actuators.

II. BLOCK DIAGRAM

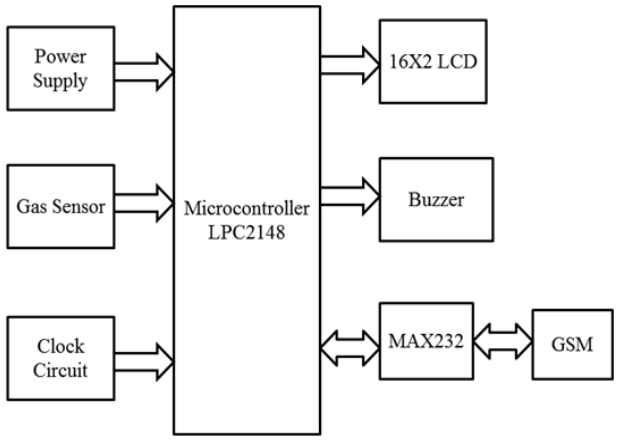

Fig.1. Block Diagram.

Fig.1 Shows System based on gas sensor with SMS based alerts. Hardware framework for System Contains Microcontroller, LCD Display, LED, Buzzer and GSM Modem. All Devices Controlled By Microcontroller Unit. When Gas inside the cylinder goes below threshold limit it sends SMS alert to the user as well as gas agency using GSM module. LCD unit continuously display level of gas inside cylinder. It Display the Quantity of Gas Inside Cylinder. When gas inside cylinder less than particular limit then microcontroller immediately send a booking message to gas

agency & at same time send alert message to user. The message will be displayed on LCD. Framework for Proposed System Proposed design can provide safety by using MQ5 gas sensor which can detect the gas leakage and gives signal to the microcontroller. It activates to buzzer & using GSM module it can send warning message to the user. Proposed design able to receive message from gas agency it can display message received by gas agency when booking is confirmed.

III. RELATED STUDY

A. ARM7 Family

ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry's most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications. The ARM7TDMI-S core is the synthesizable version of the ARM7TDMI core, available in both VERILOG and VHDL, ready for compilation into processes supported by in-house or commercially available synthesis libraries. The ARM720T hard macro cell contains the ARM7TDMI core, 8kb unified cache, and a Memory Management Unit (MMU) that allows the use of protected execution spaces and virtual memory. This macro cell is compatible with leading operating systems including Windows CE, Linux, palm OS, and SYMBIAN OS.

B. GSM (Global System for Mobile Communications)

The GSM which is one of the representative wireless networks which has low-power, low-cost and convenience to use. Global System for Mobile Communications originally from Groupe Special Mobile is the most popular standard for mobile telephony systems in the world. The GSM Association, its promoting industry trade organization of mobile phone carriers and manufacturers, estimates that 80% of the global mobile market uses the standard. GSM is used by over 1.5 billion people across more than 212 countries and territories. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.

Technical Details: Most GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including the United States and Canada) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. The rarer 400 and 450 MHz frequency bands are assigned in some countries, notably Scandinavia, where these frequencies were In the 900 MHz band the uplink frequency band is 890-915 MHz, and the downlink frequency band is 935-960 MHz this 25 MHz bandwidth is subdivided into 124 carrier frequency channels, each spaced 200 kHz apart.

Using GSM Modem in the ATM System: In the system we will be using a GSM Modem to send and receive SMS. When the robbery occurs, it will send the message to corresponding banks and near police station (PS) according to the controller.

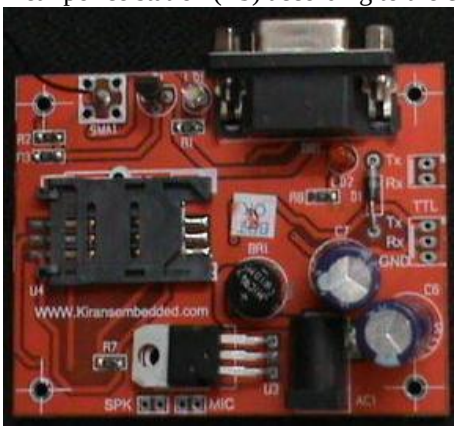

Fig.2.

C. Gas Sensor MQ2

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. Gas sensor is the device used for detecting the presence of Gases like Carbon monoxide, LPG, Ethanol, Toluene, Hydrogen etc. These are used as safety measures in work places and Home to avoid hazardous situations. The sensor can be used to generate an alarm or to activate a system to shut down the gas flow. Gas detectors are usually battery operated devices and if the gas level exceeds the preset level, it sends output signal to activate the circuit. Most commonly used gas sensors are LPG sensor, Smoke sensor and Alcohol sensor used in Breath analyzer.

Fig.3.

IV. HARDWARE RESOURCES

A. RFID Reader

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from

magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. There are two Parts in RFID, they are reader and tag.

A. Passive Reader Active Tag (PRAT)

System has a passive reader which only receives radio signals from active tags (battery operated, transmit only). The reception range of a PRAT system reader can be adjusted from 1–2,000 feet (0–600 m), allowing flexibility in applications such as asset protection and supervision.

B. Power Supply Circuit

The main building block of any electronic system is the power supply to provide required power for their operation. For the microcontroller keyboard, LCD, GSM, +5V are required & for driving buzzer +12V is required. The power supply provides regulated output of +5V & non-regulated output of +12V. The hardware part consists of the components and the sensors used in the system. This part mainly collects the status of the sensors and stores it into the micro controller‘s EEPROM.

C. LCD (Liquid Crystal Display)

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

D. DC Motor

For the Closing the ATM door, we are using DC motors. It is operated by 12VDC power supply. In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when and to the strength of the external magnetic field. Here we are placing DC Motor for closing the ATM door while thieves are trying to broken the ATM machine.

E. L293D Driver

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction.

Features:

- Wide Supply-Voltage Range: 4.5 V to 36 V.
- Output Current 1 A Per Channel (600 mA for L293D).
- Peak Output Current 2 A Per Channel (1.2 A for L293D).

F. Buzzer

Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Here in our project buzzer is used to produce sound whenever robbery occurs.

Specifications:

- Coil resistance : 42 ± 2 Ω
- Rated voltage : 5 V
- Rated current : ≤15mA
- Sound pressure level : ≥80dB
- Resonant frequency : 2048Hz
- Working temperature: - 20 ~ + 45

V. SOFTWARE IMPLEMENTATION

For the software implementation, we deploy two software packages. First one is the Keil µVision 4.0. Second one is the Flash magic simulator. The Keil µVision Debugger accurately simulates on-chip peripherals (I²C, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of ARM7device. Simulation helps to understand hardware configurations and avoids time wasted on setup problems. With simulation, we can write and test applications before target hardware is available. The system program written in embedded C using KEIL IDE software will be stored in Microcontroller. Keil development tools for the Microcontroller Architecture support every level of software developer from the professional applications engineer to the student for learning about embedded software development. The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators support all ARM7 derivatives. The Keil Development Tools are designed to solve the complex problems facing embedded software developers. Flash magic is used to dump the code to microcontroller from PC. Flash Magic is a free, powerful, feature-rich Windows application that allows easy programming of Philips FLASH Microcontrollers. Build custom applications for Philips Microcontrollers on the Flash Magic platform! Use it to create custom end-user firmware programming applications, or generate an in-house production line programming tool. The Flash Memory In-System Programmer is a tool that runs under Windows 95/98/NT4/2K. It allows in-circuit programming of FLASH memories via a serial RS232 link. Computer side software called Flash Magic is executed that accepts the Intel HEX format file generated from compiler Keil to be sent to target microcontroller. It detects the hardware connected to the serial port.

VI. CONCLUSION

LPgas which used in many applications because of its desirable properties like homes, hostels, industries, vehicles so we can use this device if there is any gas leakage this

system detects gas leakage and if gas leakage exceeds certain level this system automatically alert the people by sending the message and alert the people at home by activating the LED, Buzzer and take the necessary action of preventing the gas leakage.

VII. REFERENCES

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