GSM BASED INDUSTRIAL PROTECTION

Nuthulapati Rajesh Babu[1], A.Durga Naveena[2], R.Sainadh[3],G.Ramya[4]

[1,2,3,4]*EEE Department, DVR & DR HS MIC College of Technology*

Abstract—Security has becoming an important issue everywhere. Industrial security is becoming necessary nowadays as the possibilities of intrusion are increasing day by day. The main aim of this project is to design and implement a flexible and cost-effective GSM Based Industrial Automation Protection System. It is needed for the occupant's convenience and safety.The GSM Based Industrial Protection System helps you to detect leakage of harmful gases, increase of temperature, voltage, and fire and after detecting suspicious activity by using sensors, it sends an alarm message to the owner number as well as security personnel. The concerned person will take some action, by sending some commands to the Microcontroller unit through registered mobile and control the device through relays

Keywords- Arduino Uno a microcontroller based ATmega328p with Gas Sensor,Temperature Sensor, Fire Sensor, and Voltage Sensor

I. INTRODUCTION

With heavy automation taking place these days, the number of industries as well as number of accidents in those industries have increased substantially. Human errors and manual safety systems lead to increase in industrial accidents. So here we propose a gsm based industrial protection system that detects smoke, temperature as well as light to keep track of accidents. The system needs to detect if the temperature of a machine or environment goes above a certain level, if it goes above a level, it is an indication of a malfunction. So here we use temperature sensor to detect a possible accident. Next indication is the malfunction or overloading of machines leading to smoke. We use smoke detectors to detect smoke and similarly a light sensor to detect light due to spark or any flash caused due to malfunctions. All these indicators/sensors constantly provide their input to the microcontroller connected to them.The Arduino Uno is a microcontroller based on the ATmega328p constantly processes this data. On encountering a warning signal from any of these sensors the microcontroller now communicates this data to a gsm modem interfaced to it and sends out an SMS message to intended user as a warning.
Existing systems
1.Wired System,
2. RF Based Security System,
3.Web enabled Security System.
Disadvantage of Existing Systems
1.Difficult to maintain
2.Need internet access
3. Distance.
Proposed System:The proposed system uses GSM module which enables us to know the security status of home/industry when we are away from the home/industry.

II. ARCHTECTURE OF THE SYSTEM

It can be implemented to any levels of the security system. The architecture of the system mainly consists of three components the GSM MODEM and the interface circuit that include the different

sensors used. The function of the GSM MODEM is the remote communication between the user and the controller through the RS232 serial communication standard. The function of the controller is to continuously check the inputs coming from the different sensor and send message through the GSM network in case of emergency. The microcontroller is connected to different devices like smoke detector, motion detector through relays. The GSM connected to the user, police station, and fire brigade through the mobile cellular network. An interface circuit has been designed which includes sensors as input devices. Then the programmed microcontroller has been connected to the interface circuit and the GSM MODEM through the serial port of the GSM MODEM

III.DESIGN AND IMPLEMENTATION

The proposed system comprises of GSM modem, Microcontroller, various sensors, relays, memory and LCD Display. If the user wants to control the system from a remote place, he/ she has to send the SMS command from his registered mobile indicating the operation of the device. The GSM modem embedded with Microcontroller receives the user's command. According to the received message, the Microcontroller will switch ON/ OFF the relays (i.e. specific application).
The block diagram of the GSM Based Industrial Automation system has shown in the below diagram. The system mainly consists of three components the GSM MODEM and the interface circuit that includes the different sensors used.
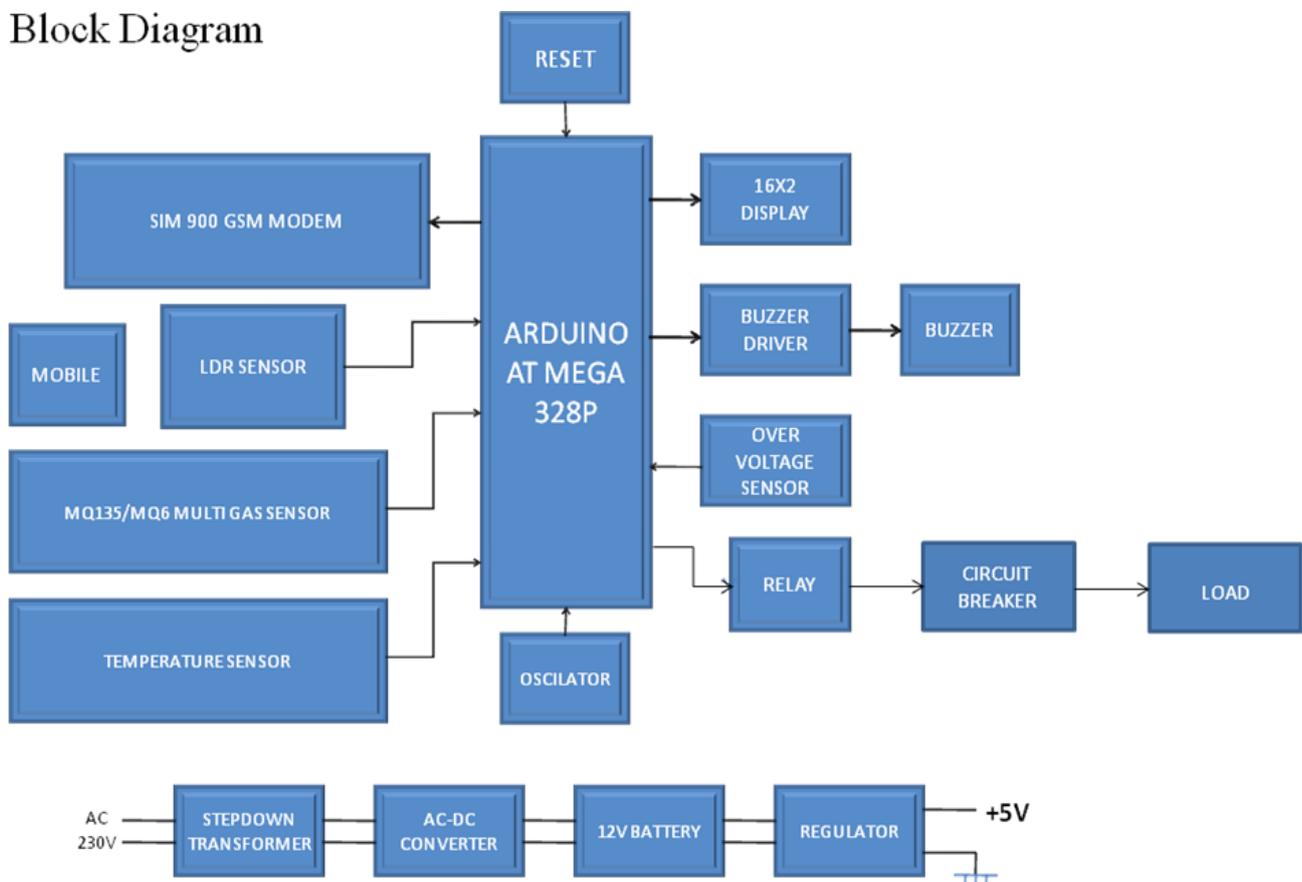

Fig 1.Block Diagram & Power Supply Circuit

IV.SENSING DEVICES

4.1 PROXIMITY SENSOR

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. It is the same principle in ALL Infra-Red proximity sensors. The basic idea is to send infra red light through IR-LEDs, which is then reflected by any object in front of the sensor. Then all you have to do is to pick-up the reflected IR light. For detecting the reflected IR light, we are going to use a very original technique: we are going to use another IR-LED, to detect the IR light that was emitted from another LED of the exact same type. This is an electrical property of Light Emitting Diodes (LEDs) which is the fact that a LED produces a voltage difference across its leads when it is subjected to light. As if it was a photo-cell, but with much lower output current.

Fig.2. IR LED's

4.2 LIGHT DEPENDENT RESISTOR

A light dependant resistor also knows as a LDR, photo-resistor, photoconductor or photocell, is a resistor whose resistance increases or decreases depending on the amount of light intensity.

LDRs (Light Dependant Resistors) are a very useful tool in a light/dark circuits. LDRs can have a variety of resistance and functions. For example it can be used to turn on a light when the LDR is in Darkness or to turn o a light when the LDR is in light. It can also work the Other way around so when the LDR is in light it turns on the circuit and when it's in darkness the resistance increase and disrupts the circuit.
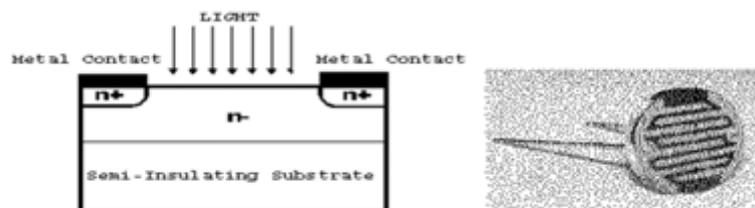
Fig.3. LDR

4.3 GAS AND SMOKE SENSOR

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shutdown. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals

Fig.4. Gas Sensor

4.4 ATmega328

The **ATmega328** is a single-chip microcontroller created by Atmel in the megaAVR family It has a modified Harvard architecture 8-bit RISC processor core. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

A common alternative to the ATmega328 is the "pico Power" ATmega328P. A comprehensive list of all other members of the mega AVR series can be found on the Atmel website.

- ATmega328

- ATmega328P and ATmega328P-AUTOMOTIVE

- ATmega328PB and ATmega328PB-AUTOMOTIVE (superset of ATmega328P)

As of 2013 the ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

V.SERIAL COMMUNICATION–RS232

A popular way to transfer commands and data between a personal computer and a microcontroller is the use of standard interface, like the one described by protocols RS232(older) or USB (newer). This chapter is devoted to communication conforming to RS232protocol, the hardware for such interface is provided onboard. An example will be presented showing the processing of commands received through RS232 interface, and sending of a string of numbers using the same interface. The microcontroller includes up-to six hardware modules to deal with RS232 signals. Some of the modules additionally implement other

communication protocols, like I2C, CAN, SPI; module named UART4 will be used in this experiment. Its detailed description can be found in RM0090, chapter 26. The voltage level translator is added on the test board, and is industry standard chip MAX3232. The Signals TX and RX are available at connector P580,pins3 and 2 respectively. The RS232 signals RX and TX are available as alternate functions replacing the regular port bits, and corresponding port pins Must be properly initialized software.
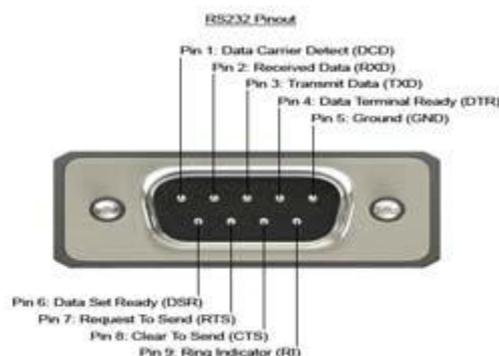

Fig.5. D-Connector

VI.SIM900-GSM/GPRS Module

GSM (Global system for mobile communication) is a cellular network. GSM network operate in four different frequency ranges. Most GSM network operates in 900 MHz or 1800 MHz bands. The transmission power int he handset is limited to a maximum of 2 watts GSM 850/900/300 and 1watt in 1800/1900. The longest distance the GSM specification supports in practical use is 35Km (22 mi). In this paper we use SIM900a based GSM modem to receive and send short message to user and system

Fig.6 SIM 900A

VII.LCD 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. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data

register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD

Fig.7. LCD Display

VIII.RELAY DRIVER CIRCUIT

Relays are components which allow a low-power circuit to switch a relatively high current on and off, or to control signals that must be electrically isolated from the controlling circuit itself. New

comers to electronics sometimes want to use a relay for this type of application, but are un sure about the details of doing so. Here is a quick run down. To make a relay operate, you have to pass a suitable 'pull-in' and 'holding' current(DC) through its energizing coil. And generally relay coils are designed to operate from a particular supply voltage often 12V or 5V, in the case of many of the small relays used for electronics work.

IX. CONTROL AND INTERFACE CIRCUITS

Nowadays, microcontrollers are so cheap and easily available that it is common to use them instead of simple logic circuits like counters for the sole purpose of gaining some design flexibility and saving some space. Some machines and robots will even rely on a multitude of microcontrollers, each one dedicated to a certain task. Most recent microcontrollers are „In System Programmable‟ ,meaning that you can modify the program being executed, without removing the microcontroller from its place. In this paper aPHILIPS madeP89V51RD2 Microcontroller is used. It has 8-bitdata bus, 16-bit address bus, 32 general purpose registers each of 8 bits, 16 bit timers, 3 internal and 2 external interrupts, Bit as well as by addressable RAM area of 16 bytes. Four 8-bitports, (short models have two 8-bit ports). 16-bitprogram counter and data pointer, 64K Flash memory and UART for serial communication. The microcontroller is programmed by using Flash Magic Software. Control and interface Circuit

X. WORKING OF THE SYSTEM

The system is fully controlled by the microcontroller and the microcontrollers will continuously monitors the sensors, detector and GSM modem. If the voltage level of sensor input pins goes to zero then it will send the "AT +CMGS ="USER MOBILE NUMBER" to GSM modem through serial port. The GSM modems will response with the character ">". After receiving ">"Character microcontroller again send the type of security problem SMS + CTRLZ to GSM Modem.GSM modem will send the type of problem to user. For example any moment detected insecurity area at the time microcontroller pin number 39 goes to logical zero. Microcontroller sensed the change and immediately send AT + CMGS = "+888888888888" to GSM modem, GSM modem give ">"character to microcontroller. After receiving ">" Character microcontroller again sends the "MOMENTDETECTED" SMS to GSM Modem. GSM modem sends the SMS to user

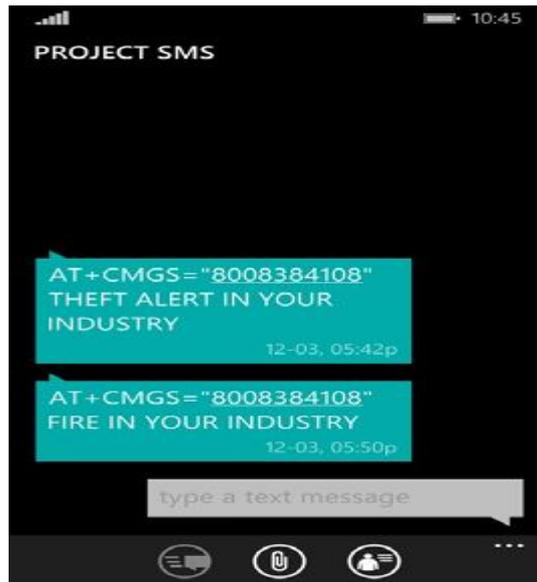Fig.8. Working Model

Fig.9. GSM Module

Fig.10. SMS Received

XI. CONCLUSION AND FUTURE WORK

This paper presents user friendly and low cost home and industrial automation and security systems. After a thorough study of literatures of all the topics that include home automation design and wireless networks. A simple system to improve the standards is developed. It is a real time monitorable system developed with simple hardware which simplifies the possibility of error free security system. This system can be easily implemented with maximum reliability and the high security with low cost is a special enhancement from the existing systems for Home security.

REFERENCES

1   Zappi P., Farella E., Benini L.,"Hydro electric Infrared Sensors based Distance Estimation", Dept. of Electron,Inf. & Syst., Univ. of Bologna. IEEE Publication, (2008) 716-719.
2   Al-Ali A. R., Rousan M. A., Mohandes M., "GSM-based Wireless Home Appliances Monitoring & Control
3   System", IEEE International Conference, ISBN: 0-7803-8482-2, (2004) 237-238.
4   Ying-Wen Bai, Shi-Chang Chen, Fu Jen, "Design and Implementation of Home Intercom and Security Control Systems for Buildings" Catholic Univ. Information.
5   Fusion, 2007 10th International Conference on Publication, ISBN: 978-0-662-45804-3, (2007) 1-6. Wuhan, China," An Improved Short Message Security Protocol for Home Network" Industry Applications.
6   Society Annual Meeting, Conference Record of the 1994 IEEE Publication, ISBN: 0-7803-1993-1, 3 (1994) 2121-2125