

Hazard Monitoring System in Industry Using Embedded Systems

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ABSTRACT: In spite of security and automation in plants, industrial environments quiet critical for machines and humans. This paper contracts with a safety in industrial condition. A system has been designed to detect dangerous situations like breakdown which is the most important parameter for occurring leakage current in substation and help to avoid them. In addition safety scenes was created in order to verify the technique used in this method. This technique is designed to protect a human. This technique reveals harmful impacts of thermally dangerous areas and humans. Human efforts are reduced using automation system which monitors and indicates any fault in the system. In this paper GSM concept is used. It is a network of physical object or things embedded with electronics, software, sensors, and network connectivity which use this object to collect and exchange data. In this paper a system is developed which will automatically monitor the industrial parameter such as temperature, gas, fire, humidity and generates alerts and alarms and take intelligent decisions with the help of GSM concept. Here automaton system will be used in industry for monitoring various parameters such as temperature, humidity, gas and fire.

KEYWORDS: Security, Human Efforts, GSM, Parameters, Temperature, Humidity, Gas and Fire.

I. INTRODUCTION

In spite of security and automation in plants, industrial environment is quite critical for both machines and humans. This project contracts with a safety in industrial conditions. A system that has been designed to detect the dangerous situations like breakdowns which is the most important issue now-a-days in industries. In addition to that safety scenes was created in order to verify the technique used in this project. The technique is designed to protect and ensure the safety of the workers in the industry. This technique reveals the dangerous areas and the fault occurrence in the industries. It consists of sensors that are used for the continuous monitoring of all the areas and working stations in the industry where the employees carry out their works. The continuous monitoring sensors alerts the in charge of the area by sending an alert message as well as with a alarm. The sensors continuously monitors the temperature, leakage of gases and humidity and takes necessary measures to ensure the safety of the workers in the industry.

The industrial devices are controlled using cloud server which alerts the admin about uneven conditions using Bluetooth. Since today is the generation of smart phones, people prefer smart work. Same goes with the industries. The term automation has led to a great change in the world of industries. Some industries are fully automated while other are partially automated. In short automation has become an important term, whether at home or the industries.

II. EXISTING SYSTEM

In few days a wide range of industrial IOT applications have been developed. It is start from RFID technology, it consist of microchips to transmit information to a reader through wireless communication by using this RFID readers, people can identify, also track and monitor any object attached with RFID tag automatically .There is another technology is the wireless sensor networks (WSNs).WSNs uses various intelligent sensors to sense and monitoring.

RFID and WSN are use to develop IOT.IOT is nothing but internet of things. In past years industry was monitor and control manually, this paper provides artificial intelligent to monitor the sensors as well as control the industry automatically without any human interference. Man power intervention required for monitoring various applications. CCTV used in industry which only monitor the application but no any alert generation takes place. Alert and their appropriate actions not presented manually. CCTV is very time consuming approach to detect and generate Alert Manually.

III. PROPOSED SYSTEM

The aim is to control and monitors the industrial parameter such as temperature, humidity, gas and fire. Algorithm of this system start with initialization process of UART of ARM7 processor at the same time initialization of GSM module also takes place. After initializing GSM module connected to hardware. this project also consist of android phone in that android app. after that when pressing the START button on app ARM7 controller continuously reading the sensor values. Controller send sensor values to android app and display .If sensor value is greater than threshold value it send SMS to respective supervisor and start output devices.

IOT is used to monitor and control industrial parameter. This modern area of automation and advanced computing using IOT with artificial intelligence offer promising solutions towards the automation industry. Internet of things is sensed the objects and controls remotely across existing network infrastructure. It consist of varioussensors (temperature, gas, fire, pressure, humidity) are used to observe environment and object conditions. In this project analog signals are used and these signals are provided to android device. supervisor set the threshold to every sensors place in industry. Android device check this threshold against incoming analog signal.

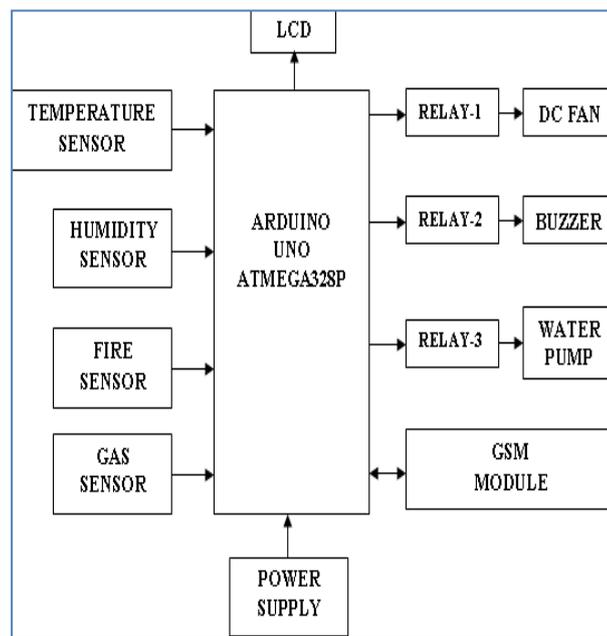


Fig 1 Block Diagram

IV. DESIGN CONSIDERATIONS

1. Start.
2. Initialize UART of ARM7.
3. Initialize GSM module.
4. Connect GSM module to hardware.
5. Connect to the power supply and run.
6. Controller will start reading sensor values.
7. Send to android app and display on android.
8. If sensor value is greater than threshold send SMS.
9. And Start output devices.
10. Repeat step 6

V. SYSTEM IMPLEMENTATIONS

Arduino UNO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

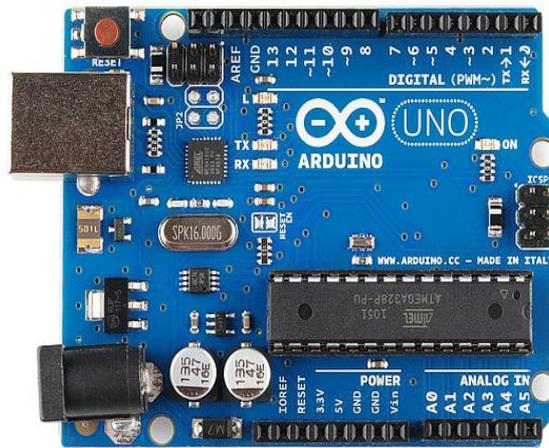


Fig 2 Arduino Uno

Temperatures Sensor

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in oC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 oC temperature rise in still air.

The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every oC rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ oC.

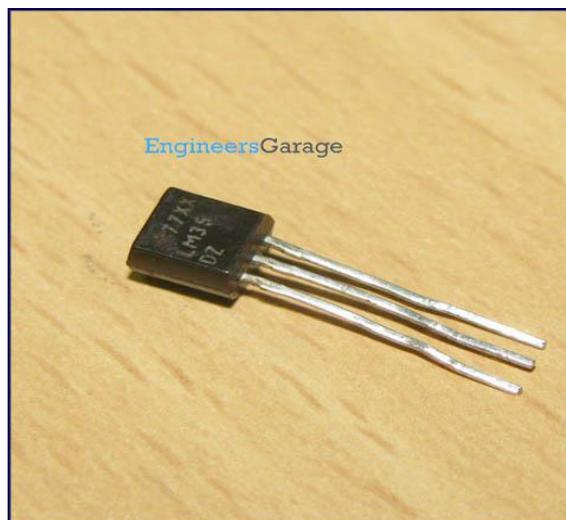


Fig 3 LM35 Temperature Sensor

Gas Sensor

This sensor module utilizes an MQ-6 as the sensitive component and has a protection resistor and an adjustable resistor on board. The MQ-6 gas sensor is highly sensitive to LPG, iso-butane, and propane and less sensitive to alcohol, cooking fume and cigarette smoke. It could be used in gas leakage detecting equipments in family and industry. The resistance of the sensitive component changes as the concentration of the target gas changes.

All Gas Sensors have 6 pins ,whether it is MQ2 (smoke), MQ3 (alcohol), MQ6 (LPG) or MQ7 (carbon monoxide).So , the following details apply to all types of MQ sensors. MQ-2 is a *Semiconductor Sensor for Combustible Gas and Smoke* This sensor detects the concentrations of combustible gas in the air and output its reading as an **analog voltage**. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible gas.

Sensitive material of MQ-2 gas sensor is Tin Di-Oxide SnO₂, which has lower conductivity in clean air. When the target combustible gas exist, MQ 2 senses and its conductivity is more higher along with the gas concentration rising. A simple electronic circuit is used to convert change of conductivity to corresponding output signal of gas concentration. MQ-2 has 6 pins, 4 of them are used to fetch signals, and other 2 are Heater coil used for providing heating current.

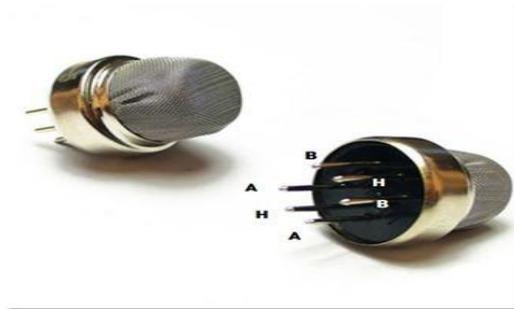


Fig 4 Gas Sensor

Features

- Continuous Analog output
- 3-pin interlock connector
- Low cost and compact size

LPG GAS Sensor Module

The SEN-1327 LPG chatter Sensor Module is designed to enable LPG detection interface to Microcontroller devoid of ADC Channels. It allows to determine what time a fixed LPG swap gossip level has been reached or else exceeded. Interfacing with the sensor module is through a 4-pin SIP heading and requires solitary I/O pin from the host microcontroller.

The onboard microcontroller provide opening heating interval later than power up and next starts to measure LPG sensor output. If it found the LPG contents beyond setted use, it yearn for put in the picture the Host controller by pulling the Output Pin to shrill and Starts to blink a onboard status LED. The sensor module is principally intended to provide a resources of comparing LPG sources and being able to customary an alarm limit once the source becomes too much.

Humidity Sensor

This module integrates DHT11 sensor and other required components on a small PCB. The DHT11 sensor includes a resistive-type humidity measurement component, temperature measurement component and a high-performance 8-bit microcontroller inside, and provides calibrated digital signal output. It has high reliability and excellent long-term stability, thanks to the exclusive digital signal acquisition technique and temperature & humidity sensing technology.

Each DHT11 is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as program in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package.

Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.

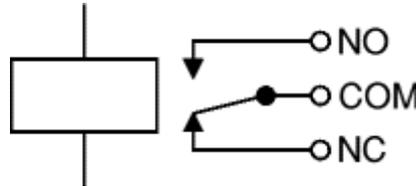


Fig 5 Relay Diagram

Protection diodes for relays

Transistors and ICs (chips) must be protected from the brief high voltage 'spike' produced when the relay coil is switched off. The diagram shows how a signal diode (eg 1N4148) is connected across the relay coil to provide this protection. Note that the diode is connected 'backwards' so that it will normally not conduct. Conduction only occurs when the relay coil is switched off, at this moment current tries to continue flowing through the coil and it is harmlessly diverted through the diode. Without the diode no current could flow and the coil would produce a damaging high voltage 'spike' in its attempt to keep the current flowing.

Advantages of relays

- Relays can switch AC and DC, transistors can only switch DC.
- Relays can switch high voltages, transistors cannot.
- Relays are a better choice for switching large currents (> 5A).
- Relays can switch many contacts at once.

Disadvantages of relays

- Relays are bulkier than transistors for switching small currents.
- Relays cannot switch rapidly (except reed relays), transistors can switch many times per second.
- Relays use more power due to the current flowing through their coil.
- Relays require more current than many chips can provide, so a low power transistor may be needed to switch the current for the relay's coil.

Power Supply

The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

VI. RESULTS AND DISCUSSION

Now a day's Automation plays major role in the industry. Human efforts are reduced using automation system which monitors and indicates any fault in the system. Here the system is design in such a way that it automatically monitors and control industrial parameters. Industrial parameters are temperature, humidity, gas and fire. These parameters are continuously monitored by ARM7 and send values to the android app using WIFI module. These values are sent to the concerned employee. If any value goes above the threshold then it send SMS to supervisor and start the output devices.

VII. CONCLUSION

Now-a-days, automation is a major part in industry. Earlier days monitoring of industrial situation takes place with the help of CCTV cameras. In order to reduce manual overhead in industries, we implement a GSM module based Embedded System concept. This Arduino based embedded system concept is to monitor and control industrial parameter such as (temperature, gas, fire, humidity) and inform to responsible person to take appropriate action.

The goal of the project was to design a system, which should be easy to implement, and short ranged. The project is implemented through onboard GSM, which is inbuilt in the mobile phones having a messenger as its system.

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