

GSM Based Home Security System

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Abstract - In recent years, there has been a growing interest among consumers in the smart home concept.

Home Security System represents and reports the status of the connected devices in an intuitive, user-friendly interface allowing the user to interact and control various devices with the touch of a few buttons. There are various technologies used for Home Security such as Bluetooth, WiMAX and Wireless LAN (Wi-Fi), ZigBee, and GSM. Among these GSM is the most widely used technology in the world.

In this paper, we are proposing the use of various types of sensors such as PIR motion sensor, Gas Leakage sensor and Fire Sensor to detect the change in surrounding of the home and notify the user by sending an SMS via GSM module SIM900A. The user can have access to turn the sensors ON and OFF by using an application connected via ESP Wi-Fi module.

Key Words: Security, Sensors, Global System for Mobile Communications(GSM), Short Message Service(SMS), ESP Wi-Fi Module.

1.INTRODUCTION

The implementation of Home Security Systems is very much essential in today's world as there is a growing demand for security and protection from various kind of threats and vulnerabilities. Due to the ease of use and low cost our system provides a good amount of security for the user as well as it is easy to operate and install

There are some previous systems already existing in the world but some of them are either too much expensive or they are not easy to use and install. Some systems require the user to install other different kind of third party software before getting access to the current system.

The user is notified by sending a simple text message or Short Messaging Service(SMS) which indicates the type of threat or problem detected by the sensors. This SMS is sent to the registered mobile number stored by the user at the time of installation.

The user is also provided with a Web Based Application which allows the user to control the sensor by either turning it ON or OFF by clicking a single button. This connection between the web application and the user's phone is established by using the ESP Wi-Fi module which

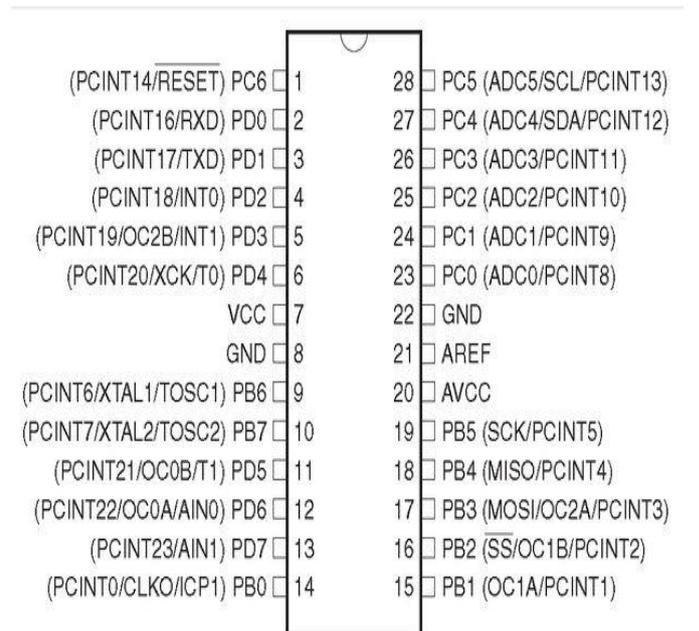
generates signals or creates a network similar in configuration to a Wi-Fi Hotspot.

1.1 Micro Controller ATMEGA 328P

Features

- 28-pin AVR Microcontroller
- Flash Program Memory: 32 kb
- EEPROM Data Memory: 1 kb
- SRAM Data Memory: 2 kb
- I/O Pins: 23
- Timers: Two 8-bit / One 16-bit
- A/D Converter: 10-bit Six Channel
- PWM: Six Channels
- RTC: Yes, with Separate Oscillator
- MSSP: SPI and I²C Master and Slave Support
- USART: Yes
- External Oscillator: up to 20MHz

The ATMEGA 328P is a micro controller by Atmel with 8K/16K bytes which enables high performance and uses a very low power supply.



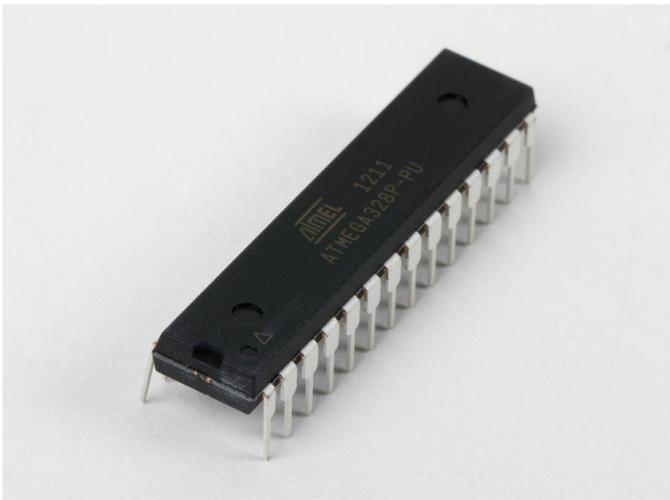


Fig -1: Micro Controller ATMEGA 328P

This is a high-performance 8-bit AVR RISC-based microcontroller that combines 32KB ISP flash memory with read-while-write capabilities, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts. Also a serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF for packages), programmable watchdog timer with internal oscillator and five software selectable power saving modes. The device operates between the voltage of 1.8-5.5 volts.

1.2 SIM 900A GSM Module



Fig -2: SIM 900A GSM Module

This is a very low cost and simple Arduino GSM module. This module supports communication in range of 910MHz band. In India, most of the mobile network providers operate in the 900MHz band. If you are from a different country then you have to check the mobile network band in your country. A majority of the mobile networks in USA

operate at 820MHz band (the band may either be 820MHz or 1800MHz). Canada operates primarily on 1900 MHz band.

1.3 ESP 8266 Wi-Fi module

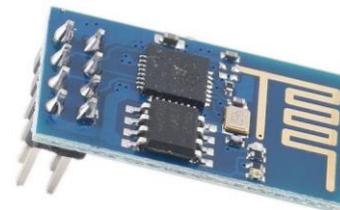


Fig -3: ESP 8266 Wi-Fi module

This module is very cheap but really effective platform for communication over the internet. It is easy to use this module with any Arduino based circuit. It can be controlled from any of our local wi-fi network or the internet. The 01 modules of this type have general purpose IO pins that can be programmed easily to turn ON/OFF any LED or a relay through by means of Internet. You can program it using any of the Arduino/USB to TTL converter through the (RX, TX) serial pins

2. SENSORS

Sensors are one of the main entities in this project. They are responsible for detecting the required changes in the environment and report to the micro controller for further actions.

2.1 GAS SENSOR

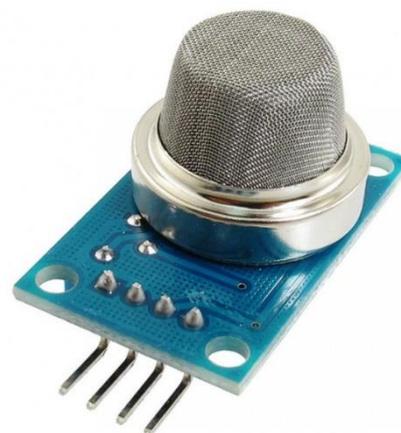


Fig - 4: Gas Sensor(MQ6)

This sensor is very simple for detecting LPG gas. It is appropriate for sensing LPG concentrations in the air or the surrounding atmosphere in a specified range. It can

detect gas in a range from 200 to 10000ppm. It has a very high sensitivity rate and quick response time. The output of the sensor is in the analog resistance format. Drive circuit is way too much simple; all we need to do is provide power to the heater coil of 5V, add a load resistance, and connect the output to an ADC converter.

2.2 FIRE SENSOR

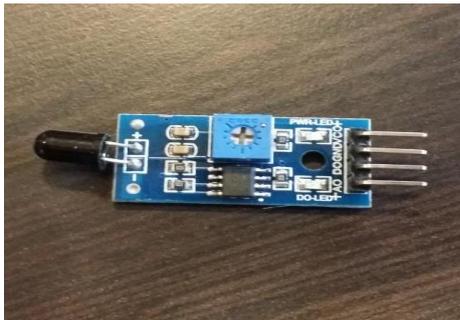


Fig - 5: MH-Fire Sensor

This sensor is responsible to detect the flames by evaluating the light emitted by the flames as well as the smoke which obstructs the light of fire.

2.3 PIR MOTION SENSOR



Fig -6: HCSR – 501 P.I.R Motion Sensor

The P.I.R sensors helps you to sense motion and always used to spot whether a human has moved in the sensors range or out of it. They are small in size, not very expensive, operate on low power supply, easy to use and do not wear out easily. Due to this reason, they are commonly found in appliances and gadgets used in various homes or businesses. They are often referred to as P. I. R, "Passive", "Infrared", "Pyroelectric" sensors.

P.I.Rs are made of a Pyro-electric sensor, which can detect different levels of infrared radiations. Every object emits some low-level of radiation and the hotter something gets; more radiation is emitted from it. The sensor is actually split in two halves because we are looking to detect motion (change) not average levels of IR. These two halves are wired up so that they cancel out each other.

3. SMS

The SMS is an abbreviation for Short Messaging Service. It is a text based service component for most of the phones in the world and also for the World Wide Web. It makes use of some standardized communication protocols which enable mobile phones to exchange text messages which are short in size. It can also be called as an intermediary service that can facilitate a text-to-voice conversion which can be sent through landlines SMS and was the most widely used technique in 2007. A rough estimation shows approximately 3.5 billion active users, or about 80% of all mobile phone subscribers will increase at the end of 2017.

It is used in modern handsets with the help of some standard protocols which enables users to communicate in a secure manner and data integrity is well maintained with the help of these standards and policies. The GSM series of standards was implemented in the year 1985. These protocols allowed several users to exchange messages of up to 160 alpha-numeric characters from GSM mobile handsets. Later it also included other mobile technologies, such as ANSI CDMA networks and Digital AMPS.

4. FLOWCHART

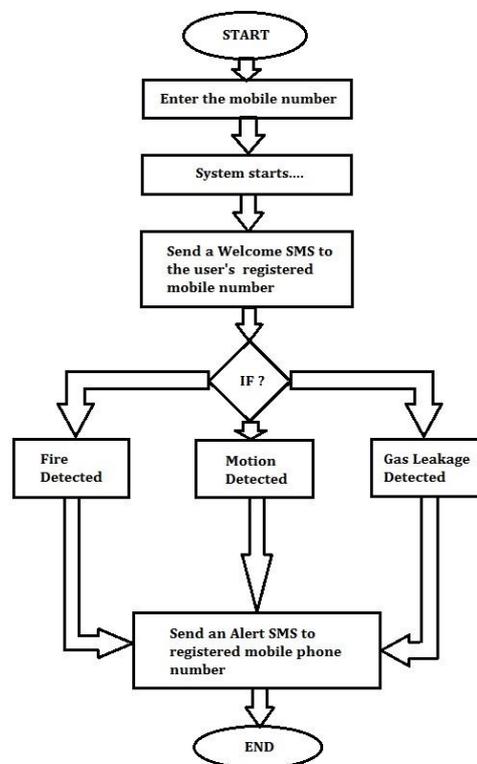


Fig - 7: Flowchart for the System

The above shown fig. 7 consists of the flowchart which clearly demonstrates the workflow of the system.

4. OVERVIEW

The following figure 8 shows the entire overview or the structure of the original project.

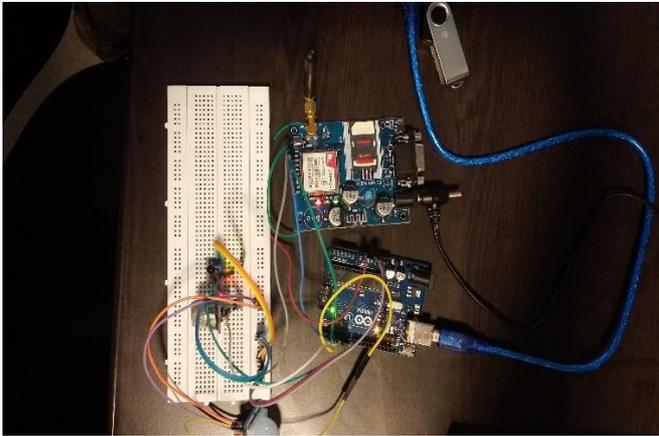


Fig - 8: Structure for the entire System

5. CONCLUSIONS

This project has helped us to gain a better understanding of the future events and the need of creating a secure environment so that there may be a crime free world. It has also lead to the conclusion that one can easily monitor the house via simple procedure of receiving an SMS if anything comes up and there is an urgent or immediate need to act accordingly. This project might not only help in maintaining the home but also can be used to protect offices and industries around the world. Due to its easy installation and low cost of establishment, it must be widely used to form a secure atmosphere.

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