# WIRELESS SECURITY SYSTEM USING GSM Module

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*Abstract :*  In today's era security is one of the main concern and not only from the rising crimes but also for day to day theft cases and accidents. In ancient days the security of the houses was maintained by means of manpower i.e. by deputing watch man or a group of residents of villages or societies were nominated by taking collective decision and they had to pay the duty in night time special and deputed team had worked on rotational bases of nominated persons. But in present era electronics devices dominate all over the world in every section.  The application of electronics in home security systems increasing wonderfully and due to technological advancement proper measure should be taken to maintain the security and the comfort of homes, banks and offices. The government also spends the huge amount of budget to providing security to homes and protection of peoples. This paper takes into consideration of all the existing products and merges them together to create a system which will not only provide automation to the building but will also take into consideration of all the security features of the building.

In this paper function of intrusion detection by proper placement of passive infrared sensor (PIR sensor) is explained with the help of GSM module. However we can use different types of sensors to sense in advance any miss happening. A contact number can be feed into the system so that a prior generated message can be transmitted to that number in case of any emergency. The detailed study of the previous systems has been done so as to improve the performance of the system from its predecessors.

*IndexTerms* - **PIR (pyro-electric infrared) sensors, Video recording devices (Video camera), Transmitter, Receiver, GSM (Global System for Mobile communication) Module.**

## I. INTRODUCTION

In this paper the security system using PIR sensors and GSM Modem is based on wireless communication between sensor element and receiver section is explained. The transmitter and receiver is based on the carrier frequency of 433Mhz and adopts GSM (Global System for Mobile Communication) technology in which TDMA (Time Division Multiple Access) technology is used [7]. TDMA technique relies on assigning different time slots to each user on the same frequency. It can easily adapt to data transmission and voice communication and can carry 64kbps to 120Mbps of data rate[8]. Time-division multiple access (TDMA) is a technique in which one channel is used for multi users to best utilization of frequency spectrum. It allows several users to share the same frequency channel by dividing the signal into different time slots. The users transmit in rapid succession, one after the other, each using its own time slot [7]. This allows multiple stations to share the same transmission medium (e.g. radio frequency channel) while using only a part of its channel capacity. TDMA is used in the digital 2G cellular systems such as Global System for Mobile Communications (GSM), IS-136, Personal Digital Cellular (PDC) and iDEN, and in the Digital Enhanced Cordless Telecommunications (DECT) standard for portable phones. TDMA was first used in satellite communication systems by Western Union in its Westar 3 communications satellite in 1979. It is now used extensively in satellite communications, combat-net radio systems, and passive optical network (PON) networks for upstream traffic from premises to the operator. For usage of Dynamic TDMA packet mode communication, TDMA is a type of time-division multiplexing (TDM), with the special point that instead of having one transmitter connected to one receiver, there are multiple transmitters. In the case of the uplink from a mobile phone to a base station this becomes particularly difficult because the mobile phone can move around and vary the timing advance required to make its transmission match the gap in transmission from its peers [7].

A GSM network consists of the following components:

**Mobile Station**

It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.

**Base Station Sub-System**

It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Microcontroller which controls the Base Transceiver station and acts as a interface between the mobile station and mobile switching centre.

**Network Sub-System**

It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the call routing and roaming capabilities of GSM. It also contains the Equipment

Identity Register which maintains an account of all the mobile equipments wherein each mobile is identified by its own IMEI number. IMEI stands for International Mobile Equipment Identity.

**Features of GSM Module**

- It has improved spectrum efficiency
- Easily capable for International roaming
- It has compatible with integrated services digital network (ISDN)
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management
- Uses encryption to make phone calls more secure
- Short message service (SMS)

The security strategies standardized for the GSM system make it the most secure telecommunications standard currently accessible. Although the confidentiality of a call and secrecy of the GSM subscriber is just ensured on the radio channel, this is a major step in achieving end-to- end security.

**GSM Modem**

A GSM modem is a modulator/demodulator device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection [9]. A GSM modem can also be a standard GSM mobile phone. GSM modem is usually preferable to a GSM mobile phone. The GSM modem has wide range of applications in transaction terminals, supply chain management, security applications, weather stations and GPRS mode remote data logging.

## II. WORKING OF GSM MODEM

As shown in circuit diagram, a GSM modem duly interfaced to the MC through the level shifter IC Max232. The SIM card mounted GSM modem upon receiving digit command from transmitter and send that data to the microcontroller through serial communication. While the program is executed, the GSM modem receives command 'STOP' to develop an output at the microcontroller, the contact point of which are used to disable the ignition switch. The command so sent by the user is based on an intimation received by him through the GSM modem 'ALERT' a programmed message only if the input is driven low. The complete operation is displayed over 16×2 LCD display.

## III. CIRCUIT DIAGRAM

In the following diagram a wireless security system with implement of PIR sensor and GSM module has shown which is implemented to give text message to home owner at his mobile set.
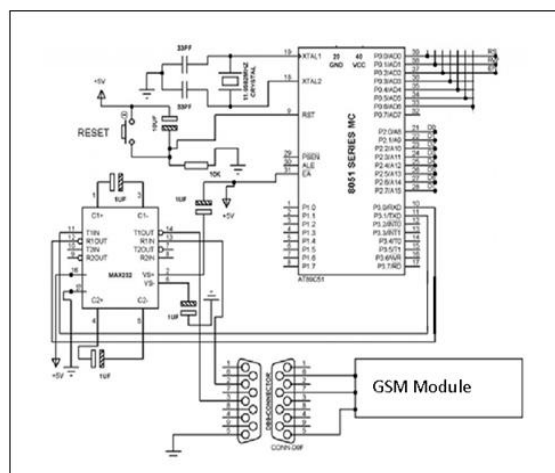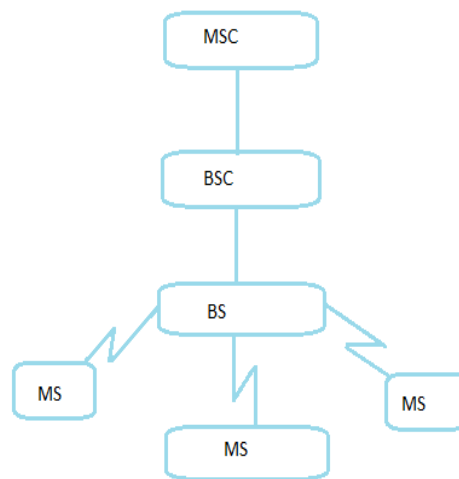


Figure 1: Circuit diagram of wireless security system

The sensors sense the presence of intruder and generate electrical signal to process the transmitter unit [4].The transmitter send the signal to the Microcontroller Receiver unit and the Receiver unit operates at that signal and send messages to all alert devices

GSM ARCHITECTURE

## IV. CIRCUIT DETAILS

### Transmitter- section

The transmitter is used to send signals to the central receiver unit by means of air. This air/wirelessly connection makes the circuit long life because there is not any   wear and tear loss of wires and cables as well as easily can hide the sensor. In this section the detected signal is amplified and transmitted at a particular frequency range. Each sensor requires a separate transmitter unit. In this section the main components are as under:
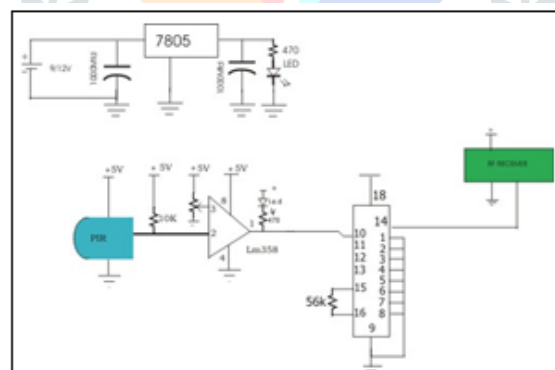


**PIR sensor**

The PIR sensor detects motion by change in temperature and generate low power electrical signal due to property of pyro electric crystalline material and send it to the RF amplifier for amplification. The generation of electrical energy is the natural property of pyro electric crystalline material [6].  The Radio frequency amplifier amplifies the received weak signal up to a level and sends it to the RF encoder.

### Receiver- section

This is the main central control unit in which all signals from various transmitters are received. In this section there are following main components:

### GSM-module

GSM stands for Global System for Mobile communication. This system uses 935-960MHz frequency for downlink and 890-915MHz for uplink [9]. Here this module uses only downlink frequency band as it implies simplex method. It does not receive any information but only send text message from BS (Base Station) to MS (Mobile Station). MSC (Mobile Switching Centre) have three sections namely VLR, HLR and AUC.

VLR is a visiting location register which maintains the record of mobile users which moves from their home location to roaming areas.

HLR is a Home Location Register which maintains the record of all mobile users with in the home area.
AUC (Authentication Centre) is used for security purposes.
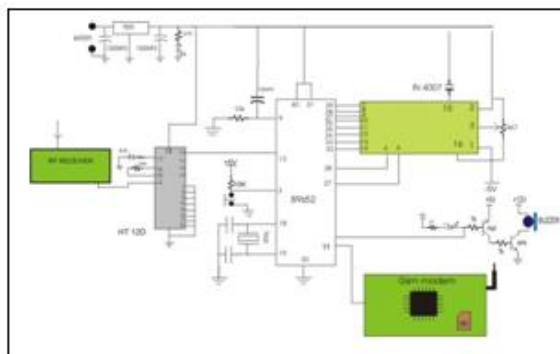


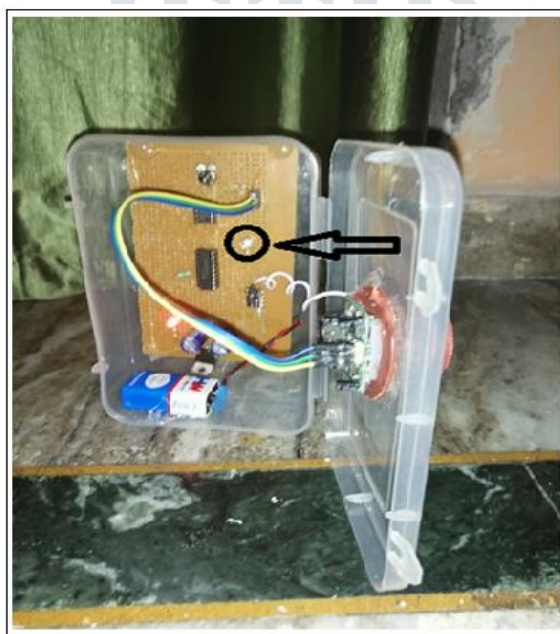## V. RESULT AND CONCLUSION

# RESULT AND CONCLUSION



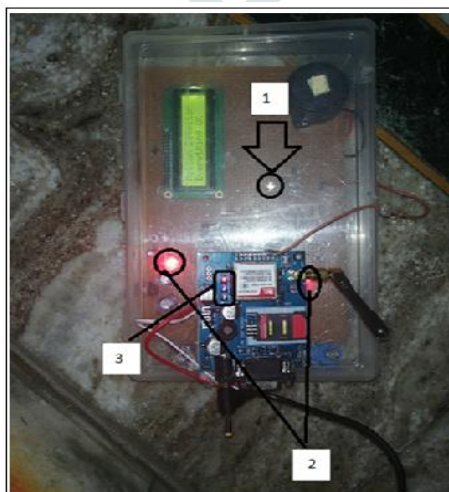Figure 2: Transmitter model in 'OFF' mode
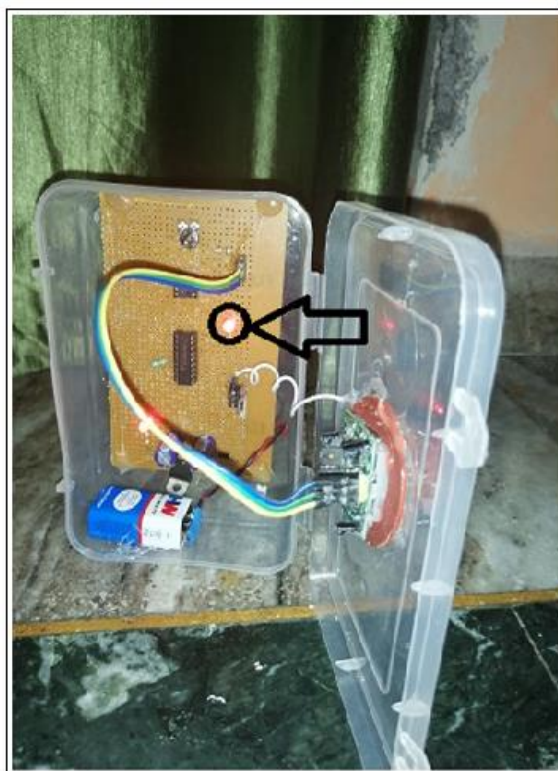


Figure 3: Receiver model 'OFF' mode
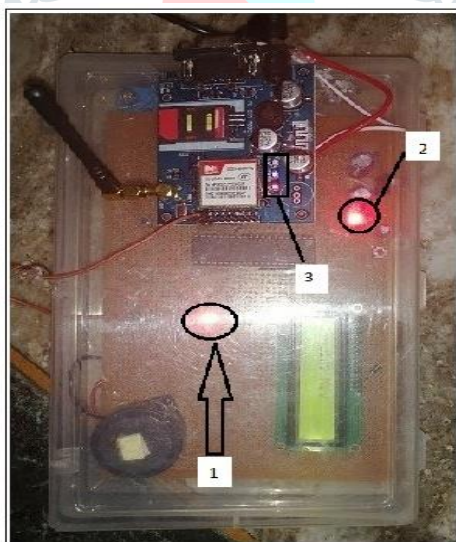
Figure5: Transmitter model in 'ON' mode



Figure6: Receiver model in 'ON' mode

When the temperature changes due to the body temperature of human beings or any animals the pyro electric material generate electrical energy. It generates voltage naturally and amplifies by the amplifier so that it can activate the alarm or lighting the lamp. The GSM module activates and makes the downlink connection to the mobile station so that text message can be send. When the intruder enters in to PIR sensor's range it take 10 to 60 seconds to activate and familiar with surrounding environment.  When the intruder left the area the alarm/ lamp/ any recording video camera etc. gets turned off. Due to the turned off all devices, energy saves as well as the recording device stops the recording when there is not any intruder present in the PIR sensor's range. Therefore the storage memory of the devise also has enough empty space. In this circuit the radiation of IR is not required because here the energy is emitted, above absolute zero temperature, due to the intruder. The temperature of wall is different from the temperature of human pass across PIR sensor [6]. Therefore it is called passive as it accepts the signal passively.

In this paper a security system by using PIR sensor and GSM module is proposed. The proposed circuit save the energy as lamp is turned on only when there is any intruder in the range of PIR sensor. It is also observed in the proposed circuit that if video

camera is used it also saves the memory space as the video camera starts reading when PIR sensor gets activated. The alarm gives the siren until the message to be sent at programmed mobile contact number.

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