***MINOR PROJECT***

On

# GSM based Home Security System

By

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Submitted to the Department of Electrical and Electronics Engineering

in partial fulfillment of the requirements

for the degree, of

Bachelor of Technology

in

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ABES Engineering College, Ghaziabad

Dr. A.P.J Abdul Kalam Technical University, Uttar Pradesh, Lucknow

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## *ACKNOWLEDGEMENT*

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# CANDIDATE'S DECLARATION

We hereby declare that the work which is being presented in this Project entitled, **"GSM based Home Security System "**submitted **Dr. A.P.J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow** in the partial fulfillment of the requirements for the

award of the degree of **BEACHLOR OF TECHNOLOGY** in **ELECTRICAL & ELECTRONICS ENGINEERING,** is an authentic record of my own work carried out from Jan, 2017 to April, 2017 under the supervision of **Dr. Javed Dhillon, Asstt. Professor in EN Dept., ABES-EC, GHAZIABAD.**

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## *ABSTRACT*

*Home Security Systems are an important feature of modern residential and office setups. Home security systems must be affordable, reliable and effective.*

*Modern complex home security systems include several security features like fire, intruders, electronic door lock, heat, smoke, temperature, etc. Some security systems may be a combination of all the security measures.*

*In this project, we designed a simple but very efficient home security that has a function of calling the homeowner on his/her mobile number in case of an intruder alert, the working of the project is explained below.*

*PIR sensor detects motion by sensing the difference in infrared or radiant heat levels emitted by surrounding objects. The output of the PIR sensor goes high when it detects any motion. The range of a typical PIR sensor is around 6 meters or about 30 feet. When the PIR sensor detects any motion, the output of the sensor is high. This is detected by the Arduino. Arduino then communicates with the GSM module via serial communication to make a call to the preprogrammed mobile number.*

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# CHAPTER 1

# Introduction

## 1.1 Overview

Security is a big challenge everywhere because thefts are increasing day by day owing to the unsafe and insecure security systems in homes, commercial complexes and industries. Several conventional technologies are available to keep home properties safe from intruders, but most common smart home security systems work on wireless GSM communication. Such systems provide security from natural, incidental, intended, unintended, accidental and human made problems by continuously monitoring homes with different sensory systems like motion, smoke, gas, temperature, glass break or door break detectors and fire alarm systems.

The project is based on Arduino, PIR motion detection sensor and GSM Module.

### 1.1.1 Hardware Required

- Arduino UNO
- PIR Motion Detection Sensor
- SIM 900A (or any other) GSM Module with SIM inserted

## 1.2 Component Description

### 1.2.1 PIR Motion Detection Sensor

Passive Infra-Red or PIR Sensor is a Pyroelectric device that detects motion. Hence, it is also called as motion detection sensor. It detects motion by sensing the changes in infrared levels emitted by nearby objects

**Fig 1.1:** PIR Sensor

An individual PIR sensor detects changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor. When an object, such as a human, passes in front of the background, such as a wall, the temperature at that point in the sensor's field of view will rise from room temperature to body temperature, and then back again. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission pattern, and thus moving them with respect to the background may trigger the detector as well.

PIRs come in many configurations for a wide variety of applications. The most common models have numerous Fresnel lenses or mirror segments, an effective range of about ten meters (thirty feet), and a field of view less than 180 degrees. Models with wider fields of view, including 360 degrees, are available—typically designed to mount on a ceiling. Some larger PIRs are made with single segment mirrors and can sense changes in infrared energy over thirty meters (one hundred feet) away from the PIR. There are also PIRs designed with reversible orientation mirrors which allow either broad coverage (110° wide) or very narrow "curtain" coverage, or with individually selectable segments to "shape" the coverage.

### 1.2.2 GSM Module (SIM 900A)

SIM 900A is the GSM/GPRS module with built in RS232 interface. It has dual band GSM/GPRS system that works on 900/1800MHz frequencies. With the help of RS232, the modem can be connected to PC or microcontroller via serial cable. Voice calls, SMS and internet access are possible with this module. There are on board connections for microphone and headphones with which we can make or receive calls.

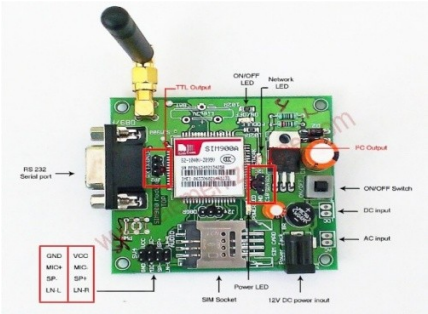


**Figure1.2:** GSM module sim 900 A

The modem needed only 3 wires (Tx, Rx, GND) except Power supply to interface with microcontroller/Host PC. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V -13V). Yes, 5 V is in between. Using this modem, you will be able to send & Read SMS, connect to internet via GPRS through simple AT commands.

The GSM module is designed as a DCE (Data Communication Equipment), following the traditional DCE-DTE (Data Terminal Equipment) connection. The GSM Modem and the client (DTE) are connected through the following signal (as following figure shows). Auto bauding supports baud rate from 1200bps to 57600bps. Serial port • TXD: Send data to the RXD signal line of the DTE • RXD: Receive data from the TXD signal line of the DTE serial port of the GSM engine supports auto bauding for the following baud rates: 1200, 2400, 4800, 9600, 19200,38400 and 57600bps. Factory setting is auto bauding enabled. This gives you the flexibility to put the GSM engine into operation no matter what baud rate your host application is configured to.

### 1.2.3Arduino UNO

It is the main controller used in this project. It detects the signals from PIR sensor and sends commands to GSM Module accordingly. The serial pins of the Arduino are used in this project to communicate with GSM module.


**Figure 1.3:** Arduino UNO

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. The source code for the IDE is released under the GNU General Public License, version 2.Nevertheless, an official Bill of Materials of Arduino boards has never been released by Arduino staff.

Although the hardware and software designs are freely available under copyleft licenses, the developers have requested that the name *Arduino* be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product.[9] Several Arduino-compatible products commercially released have avoided the project name by using various names ending in *-duino*.

Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Arduino UNO is the opt boot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods, when used with traditional microcontroller tools instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The *Diecimila*, *Duemilanove*, and current *Uno* provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and

Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards.

Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

# CHAPTER 2

# GSM Based Home Security System

## 2.1 Circuit Diagram

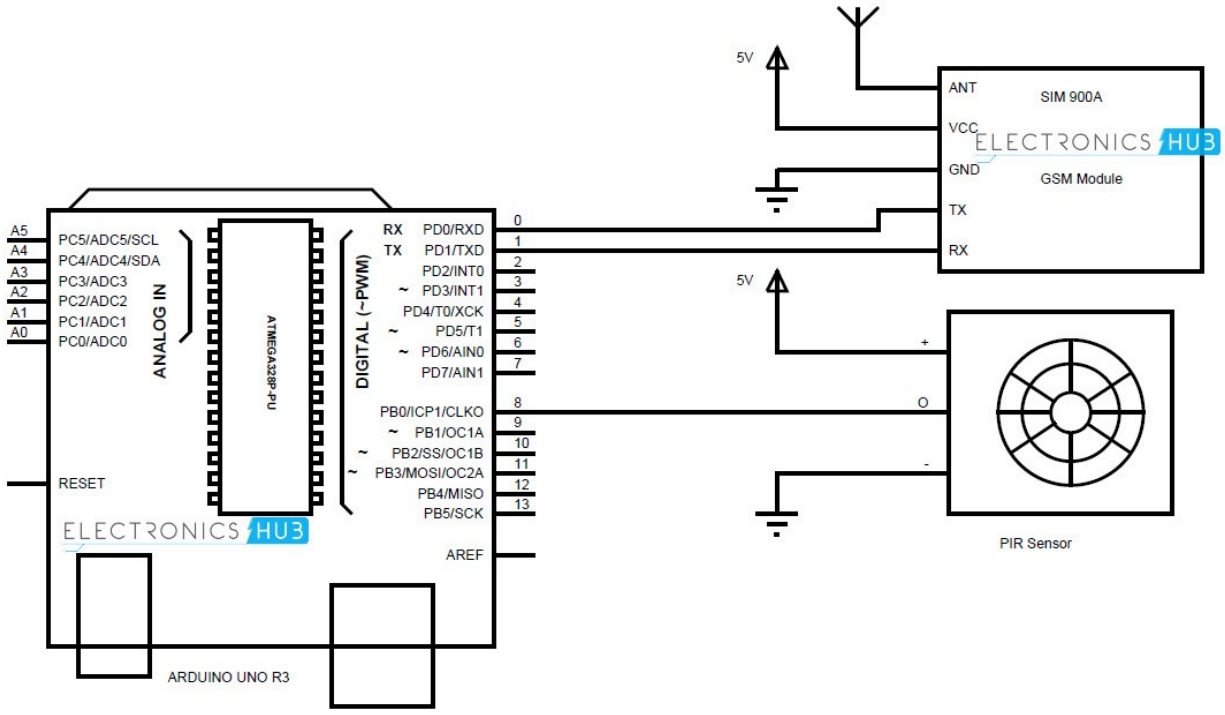


**Figure 2.1:** Circuit Diagram

As the project is based on an Arduino, the connection is pretty simple. PIR motion detection sensor module has a digital output pin. This is connected to any of the digital I/O pins of the Arduino.

The GSM Module communicates with the microcontroller in a serial manner. It has an Rx and Tx pins on the board. These pins are connected to the Tx and Rx pins of the Arduino.

It is important to note that while uploading the program (sketch) to Arduino, the GSM module must be disconnected as it might interfere with the serial communication with the Arduino IDE.

## 2.2Working

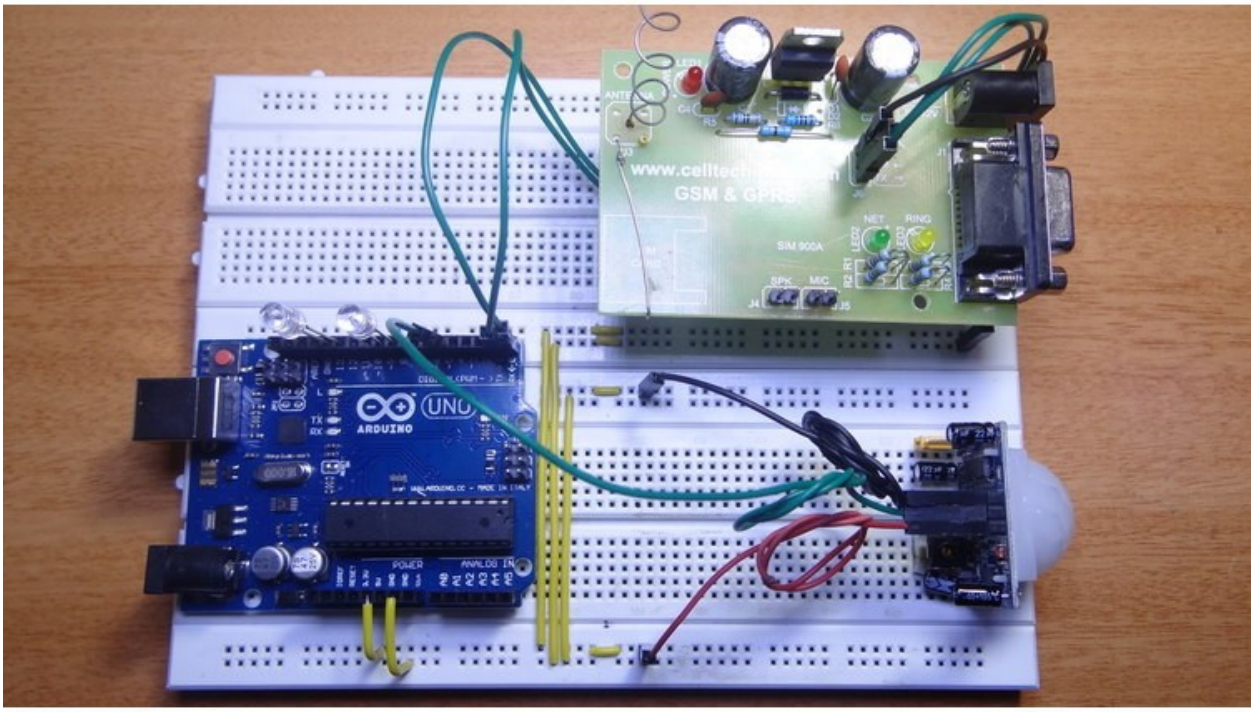


**Figure 2.2: GSM Based Security System**

Such complex systems may be expensive and may not be affordable by everyone. There are individual security systems based on the requirement. In this project, we designed a simple but very efficient home security that has a function of calling the homeowner on his/her mobile number in case of an intruder alert.

The aim of this project is to implement a simple and affordable, but efficient home security alarm system. The project is designed for detecting intruders and informing the owner by making a phone call.The working of the project is explained below.

PIR sensor detects motion by sensing the difference in infrared or radiant heat levels emitted by surrounding objects. The output of the PIR sensor goes high when it detects any motion. The range of a typical PIR sensor is around 6 meters or about 30 feet.

For proper operation of PIR sensor, it requires a warm up time of 20 to 60 seconds. This is required because, the PIR sensor has a settling time during which it calibrates its sensor according to the environment and stabilizes the infrared detector.

During this time, there should be very little to no motion in front of the sensor. If the sensor is not given enough calibrating time, the output of the PIR sensor may not be reliable.
When the PIR sensor detects any motion, the output of the sensor is high. This is detected by the Arduino. Arduino then communicates with the GSM module via serial communication to make a call to the preprogrammed mobile number.
An important point to be noted about PIR sensors is that the output will be high when it detects motion. The output of the sensor goes low from time to time, even when there is motion which may mislead the microcontroller into considering that there is no motion.
This issue must be dealt with in the programming of Arduino by ignoring the low output signals that have a shorter duration than a predefined time. This is done by assuming that the motion in front of PIR sensor is present continuously.

**2.3 Arduino Code Used**

```
pinMode(GND1,OUTPUT);
pinMode(LED2,OUTPUT);
pinMode(GND2,OUTPUT);
pinMode(pirOutput,INPUT);

digitalWrite(pirOutput,LOW);
digitalWrite(GND1,LOW);
digitalWrite(GND2,LOW);
digitalWrite(LED1,LOW);
digitalWrite(LED2,LOW);
```

```
delay(15000);
digitalWrite(LED1,HIGH);
}
void loop()
{
if(digitalRead(pirOutput)==HIGH)
{
digitalWrite(LED2,HIGH);
Serial.println("OK");
delay(1000);
Serial.println("ATD+91xxxxxxxxxx;");//add target mobile number in place of xxxxxxxxxx
delay(15000);
Serial.println("ATH");
digitalWrite(LED2,LOW);
delay(1000);
}
```

# CHAPTER 3

# CONCLUSION AND FUTURE SCOPE

## 3.1 Conclusion

- A GSM based home security alarm system is designed using Arduino, PIR motion detection sensor and a GSM module.
- When the system is activated, it continuously checks for motion and when the motion is detected, it make a phone call to the owner.
- Only intruder alert is present in this system and can be upgraded to other security alert systems like fire, smoke etc.

## 3.2 Future Scope

GSM is one of the latest mobile technologies using smart MODEM, which can easily have interfaced to embedded microcontrollers. Now everything is going to be automated using this technology, using this technology we can access the devices remotely. Using GSM and GPS now we can identify the people, vehicles etc. in anywhere of the world.

MODEM is communicating with the microcontroller using AT commands, for example if we want to send an SMS to number +919828379647, the commands we have to send is AT+CMGS=" <+919828379647>", <enter>, <message>, <ctrl-Z>.

In this project, it is used to make call to the owners mobile when somebody entered the home without permission.

In this project in future we can add a multimedia camera to see what is going inside the home by sitting in office or somewhere.

# REFRENCES

**Websites Referred -:**


- www.electronicshub.org
- https://en.wikipedia.org
- www.arduino.cc
- www.engineersgarage.com


**Books referred -:**


- Programming Arduino: Getting Started
- Smart Sensor Systems