



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 Issue: VI Month of publication: June 2017

DOI:

www.ijraset.com

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Advanced Home Security System

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Abstract: *The concept of home automation has been around since the late 1970s. But with the advancement of technology and services people's expectations have changed and so as the idea of home automation systems. In this paper we have designed an advanced electronic security system by using small PIR built around the arduino controller. PIR and IR sensors sense the presence of intruder & Controller reads the signal from sensors. If intruder is detected it turns on the buzzer and makes call and send SMS to predefined number through a GSM modem. At the same time controller also turns on camera to capture the image of intruder and send it to the person using GSM module AT commands. A good security system is centralized and one can keep a good eye on the whole area which reduces the labor and labor cost.*

Index Terms: *PIR sensor, IR sensor, rduino controller, GSM modem, Camera and Memory card*

I. INTRODUCTION

Theft has become major issue everywhere (societies, mall, shop etc). Main purpose to build this projects to provide security at residential and commercial places in both time when we are away from place or we are at home. As everywhere we can see CCTV cameras have been installed for security purposes. But the CCTV cameras are capable of only recording and storing the data. A number of GSM based electronic security systems are available in markets, but these systems can only inform to owner about the theft, it can't take and store the image of thief.

Hence to overcome this disadvantage of existing system we are designing an electronic security system which can detect the presence of intruder, informs (call or sms) to owner about presence of intruder and takes picture of intruder.

We are using the PIR sensors and IR sensors which can detect the presence of intruder, when any human is detected by the PIR or IR sensors this sensors will change its output. This output is given to arduino controller, which is the main building block of the system. Depending on the output of the sensors it will perform actions which are given in the program. Then it will send the AT commands to GSM module to make call to a predefined number of the owner of shop or home and also sends command to camera to capture the image of intruder.

II. SYSTEM REQUIREMENTS

A. PIR Sensor

PIR is a Pyroelectric Infrared Sensor or Passive IR sensor. It is made up of Pyroelectric sensors which detects the thermal radiation falls on it. Every living body releases some radiations, and if the body is hotter, the more radiations are emitted. PIR sensors has two IR-sensitive elements with opposite polarization. Elements are mounted in a hermetically sealed metal with a window, which is made of IR-transmissive material. When the sensor is in idle state, both slots sense the same amount of IR radiation. If warm body i.e. human being or animal comes in the sensing area of PIR sensor that result in a positive differential change in output of PIR sensor.

When the warm body leaves the sensing area, the sensor generates a negative differential change. These change pulses shows the something is detected. Lens is used to shape the field of view of sensor. The lens used is inexpensive and lightweight plastic material. Detection lens is split up into multiple sections to cover larger area. Along with Pyroelectric sensor, Micro Power PIR Motion Detector IC is used.

This chip takes the output from sensor and does some processing on this signal and gives a digital output pulse. PIR sensor output is shown in fig.2. When human enters in the field of view of sensor, it detects IR radiation and suddenly changes its output state. This change in output of PIR sensor triggers the controller. The range of PIR Sensor is approximately 6 meters i.e. 20 feet, and angle of 120 degree.

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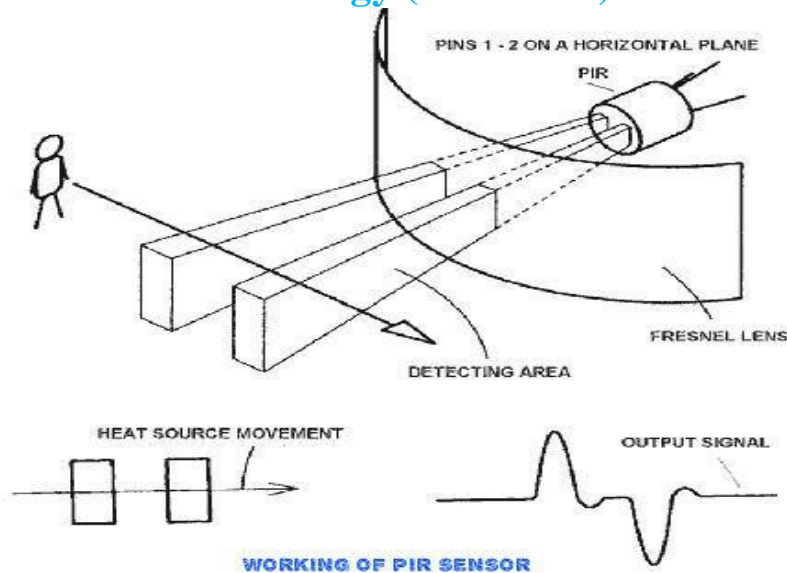


Figure: 1 Working of PIR Sensor [10]

B. Arduino Controller

Arduino is an open source electronics board or minicomputer. Arduino is designed to make electronic more accessible to artists and techies to create interactive objects or environments. Arduino was first introduced in 2005, and it was aimed to provide an inexpensive and easy way to professionals, to create devices, or different attractive projects. Arduino boards are in preassembled form. For programming arduino board, arduino integrated development environment (IDE) is used, which supports for C and C++ programming languages. An arduino board consists of an Atmel 8, 16, 32 bit AVR controller. An important aspect of the arduino is its standard connectors, which lets users connect arduino board to variety of modules known as shields.

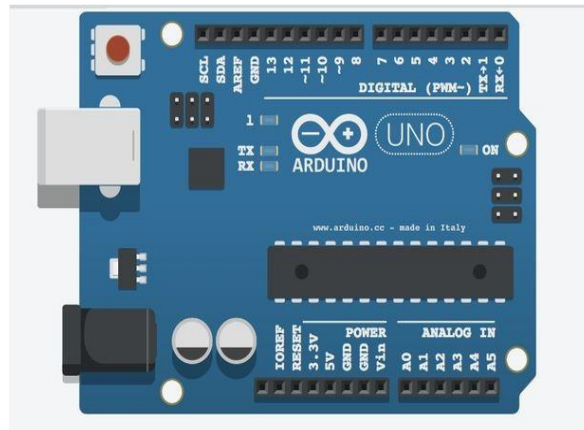


Figure: 2 Arduino [10]

C. GSM Modem

The long form of GSM is Global System for Mobile communication. Most GSM uses frequency band of 900 MHz or 1800 MHz. This GSM modem can accept any GSM network operators SIM card and act just like a mobile phone. The modem uses RS232 standard for communication and connected to serial port of controller. GSM modem is used to make calls and send/receive SMS. It can also be used as GPRS modem to connect to internet. When arduino receives signal from sensors it send AT commands to GSM modem to make a call to a predefined number stored in program.

AT commands: Every command line starts with "AT" or "at". That's why modem commands are called AT commands. Many of the commands that are used to control wired dial-up modems, such as ATD (Dial), ATA (Answer), ATH (Hook control) and ATO (Return to online data state), etc are also supported by GSM/GPRS modems and mobile phones.

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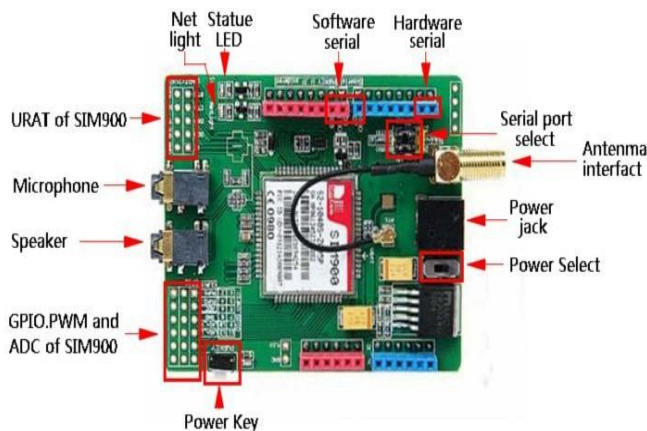


Figure: 3

D. Buzzer

A buzzer is an audio indication device, which may be mechanical, electromechanical, or piezoelectric. Typically buzzer is used as alarm. When PIR sensor senses the presence of intruder it sends signal to arduino controller, then arduino controller turns on buzzer



Figure: 4 Solarbotics [11]

E. Camera

Camera is used to capture the image of intruder. When sensor sense the presence of intruder the arduino sends command to camera to capture the image of that intruder

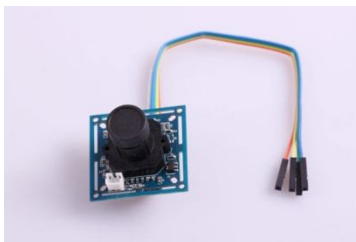


Figure: 5 Camera [10]

III. SOFTWARE

The whole system is built around the arduino controller. Arduino controller is programmed using arduino Integrated Development Environment (IDE). C and C++ are the compatible languages. Program is compiled & burned using arduino Integrated Development Environment (IDE). It has tool bar, text editor for writing code and text console. Program written in Arduino Software (IDE) is called sketch. The extension used for arduino sketches is .ino. The editor has features for cutting or pasting and for searching or replacing text. The message gives feedback while saving and exporting and also displays errors. The console is used to display text output by the Arduino Software (IDE), including error messages and other information. The toolbar contains buttons to create, open, save sketch, verify, upload programs and open the serial monitor. We have used the arduino IDE version 1.6.7.

IV. WORKING

The project is designed for detecting intruders and informing the owner by making a phone call. PIR sensor senses motion by

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identifying the difference in infrared or radiant heat levels released by surrounding objects. The output of the PIR sensor goes high when it senses any motion. The range of a typical PIR sensor is approx 6 meters. For appropriate working of PIR sensor, it needs a warm up time of 20 to 60 seconds. This time is settling time for sensor during which it adjusts itself according to the environment and alleviates the infrared detector. During this time, there should be no motion or very little motion in front of the sensor. For reliable output this much time is strongly recommended. 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 pre programmed mobile number and sends taken picture to predefined phone 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.

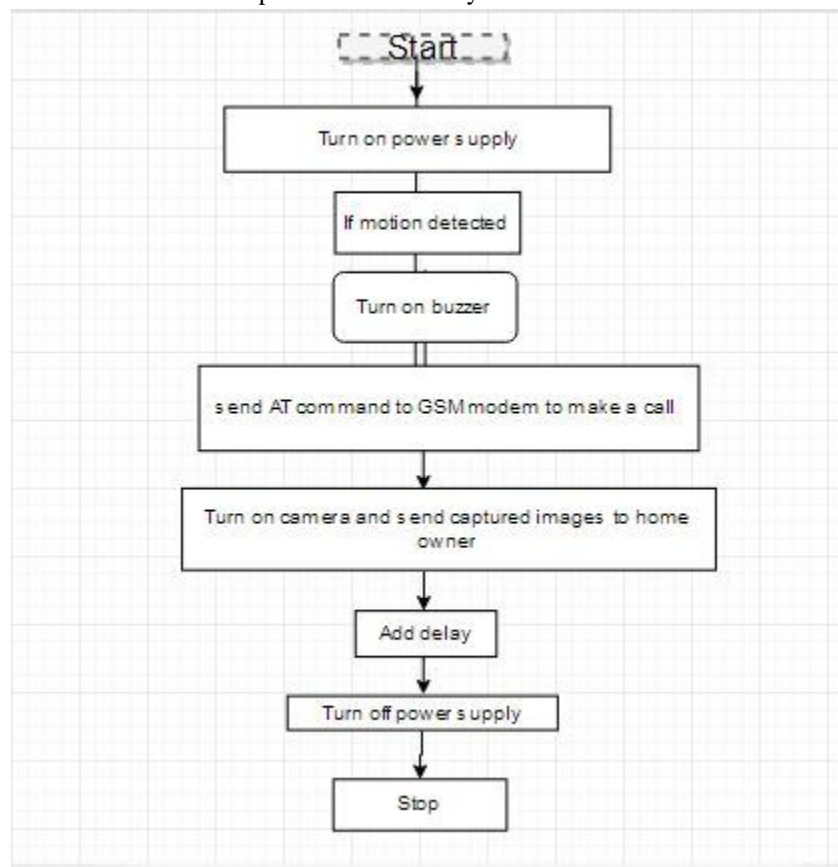


Figure: 6 Working [12]

V. ADVANTAGES

- A. Devices can be controlled from long distances.
- B. Economical design
- C. Can be easily implemented in homes
- D. Can be used by everyone with just the knowledge of text SMS
- E. Format of the SMS is simple to understand and write.
- F. Global Range
- G. Low Cost
- H. Low Power Requirement

VI. DISADVANTAGES

- A. The system is network dependent. Hence, network congestion can reduce the reliability of the system.
- B. User can make mistake while typing the message format

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- C. Delays in mobile networks.
- D. Need of a mobile phone entirely dedicated for the system

VII. FUTURE SCOPE

In our system we are capturing the image of intruder in addition to this we can compare the captured image with some predefined human image attributes, and if both images gets matched then and then only system may call to owner of house or shop. Also we can add provision to make call to police helpline.

VIII. CONCLUSION

Now a day's peoples makes use of CCTV cameras and other security measures for security of their home or shop but it have disadvantages as it can't inform to owner about theft, also GSM based electronics system are there but in that we can't take the picture of theft. Hence to overcome this disadvantage of existing systems we are implementing this project. In this project we are implementing a GSM based advanced security system to avoid theft. This system is cost effective and can be used anywhere where security is necessary.

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