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GSM & PIR Based Advanced Antitheft Security System

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Abstract— Security is a too much important thing to be concerned in our day-to-day life. Everyone wants to be secured as much as possible. Knowing our home or shop is secure provides us peace of mind. We know now a day's theft has become a major issue. In this paper we design an advanced electronic security system by using small PIR and IR sensors built around the arduino controller. PIR and IR sensors sense the presence of intruder & Controller reads the signal from sensors and if intruder is detected it turns on the buzzer & the lights in the room as well as making a call to predefined number through a GSM modem. At the same time controller also turns on camera to capture the image of intruder.
Keywords— PIR sensor, IR sensor, Arduino controller, GSM modem, Camera and SD card.

I. INTRODUCTION

We know that now a day's theft has become major issue everywhere, everyone wants to secure their homes or shops. Knowing our home is secured provides us peace of mind in both times when we are away from home or shop and when we are at home. So we would like to implement our project to provide security for homes, shops, or offices.

We see that everywhere peoples make use of CCTV camera for security purpose but the CCTV cameras are capable of only recording and storing the data. Now a day's GSM based electronic security systems are available, but this system 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 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. That is, it will send the AT commands to GSM module to make call to a predefined number of the owner of shop or home. Also it will sends command to camera to capture the image of intruder.

II. SYSTEM ARCHITECTURE

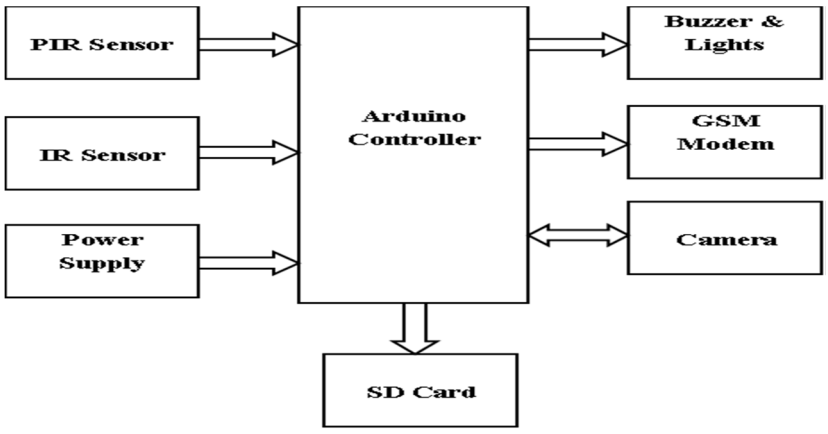

Fig.1. System architecture of GSM & PIR Based antitheft security system

The above fig. 1. shows the system architecture of GSM & PIR based antitheft security system. It contains two types of sensors PIR

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and IR sensors. These two sensors are used to detect the presence of human intruder in the room. When the sensor senses the presence of intruder it gives signal to the arduino controller. When arduino receives this signal it will turn on buzzer, lights & makes call through GSM modem.

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 emits some radiations, and if the body is hotter, the more radiations are emitted [1]. PIR sensors typically include two IR-sensitive elements with opposite polarization, which are housed in a hermetically sealed metal with a window made of IR-transmissive material. When the sensor is in idle state, both slots detect 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 [2].

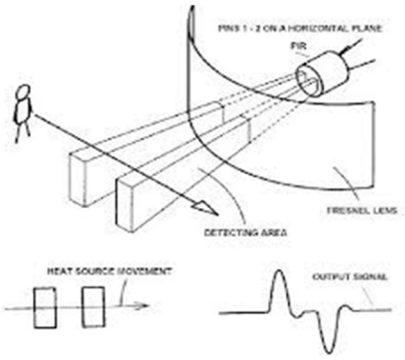

Fig. 2 PIR Sensor Schematic output

B. IR Sensor

The IR sensor used for human detection. IR sensor transmit infrared signal, this infrared signal struck on the surface of an object which comes in front of it & reflects back which is received at the infrared receiver. Infrared sensor consists of infrared source and infrared detector. Infrared source is generally an IR LED or IR LASER diode. Infrared detector includes photodiodes or phototransistors. The energy emitted by the IR source is reflected back from an object and falls on the IR detector. When object is detected by IR sensor it produces LOW output, and in absence of object IR sensors output is HIGH. This output can be directly connected to arduino controller. Below figure shows the working principle of IR sensor.

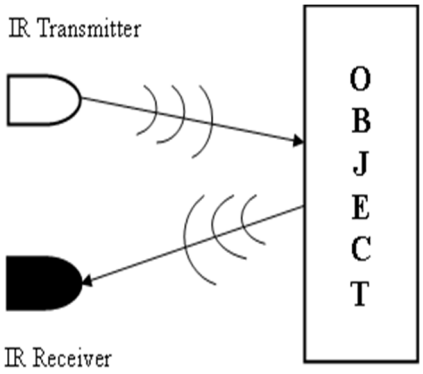

Fig. 3 Working Principle of IR Sensor

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C. Arduino Controller

Arduino is an open source electronics board or minicomputer. Arduino is designed to make electronic more accessible to artists, hobbyists and anyone interested in creating interactive objects or environments [7]. The first arduino was introduced in 2005, which is 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 [9].

D. GSM Modem

The long form of GSM is Global System for Mobile communication. Most GSM uses frequency band of 900 MHz or 1800 MHz [8]. 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. The modem can be connected to serial port of PC or to any controller. GSM modem is used to send and receive SMS or to make/receive voice calls. 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.

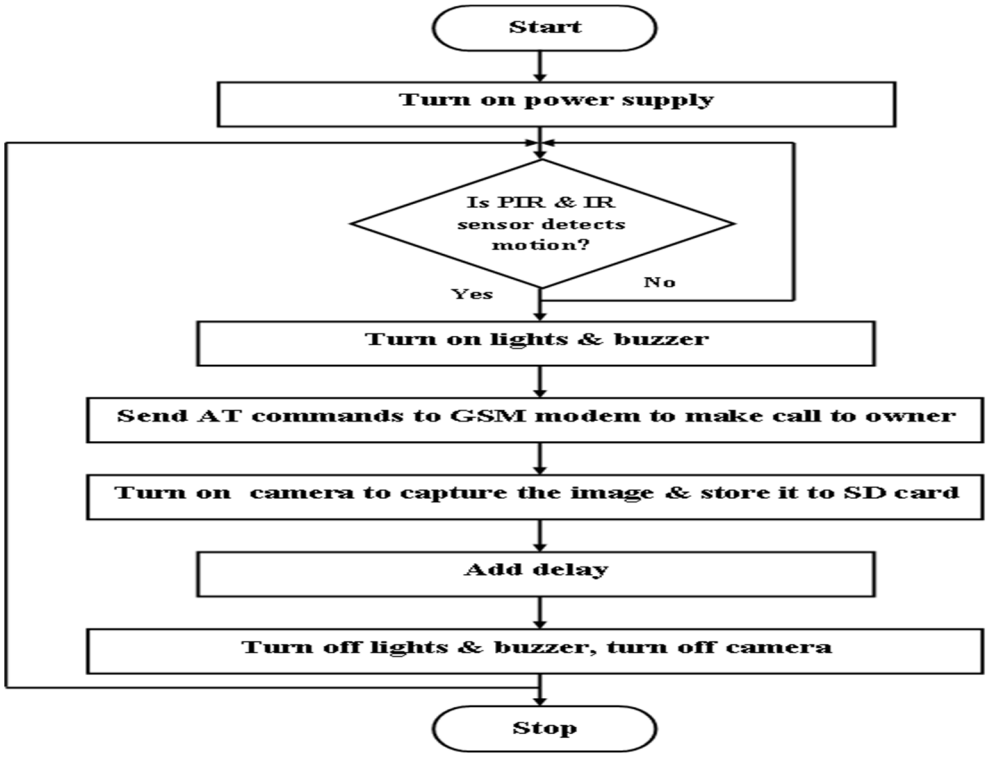
E. Buzzer and Lights

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

F. Camera and SD Card

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 and store it on SD card. User can then see that image by simply connecting the SD card to computer [3].

III. FLOWCHART



IV. SOFTWARE

The whole system is built around the arduino controller. Arduino controller is programmed using arduino Integrated Development Environment (IDE), Programming languages used are C or C++. Program is compiled & burned using arduino Integrated Development Environment (IDE). It contains a text editor for writing code, a text console, a toolbar etc. 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 verify and upload programs, create, open, and save sketches, and open the serial monitor. We have used the arduino IDE version 1.6.7. [9].

V. 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.

VI. CONCLUSION

Now a day's peoples makes use of CCTV cameras 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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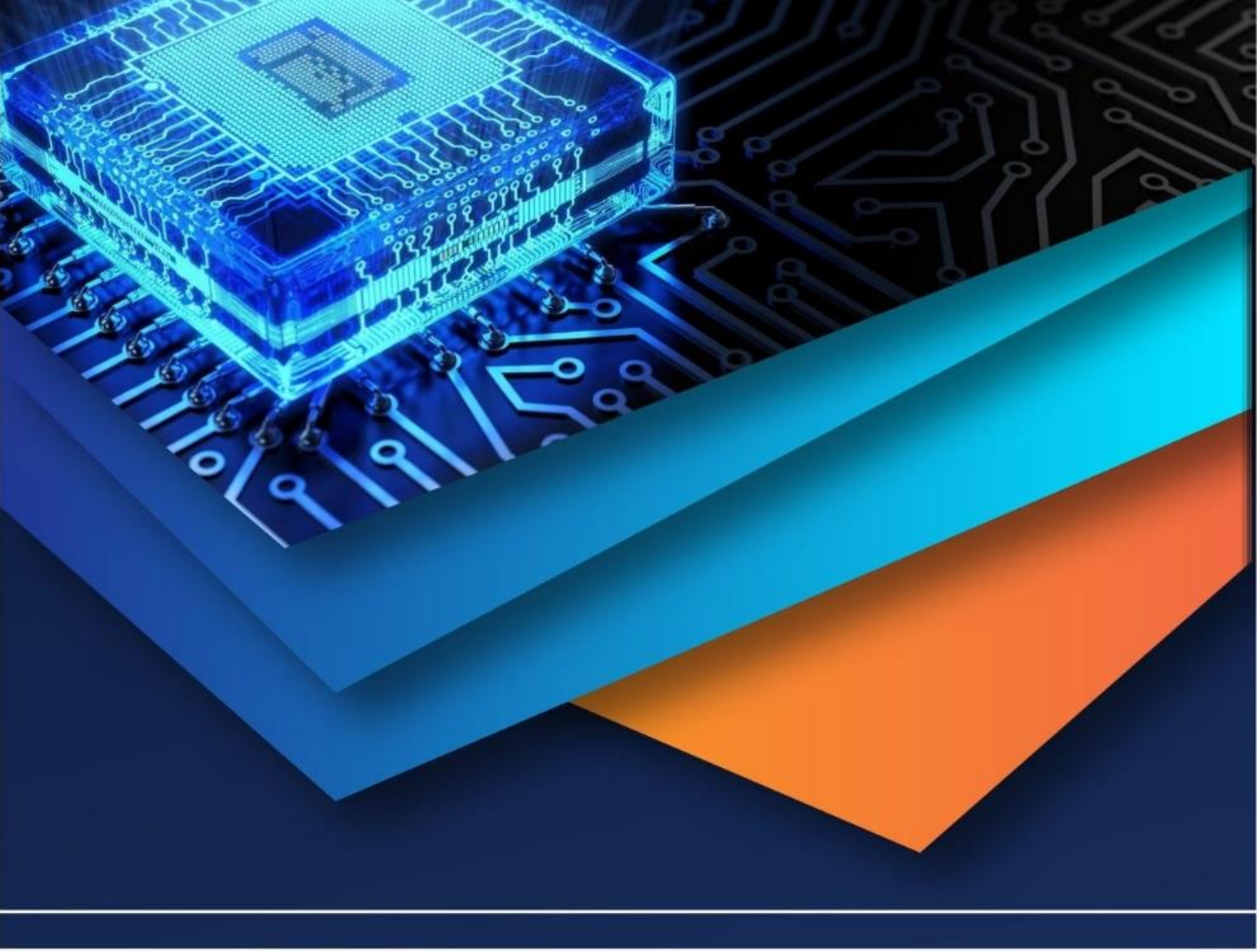

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