



DESIGN AND IMPLEMENTATION OF AN ADVANCED SECURITY SYSTEM

Manoranjan Kumar¹, Manasa.S, Maanya.N², Pooja.M³, Jyothi Ramu⁴
Telecommunication Department, MVJ college of Engineering.

ABSTRACT

The main agenda of this project is to design an advanced security system which is affordable. Nowadays property crimes are very high so there is a necessity to build an advanced security system. This is basically a single camera-based security system that can be used to protect valuable kept in the room of a house. Authorised person can only view the footage which was alerted on the presence of intrusion. Once the intruder has been detected this information about intruder will be directed to the authorised person through the SMS. And the same type the camera can slew around the room and record only when it is alerted by the presence of any intrusion. This type of system would lead to less time consuming and this will help to keep the track of intruder easily. Such a system consists of three components: sensors that detects the intrusion; the camera that slews to the point of intrusion and takes pictures; and the keypad that is used to interface with system which allows any person to disable the system by entering the right password.

INTRODUCTION

Fast development in the technology has increased the risk of intrusion. Using security cameras allows a person to monitor his property. The majority of organization and administration are making use of such security cameras with the intension to save their business as well as property for the illegal entry. Nowadays, the security cameras have become much more advanced, reasonable, smaller and straight forward. Most existing camera-based security system involve the use of multiple cameras

placed around the room to be monitored. These cameras continuously record video footage of the room and save it on a central monitoring system.

Instead of this we may use a different system in which a single camera is used, that can slew around the room and record only when it is alerted by the presence of any intrusion. The system consist of three components sensors that detect intrusion; the camera that slews to the point of intrusion add takes pictures; and the keypad that is used to interface with the system which allows any person to disable the system by entering the right password.

OBJECTIVE

- To design advanced security with an affordable and less complex system.
- Power saving.
- Most existing camera based security systems involve the use of multiple cameras placed around the room to be monitored. Instead of this, we may use a different system in which a single camera is used.
- The camera that slews to the point of intrusion and takes pictures and the key pad that is used to interface with the system which allows any person to disable the system by entering the right key word.

LITERATURE SURVEY

- Sadeque Reza Khan Et.al proposed a home security system, which detects obstacle, touch, heat, smoke, sound. A PIC microcontroller 16F76 controls the whole system. It collects information from the sensors and sends SMS to a corresponding number by using a GSM module[1].

- Nathan David et.al proposed a low cost and flexible home control and environmental monitoring system, which employs an embedded micro-web server in an Arduino Mega 2560 microcontroller with IP connectivity for access and control remotely. Their project has very good features but still lacks in providing full security of home [2].
- Viraj Mali et.al proposed a home automation and security system which is low cost by using motions sensors, PIR sensors and GSM where Arduino will trigger an alarm and alert messages will be sent to user's mobile via GSM module [3].
- N. Sriskanthan and F. Tan Karande developed a home automation system based on Bluetooth wireless technology, which allows the user to monitor and control different appliances connected over a Bluetooth in home environment. This system is complicated for vast usage and has some limitations for which it cannot provide full home security system in low cost [4].
- Bhavani Annapurna et.al developed a system which is a password based digital lock where an access control system allows authorized persons to access a restricted area and the RF wireless communication technology transmits theft indication signals to the neighboring houses [5].

METHODOLOGY

This system consist of following components:

- Sensors: PIR & IR
- 8051 Microcontroller
- DC motor
- Camera
- Mobile phone

BLOCK DIAGRAM

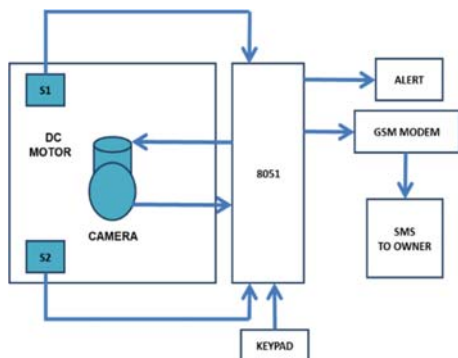


Figure1. Block Diagram.

MICROCONTROLLER

- Small computer on a single integrated circuit containing a CPU, memory, Timer and It is programmable input/output ports.
- Microcontroller available with different word length such as 8bit, 16bit and 32 bits microcontroller
- Microcontroller can contain a varying number of I/O pins. These pins can configured to either an input or an output state.



Figure2. Microcontroller.

A microcontroller is a small computer (SoC) on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose computers or other general purpose applications consisting of various discrete chips.

Microcontrollers are used in automatically controlled products and devices, such as automobiles engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processors. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at clock rate frequencies as low as

4kHz, for low power consumption(single-digit milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or the interrupt: power consumption while sleeping (CPU clock and most peripherals off) may be just nano watts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor(DSP), with higher clock speeds and power consumption.

PIR SENSOR

A passive infrared sensor (PIR sensor) is an electronic that measures infrared(IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detector.

PIR sensor allow us to sense the motion, almost always use to detect whether a human has moved in or out of the sensors range.

It is commonly found in appliances and gadgets used in homes or business.

Sensitivity Range: up to 20 feet(6 meters).

We, homo sapiens, radiate heat in form of radiation at wavelength of 10-12 micrometer that can only detect by the PIR sensor.

They are small, inexpensive, low-power ,easy to use and don't wear out.

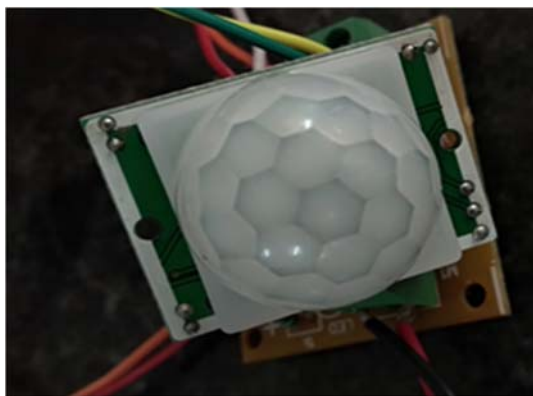


Figure3. PIR sensor.

OPERATING PRINCIPLES

All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually this radiation is invisible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose. The term passive in

this instance refers to the fact that PIR devices do not generate or radiate any energy for detection purposes. They work entirely by detecting the energy given off by other objects. PIR sensors don't detect or measure "heat": instead they detect the infrared radiation emitted or reflected from an object.

CONSTRUCTION

Infrared radiation enters through the front of the sensor, known as the 'sensor face'. At the core of a PIR sensor is a solid state sensors or set of sensors, made from materials which generate energy when exposed to heat. Typically, the sensors are approximately 1/4 inch square (40 mm²), and take the form of a thin film. Materials commonly used in PIR sensors include gallium nitride(GaN), caesium nitrate (CaNO₃), polyvinyl fluorides, derivatives of phenylridine, and cobalt phthalocyanine. The sensors is often manufactured as part of on integrated circuit. A PIR-based motion detector is used to sense movement of people, animals or objects. They are commonly used in burglar alarms and automatically-activated lighting systems. They are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector".

OPERATION

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 configuration 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 one hundred feet away from PIR. There are also PIRs designed with reversible orientation mirrors which allow either broad coverage (110 degree wide) or very narrow “curtain” coverage, or with individually selectable segments to “shape” the coverage.

DC MOTOR

- A DC motor is a rotary electrical machine that converts direct current electrical energy to mechanical energy.
- It consists of magnets, commutator, brushes, shaft, copper winding.

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor’s speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and applications. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drivers for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.



Figure4. DC motor.

GSM MODEM

- It is a special type of modem which accepts SIM card.
- These GSM modem are more frequently used to provide mobile connectivity.
- Many of them can also be used for sending and receiving SMS.
- In this case we are using GSM modem for sending the message only.
- The GSM can communicate with the calls, SMS, or with the help of the MMS.
- In the home security system we are using sim800 as a GSM modem, It has to find the number of persons inside the room, number of wrong passwords entered on the keypad.



Figure5. GSM modem.

GSM module working

- 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.
- GSM modem is usually preferable to GSM mobile phones.

KEYPAD



Figure6. keypad.

- The 16-button keypad provides a useful human interface component for microcontroller projects.
- Convenient adhesive backing provides as simple way to mount keypad in variety of applications.

Key specification

- Interface :8-pin access to 4x4 matrix
- Dimensions :
keypad, 2.7x3.0 inches ,(6.9x7.6cm)
cable, 0.78x3.5 inches,(2.0x8.8cm)
- Maximum rating :30 mA

Application ideas

- Security system
- Menu selection
- Data entry for embedded system

CAMERA

Wireless security cameras are closed-circuit television (CCTV) cameras that transmits a video and audio signal to a wireless receiver through a radio band. Many wireless security cameras require at least one cable or wire for power; “wireless” refer to the transmission of video/audio. However, some wireless security cameras are battery-powered, making the cameras truly wireless from top to bottom.



Figure7. Advanced Camera.

Wireless cameras are proving very popular among security consumers due to their low installation costs (there is no need to run expensive video extension cables) and flexible mounting options; wireless cameras. In addition to the ease of use and convenience of access, wireless security camera allows users to leverage broadband wireless internet to provide seamless video streaming over-internet.

Digital wireless is the transmission of audio and video analog signals encoded as digital packets over high bandwidth radio frequencies.

Advantages include:

Wide transmission range- usually close to 450 feet (open space, clear line of sight between camera and receiver)

- High quality video and audio
- Two-way communication between the camera and the receiver
- Digital signal means you can transmit commands and functions, such as turning lights on and off.
- You can connect multiple receivers to one recording device, such as security DVR.

ADVANTAGES

- The advantage of the system is we do not need the camera’s at every corner of the room.
- Single camera is placed in the middle of the room which covers the entire room.
- So that cost decreases, power consumption also decreases.
- There is no need for the owner always view the recording of the footage without any assurance of the theft.
- Observation of hazardous areas like radio active waste dump, Chemical storage areas.
- Real time monitoring system

DISADVANTAGES

- more cost .
- power consumption.
- theft cannot be controlled.
- Out of coverage issue .

Applications

- Used for home security system.
- Crime Deterrent.
- Office.
- Bank.
- Educational institution.
- A warehouse storing high explosive demands constant surveillance.
- Attendance system.

Scope for future work

To completely eliminate the use of the microcontroller and instead use the parallel port of the PC to monitor the sensors and control the sensors. Also, Advanced image processing techniques can be applied to track the intruder once his position has been identified.

Conclusion

Security system solves many of the problems faced by the multiple camera based system at an easily affordable cost. The biggest advantage is that we can avoid having to wade through hours of footage on empty rooms.

References

[1] Nathan David, Abafor Chima, Aronu Ugochukwu, Edoqa Obinna, "Design of a Home

Automation System Using Arduino", International Journal of Scientific & Engineering Research, Vol. 6, Issue 6, 2015.

[2] Viraj Mali, Ankit Gorasia, Meghana Patil, Prof. P.S.Wawage, "Home Automation and Security using Arduino Microcontroller", International Journal of Research in Advent Technology (E-ISSN: 2321-9637) Special Issue, National Conference "NCPCI-2016", 19 March 2016.

[3] B. Annapurna, K. Mounika, K. Chakradhara Chary, Roohi Afroz, "Smart Security System using Arduino and Wireless Communication", International Journal of Engineering Innovation & Research, Volume 4, Issue 2, ISSN: 2277 – 566