Invisible Eye- An Advanced Security System

Dr.V Asha¹, Channa Keshava P L², Geetha³
¹,²,³Master of Computer Applications, Department of New Horizon College of Engineering.

Abstract-- The main agenda of this work is to design advanced security with affordable and less complex system referred as “Invisible Eye”. In this modern era, property crimes are more predominant. This necessitates our need to develop an advanced security system which is the INVISIBLE EYE. It is basically a single camera based security system that can be used to protect valuables kept in a room of a house or property. Most existing camera based security systems involve the use of multiple cameras placed around the room to be monitored. This camera continuously records the video footage of the room and saves it on a central monitoring station. The biggest advantage is that we can avoid having to wade through hours of footage of empty rooms and also avoid having to install multiple cameras to cover a single room. Invisible Eye security system solves many of the problems faced by the multiple camera based systems at an easily affordable cost.

Keywords--Sensors, Microcontroller, Stepper Motor, GSM Modem.

I. INTRODUCTION

In this modern life, property crimes are more primary. This require our need to develop an advanced security system which is the INVISIBLE EYE. It works with single camera based on security system which can be used to protect valuables kept in a room of a house or property. Manage can only view footage which was alerted on the presence of trespasser. Once the trespasser has been detected this information about trespasser will be directed to cop and owner through the SMS. The Cameras which continuously record footage of the room and save it on a Central Monitoring Station. And the same time camera can slew around the room and record only when it is alerted by the presence of trespasser. This type of system would lead to less time consuming and this will help to keep track of the trespasser easily in less time. Such a system would consists three components: Sensors that detect trespasser; the camera that slews to the point of trespasser and take 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. The biggest advantage is that we can avoid having to wade through hours of footage of empty rooms and also avoid having to install multiple cameras to cover a single room. Invisible Eye security system solves many of the problems faced by the multiple camera based systems at an easily affordable cost.
II. SYSTEM ARCHITECTURE

![Block Diagram of Invisible Eye](image)

*Figure 1: Block Diagram of Invisible Eye.*

This system consists of the following components: Sensors, AVR (Microcontroller), Stepper Motor, GSM Modem.

III. SENSOR

A Sensor is a device, module or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A Sensor is a device that detects and responds to some type of input from the physical environment. In today’s life the sensors are used in everyday objects such as touch sensitive elevator buttons and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. Sensors are used for human body detection an electric sensor PIR (Passive Infra-Red) module is developed. In combination with Fresnel lens a PIR detector is mounted on computer size PCB with an analogy IC and limited components to form the module. For human body detection a pyro electric sensor PIR module is developed. In combination with Fresnel lens a PIR detector is mounted on a compact size PCB with IC-SB0081 and other components to form module. The variable width of high level output is usually preferred and used.
PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", “Pyro electric”, or "IR motion" sensors. To increase the efficiency of SIP signalling, yet maintain 100% standards compatibility with external VoIP systems and soft switches, xG has created patent pending SIP compression technology for the Invisible Eye system that reduces SIP overhead bandwidth from 400% to 66% on the over the air links and backhaul links from the Base Stations to the Invisible Eye MSCs. The MSCs do the SIP compression and decompression to maintain 100% interoperability with third-party VoIP systems. This also has the benefit of making more bandwidth available for mobile data applications being carried alongside voice traffic.

VI. AVR (Microcontroller)

An AVR microcontroller is a type of device manufactured by Atmel, which has particular benefits over other common chips. The easiest way of thinking about it is to compare a microcontroller with your PC, which has a motherboard in it. On that motherboard is a microprocessor that provides the intelligence, RAM and EEPROM memories and interfaces to rest of system, like serial ports disk drives and display interfaces. A microcontroller has all or most of these features built-in to a single chip, so it doesn’t need a motherboard and many components, LEDs. AVR microcontroller come in different packages, some designed for through-hole mounting and some surface mount. AVRs are available with 8-pins to 100-pins, although anything 64-pin or over is surface mount only.\(^1\) A PC has an operating system and this runs programs, such as Word or Internet Explorer or Chrome that do specific things. An 8-bit microcontroller like the AVR doesn’t usually have an operating system, although it could run a simple one if required, and instead it just runs a single program.
The AT89S52 is an 8-bit low-power, high-performance CMOS microcontroller with 8K bytes of in-built system programmable Flash memory. This device is manufactured using Atmel’s high density non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash memory allows a conventional non-volatile memory programmer to be programmed or by the program memory to be reprogrammed in-system. On a monolithic chip, by combining in-system programmable Flash with a versatile 8-bit CPU, the Atmel AT89S52 is a potentially huge microcontroller which provide a highly-manageable and cost-serviceable solution to many embedded system control applications. The features of AT89S52 are 8K bytes of Flash, two data pointers, watchdog timer, 32 I/O lines, 256bytes of RAM, three 16-bit timer/counters, a two-level interrupt architecture, full duplex serial port and clock circuitry and a on chip oscillator. In addition, for operation down to zero frequency the AT89S52 is designed with static logic and supports two selectable power saving software modes. The Idle Mode allows the RAM, serial port, timers, counters and interrupt system to continue functioning and stops CPU functioning. The Power-down mode solidifies the oscillator, until the next hardware or the next interrupt resets it disables all other chip functions but saves the RAM contents.

**A) Data Memory:** This AT89S52 microcontroller implements on-chip RAM of size 256 bytes of memory. In Special Function Registers the parallel address space is occupied by the upper 128 bytes of memory. This means that the special function registers have the same addresses as that of the upper 128 bytes of memory but upper 128 bytes of memory and the special functional registers are clearly separate from each other.

**B) Watchdog Timer (One-time Enabled with Reset-out):** The CPU may be subjected to software upsets in that case the watch dog timer is planned as a recovery method. The watch dog timer consists of a watch dog timer special functional registers reset (WDTRST) and a 14-bit counter. To disable the watch dog timer from exiting reset it is just made default. A user must write 01EH and 0E1H to enable
the watch dog timer with respect to the WDTRST register (Special Function Register location is 0A6H). When the oscillator is running if Watch Dog Timer is enabled, then it will get incremented for every machine cycle. The external clock frequency is always dependent on the watch dog timer time period. Disabling of width is done by reset (either WDT overflow reset or the hardware reset). When output RESET HIGH pulse at the RST pin the WDT overflows.

![Block Diagram of Microcontroller]

**Figure.4 Block Diagram of Microcontroller**

**C) Baud Rate Generator:** Timer 2 is selected as the baud rate generator by setting TCLK and/or RCLK in T2CON. If Timer 2 is used for both the receiver and transmitter and Timer 1 is used for any other function then the baud rates for the receive and the transmit are different. If the RCLK and/or TCLK are set then it puts Timer 2 into its baud rate generator mode. The auto reload mode is similar to the baud rate generator mode that a rollover in TH2 causes the Timer 2 registers to be reloaded with the 16-bit value in registers RCAP2H and RCAP2L, which are preset by software. According to the following equation the baud rates in Modes 1 and 3 are calculated by Timer 2’s overflow rate.
The baud rate formula is given by:

$$\text{Modes 1 and 3 Baud Rates} = \frac{\text{Timer 2 Overflow Rate}}{16}$$

$$\frac{\text{Modes 1 and 3 Baud Rate}}{32 \times (65536 - \text{RCAP2H, RCAP2L})}$$

V. STEPPER MOTOR

A Stepper Motor or Step Motor or Stepping Motor is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor’s position can then be commanded to move and hold at one of these steps without any position sensor for feedback, as long as the motor is carefully sized to the application in respect and speed. Stepper motors are DC motors that move in discrete steps. They have multiple coils that are organized in groups called “phase”. The motor will rotate, one step at a time. Stepper motors come in many different sizes and styles and electrical characteristics. Usually for the interfacing of the unipolar stepper motor generally the 4 wire connection method is used, but we can even more simplify the design by the help of the 2 wire connection method by making the controller use less number of pins. The circuit for 2-wire connection is shown below.

![Figure 5 Wire Connection of Unipolar Stepper Motor](image)

A) Step Angle: Step angle of the stepper motor is defined as the angle which rotates the motor in one step. To determine the step angle, simply divide the full rotation 360 by the number of steps which a motor takes to complete one revolution. The number of steps rotated by the motor to complete one full revolution gets doubled in a half mode, so alternatively step angle reduces to half. As in above examples, to complete a revolution Stepper Motor takes 4 steps to rotate in full mode so step angle can be determined as

$$\text{Step Angle } \phi = \frac{360\degree}{4} = 90\degree.$$
IV. GSM (Global System for Mobile Communication)

GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones.

A) Structure of GSM Network: The network behind the GSM system seen by the customer is large and in order to provide all of the services which are required by the network is complicated. It is divided into the following number of sections that are, The Base Station Subsystem (the base station and their controllers). The Network and Switching Subsystem (the part of the network most similar to a fixed network) and is sometimes also referred as the core network. The GPRS Core Network (the optional part which allows packet based Internet connections). GSM services such as SMS and Voice calls are produced by all of the elements in the system.

B) Short Message Service (SMS): Short Message Service (more commonly known as text messaging) has become the most used data application on mobile phones, with 74% of all mobile phone users worldwide already as active users of SMS, or 2.4 billion people by the end of 2007. SMS text messages may be sent by mobile phone users to other mobile users or external services that accept SMS. Using the MAP protocol the messages are usually sent via the Short Message Services from mobile devices. The central routing hub for the Short Messages is the Short Message Service Centre SMSC. Many mobile service operators use their SMSCs as gateways to external systems, including incoming SMS news feeds, the Internet and other mobile operators. The SMS standard is also used outside of the GSM system.

C) GSM: Sending messages to multiple people at a time is referred as Multi messaging system. Multi messaging system that are used for sending warning messages, important information and providing security. Multi messaging system sending messages using GSM modem. The system provides availability due to development of high speed system. Sending important information in schools and universities to students and intended recipients is more flexible and effective system.
A GSM modem is a specialized type of modem, which accepts a SIM card and operates as mobile operator. GSM modem just like mobile phone. GSM modem is communication medium. GSM modem is an external device that is connected via serial port RS232 to PC. GSM modem sends and receives messages by using radio waves. AT commands is set of commands which are used for communicate with GSM modem.[1]. These commands can be used for sending, receiving and deleting messages. Any processing unit can make an interface with GSM modem using these command sets.

D) Accessing a GSM network: Any user needs two things in order to establish access to any GSM services
1) A billing relationship with a mobile phone operator. This is usually either where services are paid for in advance of them being consumed (prepaid), or where bills are issued and settled after the service has been consumed (post-paid).
2) A mobile phone that is GSM compliant and operates at the same frequency as the operator.

Figure 7 Structure of GSM Modem

A subscriber Identity Module (SIM) card, which is activated by the operator once the billing relationship is established. After activation subscriber’s Mobile Subscriber Integrated Services Digital Network Number (MSISDN) (the telephone number) is then programmed with the card. Personal information such as contact number of friends and family can also be stored on the SIM by the subscriber.

After subscribers sign up, the services that are allowed to access and the information about their identity (telephone number) are stored in a “SIM record” in the Home Location Register (HLR). Once the SIM card is placed into the phone and the phone is switched on, it will check for the nearest available mobile phone mast (that is also called as a Base Transceiver Station) with the powerful signal in the operator's
frequency band. If a mast can be successfully approached, then there is said to be coverage in that particular area. The phone then correspondingly detects itself to the network through the available control channel. Once this is successfully made, the phone is said to be associated to the network. The basic key feature of any mobile phone is the ability to make and receive the calls in any particular area where the coverage is available. This is generally referred roaming from a customer perspective, but when describing the underlying technical process it is also called as visiting. Each geographic area has a database called the Visitor Location Register (VLR), which contains details of all the mobiles currently in that area. Whenever a phone visits or connects the new area, the Visitor Location Register must approach the Home Location Register to acquire the details for that particular phone. When the GSM network wishes to locate the mobile phone the current cellular location of the phone (i.e., whichever Base Transmitter Station it is at) is entered into the Visitor Location Register record and the same will be used during a process called paging. The authentication and encryption services of every SIM card is provided by a secret key of that particular SIM card. This is useful to prevent theft of service, and also to prevent "over the air" snooping of a user's activity. The network does this by employing the Authentication Centre and is obtained without transmitting the secret key directly. Every GSM phone contains a unique identifier (different from the phone number). This can be found by dialling *#06#. When a phone contacts the network, its IMEI may be examined against the Equipment Identity Register to detect stolen phones and preside monitoring.

VII. CONCLUSION AND FUTURE WORK

Invisible Eye security system solves many of the problems faced by the multiple camera based systems at an easily affordable cost. The biggest advantage is that we can stop recording the hours of footage of the empty rooms. One can also avoid installing multiple camera to cover a whole single room. Cost required for the installation is very less compared to multiple camera based system. Good view of the video footage can be obtained as camera turns 360 degrees. This work can be extended to completely eliminates the use of the microcontroller and instead use parallel port of the PC to monitor the sensor. Also advanced image processing techniques can be applied to track the intruder once his position has been identified.

REFERENCES

II. Dr. Aswatha, Nagraj”, Telecommunication, Publication Year 2014, Vol 1.
IV. Douglas W Jones, “Control of Stepping Motors”. The University of Lowe.