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Invisible Eye- An Advanced Security System

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***Abstract*— 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.**

I. INTRODUCTION

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. Instead of the cameras which continuously record video footage of the room and save it on a central monitoring station, we may use a different system in which a single camera is used, that can slew around the room and record the video only when it is alerted by the presence of any intrusion. Such a system consists of the three following components - sensors that detects the intruding objects; the camera that moves to the point of intrusion and captures the 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.

II. HARDWARE DESCRIPTION

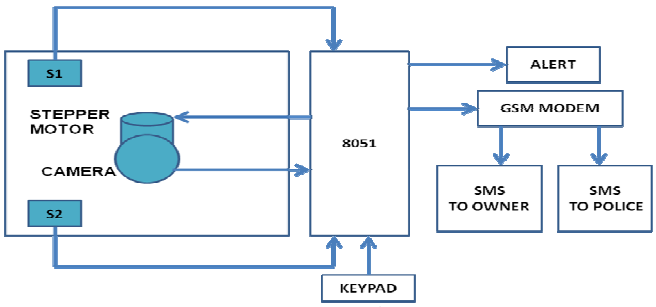

Fig.1 Block Diagram of Invisible Eye

A. Sensors

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.

Fig.2 Motion detector module uses a motion detector IC and PCB mounted Fresnel lens.

B. Microcontroller

The AT89S52 is a 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 nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash memory allows a conventional nonvolatile 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 provides 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.

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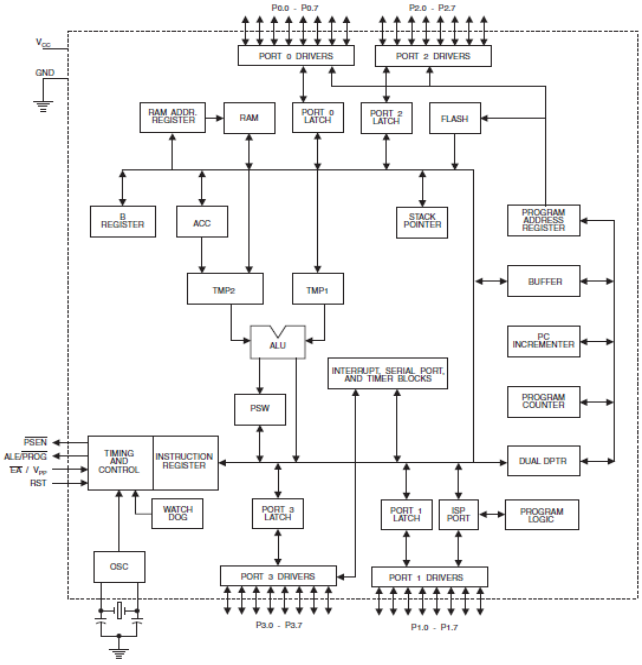

Fig.3 Block Diagram of Microcontroller

1) 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. ce.

2) 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 wdt is done by reset (either WDT overflow reset or the hardware reset). When output RESET HIGH pulse at the RST pin the WDT overflows.

3) 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 modeis 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

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

The baud rate formula is given by

$$\frac{\text{Modes 1 and 3}}{\text{Baud Rate}} = \frac{\text{Oscillator Frequency}}{32 \times [65536\text{-RCAP2H,RCAP2L})]}$$

C. Stepper Motor

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.

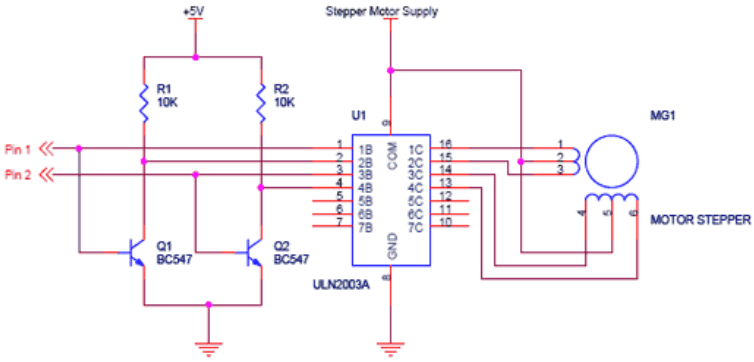

Fig.4 Wire Connection Of Unipolar Stepper Motor

1) 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

Step Angle ø = 360° / 4 = 90°.

D. GSM

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.

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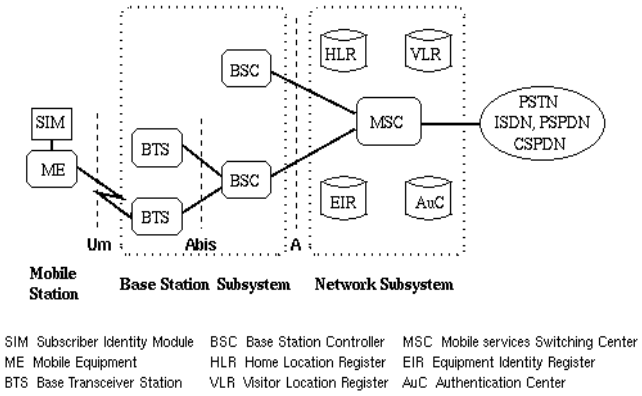

Fig.5 Block Diagram Of GSM

1) 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.

2) 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.

3) GSM Modem

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.

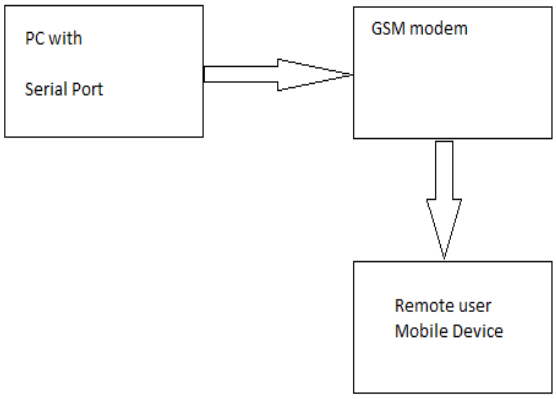

Fig.6 Block Diagram Of GSM Modem

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.

4) Accessing a GSM network:

Any user needs three things in order to establish access to any GSM services

- 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(postpaid).
- A mobile phone that is GSM compliant and operates at the same frequency as the operator.

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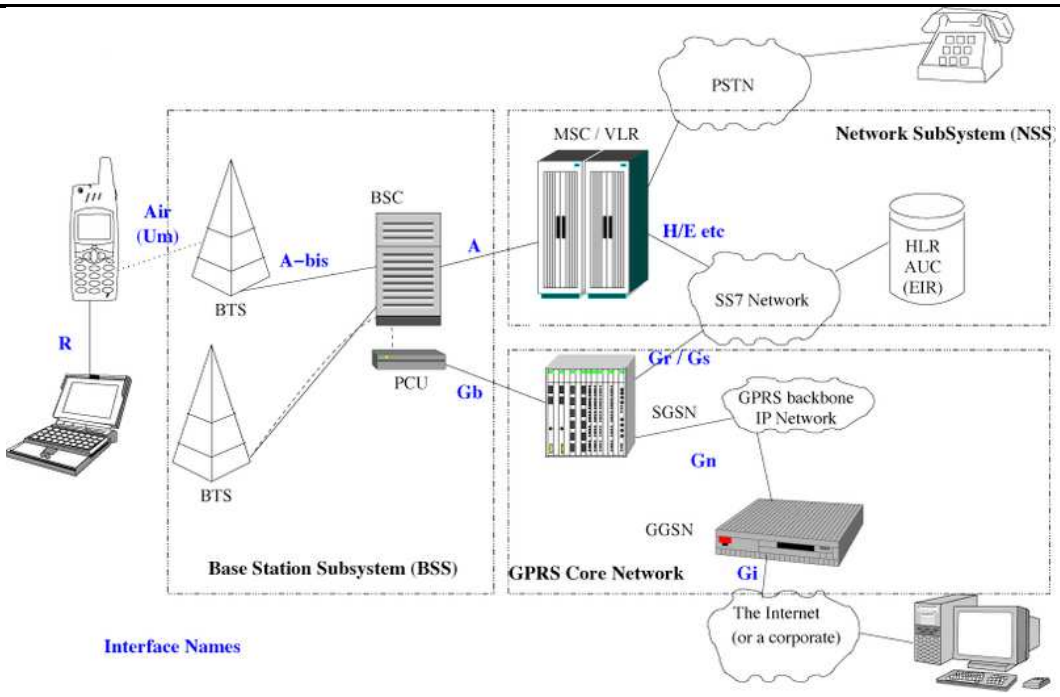

Fig.7 Structure Of GSM Modem

- 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 prticular 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.

III. CONCLUSION

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 cameras to cover a whole single room.

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 implemented to trace the intruder once his position has been identified.

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