A Review on Ultrasonic based Security System

Garima Pandey
Bachelor of Technology
Department of Electronics & Communication Engineering
MIT, Moradabad

Aditya Gupta
Bachelor of Technology
Department of Electronics & Communication Engineering
MIT, Moradabad

Dr. Pankaj Sharma
Associate Professor
Department of Electronics & Communication Engineering
MIT, Moradabad

Abstract

This paper presents the review of microcontroller and ultrasonic sonar based security system. Considering the high rate of crime and insecurity, there is an urgent need to design a security system that takes proper measure to prevent intrusion, unwanted and unauthorized user(s). Decoder, ultrasonic sonar, LCD and microcontroller as its main components to control the system. The result of these processes led to a security door which can be accessed by entering the corresponding keys of the assigned codes on the LCD screen or by entering the corresponding code. The system allows only that person who has a valid ID and at the same time unconscious the suspected person who is not having their ID proof. The designed system has been proven to be a reasonable advancement in access control and security system technology.

Keywords: LCD, ultrasonic sonar, Atmega- 89s52, microcontroller, HT-12ed, opto-coupler, RF receiver

I. INTRODUCTION

Over the years, various control systems have been designed to prevent access to unauthorized user. The main reason for providing security for our borders, buildings, colleges, industries, etc. is for security of our lives and property. It is therefore important to have a stress free and convenient means of achieving security purpose. Today, security has been a major issue of concern because of the dramatic increase in crime rate and illegal entries of suspected persons around the border area and thus, everybody wants to take proper measure to prevent it. In addition, there was a need of ultrasonic sonar which is used to detect the distance and range of a suspected person and take appropriate action according to that. It is also interesting to know that if a suspected person tries to cross the border area it automatically shoots the person to their unconsciousness because of ultrasonic sonar.

The present method has proven to be a bit unsatisfactory in one way or the other in terms of security. Due to the fact that live and property may be at risk, it is important to always have a reliable security system, putting into consideration the high rate of crime and insecurity. Most security systems also require special armed forces. Advanced Security system can be seen worthwhile to move from present security system to this advanced security system. This system can be used on borders in colleges, in societies etc.

The main objective of this system is to design a security system that has appreciated advantages over those in existence.

- To design a security system that ease problems of unauthorized entry in the society.
- To design and construct a security system with an alarm system that alert the user if a wrong person entered in the restricted area.
- To control access, a system must be modified in some manner to provide signals to the system to let it know whether or not the person entering in the area is valid or not. Simple access control is frequently used by corporate organizations and firms to limit access to their facilities, eliminating the need for a BSF for security. This checking can be done by bar code check or also can be done any tag check.

This paper is organised as follows Section II is Mode of Operation which presents the different modes of the security system. Section III present system design of the project. Section IV gives the description of the project. Section V gives the Conclusion of the project; this is the final part of the paper.

II. MODES OF OPERATION

There are four modes of this system:

A. Wireless Robot

In this mode we operate the robot wireless technology through RF technology.

B. To Design Radar Concept

In this mode we use the ultra-sonic sensor that sense the obstacle and measure the distance and display in LCD.

C. *Border Checker Mode*

In this mode we use the switch for setting the critical distance and it can be change.

D. *Person Checker*

In this mode we use the RF active module for wireless ID card that sense the system automatically check and take appropriate action for criminal.

III. SYSTEM DESIGN

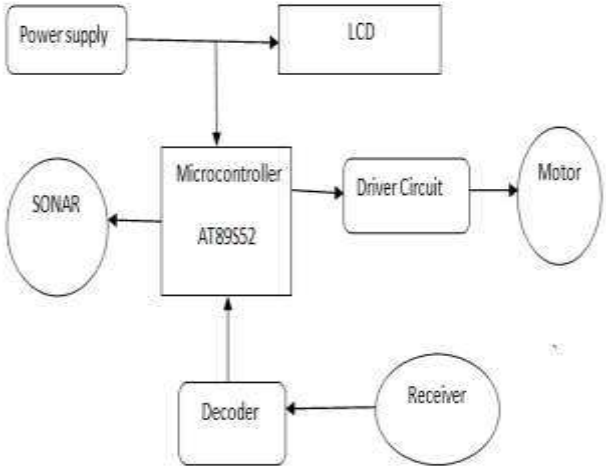

Fig. 1: Block diagram of a security system comprising of a microcontroller

The block diagram used for implementation is as shown in Fig 1. The proposed system consists of ultrasonic sensor also called ultrasonic transceiver because they can both transmit and receive the ultrasonic signal. These device work on principle similar to that of transducers used in radar and sonar system, which evaluate attributes of a target by interpreting the echoes form radio or sound waves respectively. Active ultrasonic sensor generate high-frequency sound waves and evaluates the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object.

Proposed system also consist decoder and encoder IC. The 2^{12} encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12-N data bits. Each address/data input can be set to one of the two logic state. The programmed address/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of trigger signal. The pin no 1 to pin no 8 is use for the address line, if we use one encoder and one decoder IC then we give a same address in encoder and decoder IC. In this project we connect the entire address pin to join together and connect to the ground pin. So we provide same data to decoder IC by connecting to all address pin to the same ground voltage pin no 9 is V_{ss} pin, pin no

10 to pin no 13 is for data line. In this project we connect a changeable data base logic to these points. By connecting a DIP switch to these pin, DIP switch is used for external data base by changing the side switch we change the data base.

Data from RF transmitter is received by the RF receiver module. Modulation frequency of receiver and transmitter is same 433 MHz, when RF modules receive the data then it transfers this data serially into decoder IC. Decoder IC receives the data serially and decoder delivers a data parallel.

IV. SYSTEM DESCRIPTION

The proposed AI unit is using 8-bit microcontroller with 8K bytes of in-system programmable flash memory. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable flash on a monolithic chip, the Atmel AT89S52 (Fig 2) is a powerful microcontroller which provides a high-flexible and cost-effective solution to many embedded control applications.

The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointer, three 16-bit timer/counters, a six vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and support two software selectable power saving modes. The idle mode stop the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The power down mode save the RAM contents but freezes the oscillator, disabling all other chip function until the next interrupt or hardware reset.

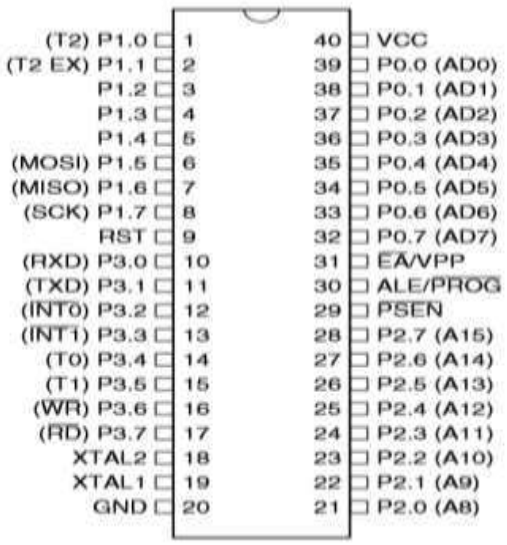

Fig. 2: Pin diagram of AT89S52 Microcontroller

Ultrasound is acoustic (sound) energy in the form of waves having a frequency above the human hearing range. The highest frequency that the human ear can detect is approximately 20 thousand cycles per second (20,000 Hz). This is where the sonic range ends, and where the ultrasonic range begins. Ultrasound is used in electronic, navigational, industrial, and security applications. It is also used in medicine to view internal organs of the body. Ultrasound can be used to locate objects by means similar to the principle by which radar works. High frequency acoustic waves reflect from objects, even comparatively small ones, because of the short wavelength. The distance to an object can be determined by measuring the delay between the transmission of an ultra-sound pulse and the return of the echo. This is the well-known means by which bats navigate in darkness. It is also believed to be used underwater by cetaceans such as dolphins and whales. Ultrasound can be used in sonar systems to determine the depth of the water in a location, to find schools of fish, to locate submarines, and to detect the presence of SCUBA divers. In this paper, a highly advanced ultrasonic and an At89s52 microcontroller are used to alert the security personals. Ultrasonic sensor is sensitive to any human movement. It detects infrared radiation coming from any alive body. At89s52 microcontroller is used for main module. In activated condition, when an intruder enters the prohibited area, sensor trigger main module zones, which in turn sends the message to the central camp and a visual and audible alert is produced. Working of ultrasonic sensor is shown in Fig 3.

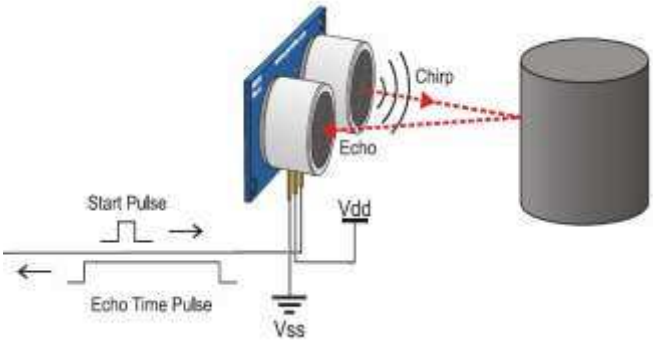

Fig. 3: Working of Ultrasonic Sensor

The 2^{12} encoders are a series of CMOS LSIs for remote control system applications. They are capable of encoding information which consists of N address bits and 12N data bits. Each address/data input can be set to one of the two logic states. The programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium upon receipt of a trigger signal. The capability to select a TE trigger on the HT12E (Fig 4) or a DATA trigger on the HT12A further enhances the application flexibility of the 212 series of encoders. The HT12A additionally provides a 38 kHz carrier for infrared systems.

A. Features of HT12E

- Operating voltage: HT12E
- Low power and high noise immunity CMOS technology
- Low standby current: 0.1_A (typ.) at VDD=5V
- HT12A with a 38kHz carrier for infrared transmission medium
- Built-in oscillator needs only 5% resistor

- Data code has positive polarity
- Minimal external components
- 18-pin DIP

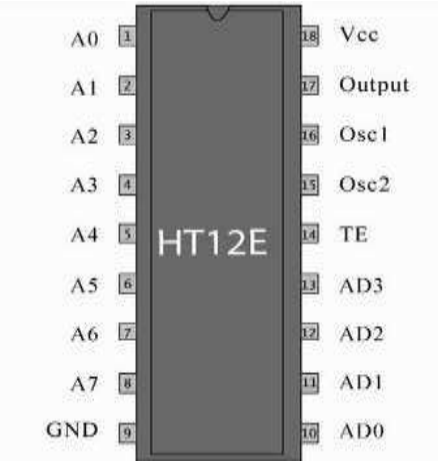

Fig. 4: Pin diagram of HT12E

The 2^{12} decoders are a series of CMOS LSIs for remote control system applications. They are paired with 2^{12} series of encoders. For proper operation a pair of encoder/de-coder with the same number of addresses and data format should be chosen. The decoders receive serial addresses and data from a programmed 2^{12} series of encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes have been found, the input data codes are decoded and then transferred to the output pins. The VT pin also goes high to indicate a valid transmission. The 2^{12} series of decoders is capable of decoding information that consists of N bits of address and 12–N bits of dat. Of this series, the HT12D (Fig 5) is arranged to provide 8 address bits and 4 data bits, and the HT12F is used to decode 12 bits of address information.

B. Features of HT12D

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- Low standby current
- Capable of decoding 12 bits of information
- Binary address setting
- Received codes are checked 3 time
- Built-in oscillator needs only 5% resistor
- Valid transmission indicator
- Easy interface with an RF or an infrared transmission medium Minimal external
- 18-pin DIP

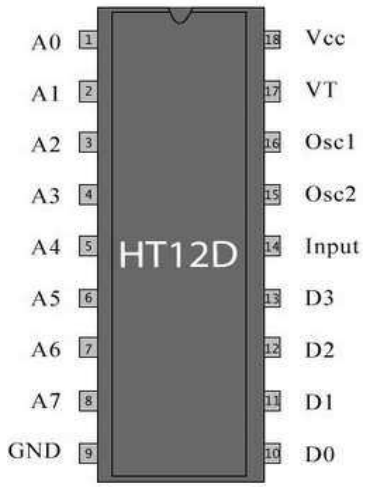

Fig. 4: Pin diagram of HT12D

V. CONCLUSION

The design and implementation of microcontroller based security system (using SONAR & microcontroller AT89s52) has been proven to be a reasonable advancement in security system technology and access control. The computer interface has expanded the flexibility of the multi-functional microcontroller. The work done here is original and has not been published. This is a major breakthrough in digital design and technological advancement in general.

ACKNOWLEDGMENT

The authors are grateful to Dr. Pankaj Kumar Sharma, Associate Professor, Electronics & Communication Engineering Department, MIT Moradabad for assisting us in giving the idea of project, for implementation of the hardware and for inputs on the paper.

REFERENCES

[1] http://www.smartcomputing.com/editorial/article.asp?article=articles%2F1995%2Fmar95%2Fpcn0323%2Fpcn0323.asp retrieved 2010 09 02
[2] "U.S. Patent 613809: Method of and apparatus for controlling mechanism of moving vessels and vehicles". United States Patent and Trademark Office. 1898-11-08. Retrieved 2010-06-16.
[3] William C. Mann (ed.) Smart technology for aging, disability and independence: the state of the science, John Wiley and Sons, 2005 0471-69694-3, pp. 34-66
[4] "Home automation costs". Totalavcontrol.co.uk. Retrieved 2010-02-18.
[5] "About Us". InsteonSmartGrid.com. Retrieved 2009-11-20.
[6] Worlds Open Protocol ISO/IEC 14543-3 KNX www.knx.org
[7] Fundamentals of Information Systems Security/Access Control Systems. (4th May, 2008). [Online]. pp. 8-11. Available:http://en.wikibooks.org/wiki/Fundamentals_of_Information_Systems_Security/Access_Control_Systems.
[8] Encyclopedia Britannica, Eleventh Edition. (6th June, 2008). [Online]. pp 15-16. Available: http://britannica.com/search?query=security+door+system.
[9] Ameze and A. Ejoke, "Security Lock System Using Pass code and Smart-Card," Electrical/Electronic Department, University of Port Harcourt, Nigeria, 2007, ch. 2, pp. 35.
[10] Webster and J. Brown, "Changes in Aromatic Chemistry and Sensory Quality of Milk Due to Light Wavelength," Dual tone multi frequency, Ph.D. Dept. Food Science and Technology, pp 85-86, 6th July, 2008.
[11] AT89c52. (July 16, 2008). [Online]. pp. 12 Available: http://www.atmel.com
[12] V. H. Douglas, Microprocessors and Interfacing, 2nd Edition, New Delhi: Tata Mcgraw-Hill, 1999, pp 102-103.