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# Embedded Surveillance System Using Ultra Sonic Sensor Coding With Multiple Pir Sensor

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## Abstract:

Recently surveillance systems have become more important for home safety. The embedded surveillance system, frequently used in a home, an office or a factory, uses a sensor which is triggered to turn on a camera. Some designs use different types of sensors to achieve reliability by means of the different features of each sensor. In this project extend our previous design not only by using both multiple PIR sensors and ultrasonic sensors as a sensor group, but also by using the temperature sensor. Ultrasonic receivers and transmitters are located at opposite ends. In this paper we design and implement an embedded surveillance system by use of a time-variation ultrasonic coding signal with multiple pyroelectric infrared sensors (PIR) to detect an intruder in a home or a storehouse.

The ultrasonic sensor module consists of a transmitter and a receiver which are placed in a line direction; however, ultrasonic sensors with the same frequency are subject to interference by crosstalk with each other and have a high miss rate. To overcome these disadvantages of the ultrasonic sensor, we propose a coding mechanism to reduce both crosstalk and environmental interference and to enhance the distinguishing features of the signal. In addition we use a time-variation coding signal to make the system more reliable against the breaking of the system when the coding signals vary. Both ultrasonic sensors and PIR sensors are managed by the majority voting mechanism .

## Index Terms:
Surveillance System, Coding Signal, Majority Voting Mechanism, PIR Sensor, Ultrasonic Sensor, Time-variation

## 1. INTRODUCTION:

Recently surveillance systems have become more important for home safety. The embedded surveillance system, frequently used in a home, an office or a factory [1-3], uses a sensor which is triggered to turn on a camera [4-5]. Some designs use different types of sensors to achieve reliability by means of the different features of each sensor [6-7]. In this paper we extend our previous design not only by using both multiple PIR sensors and ultrasonic sensors as a sensor group, but also by using the MVM. Ultrasonic receivers and transmitters are located at opposite ends [8-9]. However, to reduce the interference from other frequencies in ultrasonic signals, we use a coding signal to enhance the ability to distinguish all random interference [10].

To enhance system reliability, some of our previous research focuses on improving the shortcomings of the ultrasonic sensor. Some parts of the previous research explore both the influence of attenuation in air and the crosstalk of ultrasonic signals by using a coding signal [11-12], while other parts of this previous research provide improvement of the ultrasonic signal by using different coding signal types [13-14]. Still other parts of previous research use time-variation to transmit different messages with respect to time for a receiver. For a faster and useful time-variation coding mechanism some previous research projects explore the influence of both the environments and any noise on the time-variation coding signal [15]. Some previous research projects use hardware and software modules to implement a real-time operation system for a quicker and easy extending function [16]. For the delay time between the transmitter and the receiver some use the RLNC in delay and throughput [17].

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Some use the coding signal in the ultrasound image to improve the SNR [18-19]. Others analyze the difference of the encryption mechanism from the merit and deficiency of the database [20]. We propose adding to the number of bits of time-variation by means of both coding and encryption to reduce the probability of code breaking.

## 2. BLOCK ARCHITECTURE OF THE SYSTEM:

Fig. 1 shows our design which contains several ultrasonic and PIR sensor groups. In the modules of the ultrasonic sensor groups both the transmitter and the receiver are separated. The transmitter circuit generates a multi frequency square waveform, and the receiver circuit amplifies the received signals and filters out any noise. When a transmitter transmits a time-variation ultrasonic coding signal, the ultrasonic receiver determines whether there is an intruder passing through the sensing area. If there is no intruder, the MCU (Micro Controller Unit) will use the predefined ultrasonic signal pattern to decode the received signal.

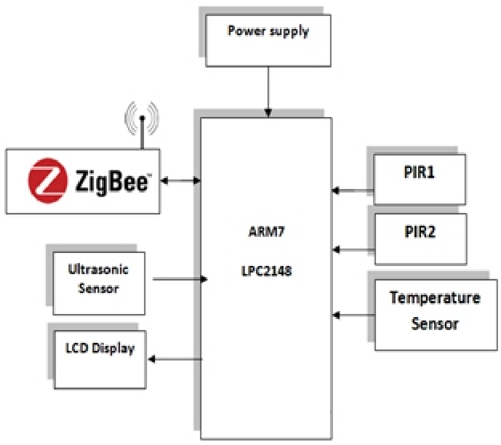


Fig:1 Block diagram of the Surveillance system

The blocks mainly constitute ARM-7, PIR sensors and Ultra-Sonic Sensors as important components. The LM35 temperature sensor is the main component for sensing the temperature.

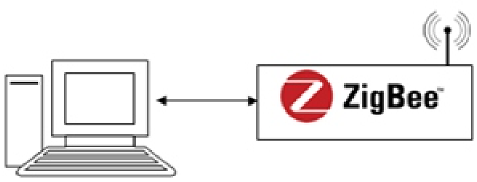


Fig:2 Block diagram of the Control system

The use of both the relay stations and the frequency conversion extends the sensing range. Our design reduces the environmental interference with the ultrasonic signal. All sensing signals are input to the embedded surveillance system by the DB9 (General purpose input and output), and the MVM program counts the number of sensing states to determine whether to adopt the MVM or not. The PIR sensor groups obtain the sensing signals from human temperature. If the voting results of both the ultrasonic and PIR sensor groups pass the criteria, the embedded surveillance system starts the Web camera to capture images.

## 2. Software modules:

We choose Windows as our operating system. The program of the majority voting mechanism contains a detection of the DB9 function, a counting and majority voting function, an image captured function and a Web server. The embedded system scans the DB9 sockets, which are connected to external PIR sensors and ultrasonic sensors. To verify the state of each PIR and ultrasonic sensor, the embedded system reads the voltage levels of the DB9 sockets. When the system reads 5V from a DB9 socket, we learn that the ultrasonic sensors or the PIR sensors have been triggered and will execute the majority voting program by counting the state of each ultrasonic and PIR sensor. The majority voting is achieved by the sensor groups of the different DB9 sockets. The embedded system, when interrupted by the detection procedure, starts the Web camera to capture images. When this is finished, the embedded system starts the detection procedure over again. If the intruder is still in the monitoring area, the count of the DB9 sockets' voltage levels continues the operation of the majority voting mechanism, and the embedded system again starts the Web camera to capture images. The embedded system uploads the captured images through the Internet by means of both the Web server and the streaming server.

## 3. Hardware modules:

This proposal mainly consist of the hardware blocks such as
1. ARM-7 Micro-controller.
2. PIR Sensor.
3. Ultra-Sonic Sensor.

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4. LM-35 Sensor.
5. Zig-Bee Tx/Rx.

### i. ARM-7 Micro-controller:

The LPC2141/42/44/46/48 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-s CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kb to 512 kb. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

Serial communications interfaces ranging from a USB 2.0 full-speed device, multiple UARTS, SPI, SSP to i2c-bus and on-chip SRAM of 8 kb up to 40 kb, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

### ii.PIR Sensor:

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin.

Fig4.6: PIR sensor

A Passive Infrared sensor (PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view.

PIR sensors are often used in the construction of PIR-based motion detectors . Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall. This is not to say that the sensor detects the heat from the object passing in front of it but that the object breaks the field which the sensor has determined as the "normal" state. Any object, even one the exact same temperature as the surrounding objects will cause the PIR to activate if it moves in the field of the sensors.

### iii. Ultrasonic sensors:

The GH-311 sensor works by transmitting an ultrasonic (well above human hearing range) burst and providing an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring the echo pulse width, the distance to target can easily be calculated .

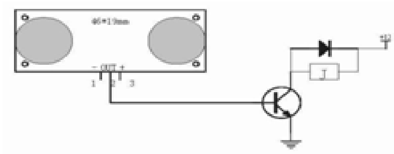

Fig 3: Ultra-sonic sensor in DC load

this ultra-sonic sensor is mainly useful to obstructer for the human detection during purpose of security.

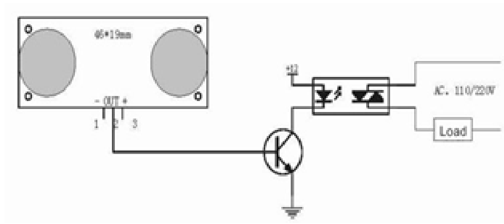


Fig 4: Ultra-sonic sensor in AC load

### iv LM35 Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range.

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Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a -55° to +150°C temperature range, while the LM35C is rated for a -40° to +110°C range (-10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.


Fig 5: LM35 temperature sensor

## v.ZigBee:

ZigBee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. Low power-usage allows longer life with smaller batteries.Mesh networking provides high reliability and more extensive range. ZigBee chip vendors typically sell integrated radios and microcontrollers with between 60 KB and 256 KB flash memory.ZigBee operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide.

Data transmission rates vary from 20 to 900 kilobits/second. The ZigBee network layer natively supports both star and tree typical networks, and generic mesh networks. Every network must have one coordinator device, tasked with its creation, the control of its parameters and basic maintenance. Within star networks, the coordinator must be the central node. Both trees and meshes allow the use of ZigBee routers to extend communication at the network level.

ZigBee builds upon the physical layer and medium access control defined in IEEE standard 802.15.4 (2003 version) for low-rate WPANs. The specification goes on to complete the standard by adding four main components: network layer, application layer, ZigBee device objects (ZDOs) and manufacturer-defined application objects which allow for customization and favor total integration. Besides adding two high-level network layers to the underlying structure, the most significant improvement is the introduction of ZDOs.

These are responsible for a number of tasks, which include keeping of device roles, management of requests to join a network, device discovery and security. ZigBee is not intended to support power line networking but to interface with it at least for smart metering and smart appliance purposes. Because ZigBee nodes can go from sleep to active mode in 30 ms or less, the latency can be low and devices can be responsive, particularly compared to Bluetooth wake-up delays, which are typically around three seconds. Because ZigBee nodes can sleep most of the time, average power consumption can be low, resulting in long battery life.

## 4. PRACTICAL RESULTS:

In the experiment results we found that an ultrasonic signal would be affected by both environment sounds and the amplitude of the reference voltage. Those factors affect both the transmission distance and the error rate in detecting. We therefore put the transmitter and the receiver on both ends of the sensing area and make sure the intruder passes through if the outside group has detected an individual. The Ultra-Sonic Sensor is mainly used to detect the Human inside and to alert the person as an wrong entry.

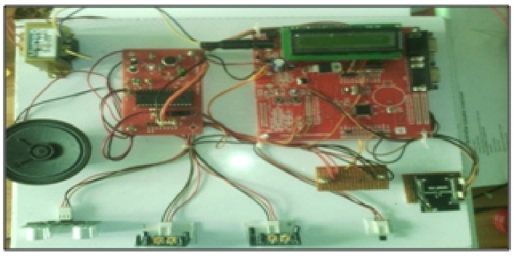

Fig6: Transmitting section of board.

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Fig 7: If any obstacle is detected by ultra sonic sensor the LCD displays the obstacle detected.


Fig 8: If the room temperature is increas the temperature sensor detected and the information disply on the lcd screen like high temperature.

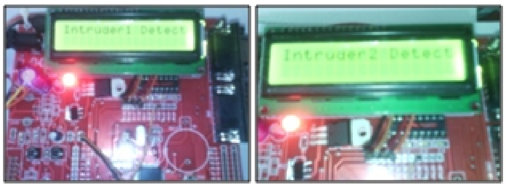

Fig 9: If any person is entered the pir sensor1 and 2 detected and lcd displys intruder1 and 2 detected.

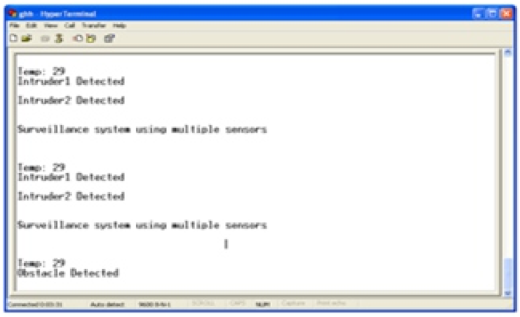


Fig 10: The zigbee of the other part is connected to system through the db9 pin connecter the output will be display like above.

## CONCLUSION:

**This embedded surveillance system by using ultra sonic sensor coding with multiple pir sensor is mostly used in home and industrial areas. By using this embedded surveillance system we can find out the unknown persons entered into the organization through the pir sensors and the temperature sensor is used to detect the high temperature when room temperature is suddenly increase due to the fire.**

Recently surveillance systems have become more important for home safety. The embedded surveillance system, frequently used in a home, an office or a factory, uses a sensor which is triggered to turn on a camera. Some designs use different types of sensors to achieve reliability by means of the different features of each sensor. In this project extend our previous design not only by using both multiple PIR sensors and ultrasonic sensors as a sensor group, but also by using the temperature sensor. Ultrasonic receivers and transmitters are located at opposite ends.

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## REFERENCES:

[1]. Jun Hou, Chengdong Wu, Zhongjia Yuan, Jiyuan Tan, Qiaoqiao Wang and Yun Zhou, "Research of Intelligent Home Security Surveillance System Based on ZigBee," International Symposium on Intelligent Information Technology Application Workshops, Shanghai, 21-22 Dec. 2008, pp. 554-57.

[2]. Xiangjun Zhu, Shaodong Ying and Le Ling, "Multimedia sensor networks design for smart home surveillance," Control and Decision Conference, 2008, Chinese, 2-4 July 2008, pp.431 435.

[3]. L. Lo Presti, M. La Cascia, "Real-Time Object Detection in Embedded Video Surveillance Systems," Ninth International Workshop on Image Analysis for Multimedia Interactive Services, 7-9 May 2008, pp.151-154.

[4]. Wen-Tsuen Chen, Po-Yu Chen, Wei-Shun Lee and Chi-Fu Huang, "Design and Implementation of a Real Time Video Surveillance System with Wireless Sensor Networks," VTC Spring 2008. IEEE Vehicular Technology Conference, 11-14 May 2008, pp. 218-222.

[5]. Mikko Nieminen, Tomi Raty, and Mikko Lindholm, "Multi Sensor Logical Decision Making in the Single Location Surveillance Point System," Fourth International Conference on Systems, France, 1-6 March 2009, pp.86-90.

[6]. Ying-Wen Bai, Li-Sih Shen and Zong-Han Li, "Design and Implementation of an Embedded Surveillance System by Use of Multiple Ultrasonic Sensors", The 28th IEEE International Conference on Consumer Electronics, Las Vegas, Nevada, USA, 11-13 Jan. 2010, 11.1-3, pp. 501-502.

[7]. Yang Cao, Huijie Zhao, Na Li and Hong Wei "Land-Cover Classification by Airborne LIDAR Data Fused with Aerial Optical Images," International Workshop on Multi Platform/Multi-Sensor Remote Sensing and Mapping (M2RSM), Jan. 2011, pp. 1-6.

[8]. Hai-Wen Zhao, Hong Yue, and He-Gao Cai, "Design of a Distributed Ultrasonic Detecting System Based on Multiprocessor for Autonomous Mobile Robot," Proceedings of tbe 2007 WSEAS Int. Conference on Circuits, Systems, Signal and Telecommunications, Gold Coast, Australia, January 17-19, 2007, pp.59-64.

[9]. Zi-LI Xie and Zong-Han Li, "Design and implementation of a home embedded surveillance system with ultra-low alert power," IEEE Transactions on Consumer Electronics, Feb. 2011, pp. 153-159.

[10]. Francesco Alonge, Marco Brancifortem and Francesco Motta, "A novel method of distance measurement based on pulse position modulation and synchronization of chaotic signals using ultrasonic radar systems," IEEE Transactions on Instrumentation and Measurement, Feb.2009, pp. 318-329.

[11]. Shraga Shoval and Johann Borenstein, "Using Coded Sognals to Benefit from Ultrasonic Sensor Crosstalk in Mobile Robot Obstacle Avoidance," IEEE International Conference on Robotics and Automation, Seoul, Korea, 21-26 May, 2001, vol.3, pp. 2879-2884.

[12]. Hannes Elmer, and Herbert Schweinzer, "High Resolution Ultrasonic Distance Measurement in Air Using Coded Signals," The 19th IEEE Conference on Instrumentation and Measurement Technology Conference, Anchorage, AK, USA, 21-23 May, 2002, vol.2, pp.1565-1570.

[13]. Rodrigo Pereira Barretto da Costa-Felix and Joao Carlos Machado, "P1G-9 Stepped Sine Versus Coded Pulse As Excitation Signals for Ultrasonic Transducer Calibration in a Non-Linear Propagation Field," IEEE Conference on Ultrasonics symposium, 2-6 Oct, 2006, pp. 1398-1401.

[14]. Fernando J. Alvarez, A. Jesus Urena, varo Hermamdez, Ana Jimenez, Carlos de Marziano, M. Jose Villadangos, and M. Varmen Perez, "Detecting Ultrasonic Signals in a Turbulent Atmosphere Performance of Different Codes," IEEE International Symposium on Intelligent Signal Processing, 3-5 Oct, 2007.

[15]. Gin-Der Wu and Chin-Teng Lin, "A recurrent neural fuzzy network for word boundary detection in variable noise-level environments," IEEE Transactions on Systems, Man, and Cybernetics, PartB: Cybernetics, Journals, Feb, 2001, vol. 31, pp.84-97.

[16]. I. V. Druzhinin, A. A. Mynzhasova and E. A. Sinelnikov, "Design and implementation of a hardware-software module for testing real-time systems," MIPRO, 2011 Proceedings of the 34th International Convention, Opatija, Croatia, 23-27 May, 2011, pp.788-791.

[17]. B. T. Sqnpna, Atilla Eryilmaz, and Ness B. Shroff, "Throughput-Delay Analysis of Random Linear Network Coding for Wireless Broudcasting," IEEE International Symposium on Network Coding, 9-11 June 2010, pp. 1-6.

[18]. Frank Melandso and Svein Jacobsen, "Single-transducer ultrasonic continuois-wave system for transmitting coded sequences," IEEE International on Ultrasonics Symposium, 18-21 Oct. 2011, pp.1664-1668.

[19]. Cao Lina, Guo Yinjing, Lu Wenhong, Yao Mingyuan, Wang Zhengjie, and Sun Hongyu, "Ultrasonic Imaging Dectective System Based on Spread Spectrum Technology," International conference on Wireless Communications, Networking and Mobile Computing, 21-25 Sept. 2007, pp. 6449-6451.

[20]. WU Xing-Hui, and ZHOU Yu-Ping, "Analysis of Data Encryption Algorithm Based on WEB," 2010 2nd International Conference on Computer Engineering and Technology, 16-18 April 2010, Vol. 7, pp. 673-677.

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