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High Secure Sensing Reliability Capture Using Ultrasonic and Proximity Sensors on Majority Voting Mechanism (MVM)

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1. ABSTRACT:
The Project represents embedded surveillance system, frequently used in a home, an office or a factory, uses a sensor 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 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. However, to reduce the interference from other frequencies in ultrasonic signals, we use a coding signal to enhance the ability to distinguish the random interference.

2. INTRODUCTION:
2.1 Embedded Systems:
An embedded system is a special purpose computer system that is designed to perform very small sets of designated activities. Embedded systems date back as early as the late 1960s where they used to control electromechanical telephone switches. The first recognizable embedded system was the Apollo Guidance Computer developed by Charles Draper and his team. Later they found their way into the military, medical sciences and the aerospace and automobile industries.

Today they are widely used to serve various purposes like:

• Network equipment such as firewall, router, switch, and so on.

• Consumer equipment such as MP3 players, cell phones, PDAs, digital cameras, camcorders, home entertainment systems and so on.

• Household appliances such as microwaves, washing machines, televisions and so on.

• Mission-critical systems such as satellites and flight control.

3. LITERATURE SURVEY:
With embedded systems fast expanding its reach, subject matter related to this field is available in abundance. While working on this project we have studied matter from various sources such as books, online articles and reference manuals. The knowledge gained from this activity has been of great help to us in understanding the basic concepts related to our project and has ignited further interest in this topic. “Linux for Embedded and Real time Applications”, by Doug Abbott has been of great help in providing an introduction to the process of building embedded systems in Linux. It has helped us understand the process of configuring and building the Linux kernel and installing tool chains. The ARM architecture is a confluence of many useful features that makes it better than other peer processors. Being small in size and requiring less power, they prove useful in providing an efficient performance in embedded applications.

4. OBJECTIVE OF PROJECT:
The main aim of the project is to design “Use of Ultrasonic Signal Coding and PIR Sensors to Enhance the Sensing Reliability of an Embedded Surveillance System”.

4.1 EXISTING METHOD:
In the recent applications we may have use using ultrasonic or other devices based home surveillance

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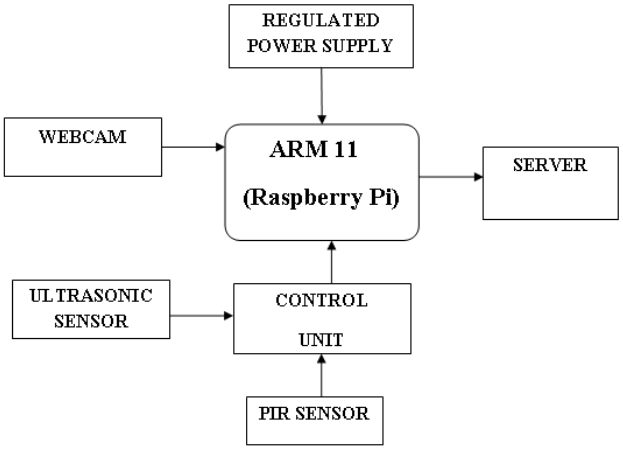
but those are not giving accurate values and that too not supporting to environmental conditions in this previous project ultrasonic range might possible to get interfere with the normal free frequencies from that the device may not give exact value so to overcome about this drawback we suppose to do one thing that will shown in our proposed system.

4.2 PROPOSED METHOD:

In this proposed system we implement an embedded surveillance system by use of ultrasonic signal coding of ultrasonic sensors with multiple pyro electric infrared sensors (PIR) to detect an intruder in a home or a storehouse. The PIR sensors are placed on the ceiling, and 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, our design reduces the miss rate from the environmental interference by using an ultrasonic coding signal. Both ultrasonic sensors and PIR sensors are managed by the majority voting mechanism (MVM).

5. BLOCK DIAGRAM:



4.1 Block Diagram:

6. RASPBERRY PI BOARD:

- **Extra Hardware You Will Need:**
- The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. It operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply.
- Since raspberry Pi board operates like PC it requires ‘mass-storage’, but a hard disk drive of the type found in a typical PC is not really in keeping with the miniature size of RPi.
- Instead we will use an SD Flash memory card normally used in digital cameras, configured in such a way to ‘look like’ a hard drive to RPi’s processor.
- RPi will ‘boot’ (load the Operating System into RAM) from this card in the same way as a PC ‘boots up’ into Windows from its hard disk.
- The following are essential to get started:
- SD card containing Linux Operating system
- USB keyboard
- TV or monitor (with HDMI, DVI, Composite or SCART input)
- Power supply (see Section 1.6 below)
- Video cable to suit the TV or monitor used

7. HARDWARE COMPMONENTS:

7.1 ULTRASONIC SENSOR:

The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front.

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One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone).

It uses the following mathematical equation:

Distance = Time x Speed of Sound divided by 2

Time = the time between when an ultrasonic wave is transmitted and when it is received

You divide this number by 2 because the sound wave has to travel to the object and back.

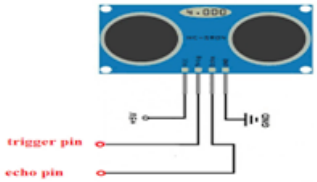
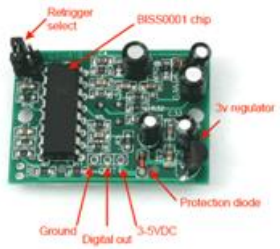


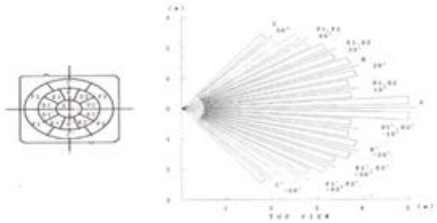
Fig7.Ultrasonic Sensor

7.2PYRO ELECTRIC SENSOR (PIR):

How does PIR sensor selectively responds to human radiated IRs? Upto what range can this sensor work? What lies inside this sensor that makes it work? This and answers to more questions in this Insight on PIR sensors. What adds more charm to this Insight is that the Panasonic 10m sensor taken is also one of the smallest PIR sensors commercially available till date.



PIR sensors are rather generic and for the most part vary only in price and sensitivity. Most of the real magic happens with the optics. This is a pretty good idea for manufacturing: the PIR sensor and circuitry is fixed and costs a few dollars. The lens costs only a few cents and can change the breadth, range, sensing pattern, very easily.



Most PIR modules have a 3-pin connection at the side or bottom. The pinout may vary between modules so triple-check the pinout! It's often silkscreened on right next to the connection (at least, ours is!) One pin will be ground, another will be signal and the final one will be power. Power is usually 3-5VDC input but may be as high as 12V. Sometimes larger modules don't have direct output and instead just operate a relay in which case there is ground, power and the two switch connections.

7.3 Web Camera:

The Raspberry Pi camera module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slow motion and other video cleverness. You can also use the libraries we bundle with the camera to create effects. If you're interested in the nitty-gritty, you'll want to know that the module has a five megapixel fixed-focus camera that supports 1080p30, 720p60 and VGA90 video modes, as well as stills capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi. The camera works with all models of Raspberry Pi 1 and 2. It can be accessed through the MMAL and V4L APIs, and there are numerous third-party libraries built for it, including the Picamera Python library.

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8. SOFTWARE TOOLS:

8.1. QT EMBEDDED FRAME WORK:

Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface (GUI) (in which cases Qt is classified as a widget toolkit), and also used for developing non-GUI programs such as command-line tools and consoles for servers.

Qt uses standard C++ but makes extensive use of a special code generator (called the Meta Object Compiler, or moc) together with several macros to enrich the language.

Qt can also be used in several other programming languages via language bindings. It runs on the major desktop platforms and some of the mobile platforms. It has extensive internationalization support. Non-GUI features include SQL database access, XML parsing; thread management, network support, and a unified cross-platform application programming interface (API) for file handling.

8.1.1 Applications of the Qt framework:

Qt is available under 3 different licensing, the GNU LGPL v 2.1, GUN GPL v.3.0, and the Qt Commercial Developer License. The Qt framework is used by other widely used softwares, such as VLC media player, Virtualbox, KDE, etc. As users today uses a variety of different platforms, it is important that developers can have a GUI front that can be run in most OS environment and it is easy to implement, and it interfaces well with the existing language they are using to build the back end of the software without or with little overhead. This is where the Qt framework comes into play.

Design:

8.1.2 Modules:

- Modules for general software development
- **QtCore** – contains core non-GUI classes, including the event loop and Qt's signal and slot mechanism, platform independent abstractions for Unicode, threads, mapped files, shared memory, regular expressions, and user and application settings
- **QtGui** – contains most GUI classes; including many table, tree and list classes based on model–view–controller design pattern; also provides sophisticated 2D canvas widget able to store thousands of items including ordinary widgets
- **QtMultimedia** – implements low-level multimedia functionality
- **QtNetwork** – contains classes for writing UDP and TCP clients and servers; implementing FTP and HTTP clients, supporting DNS lookups; network events are integrated with the event loop making it very easy to develop networked applications
- **QtOpenGL** – contains classes that enable the use of OpenGL in rendering 3D graphics
- **QtOpenVG** – a plugin that provides support for OpenVG painting
- **QtScript** – an ECMAScript-based scripting engine
- **QtScriptTools** – provides added components for applications using QtScript
- **QtSql** – contains classes that integrate with open-source and proprietary SQL databases. It includes editable data models for database tables that can be used with GUI classes. It also includes an implementation of SQLite
- **QtSvg** – contains classes for displaying the contents of SVG files. It supports the static features of SVG 1.2 Tiny
- **QtWebKit** – provides a WebKit-based layout engine as well as classes to render and interact with web content
- **QtXml** – implements SAX and DOM interfaces to Qt's XML parser
- **QtXmlPatterns** – provides support for XPath, XQuery, XSLT and XML Schema validation
- **Phonon** – multimedia API, provides simple multimedia control
- **Qt3Support** – provides classes that ease porting from Qt 3 to Qt 4

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- **Qt Declarative** module is a declarative framework for building fluid user interfaces in QML

9. PROTOCOLS:

9.1 HTTP PROTOCO (Hyper Text Transfer Protocol):

The WEB Internet (or The Web) is a massive distributed client/server information system as depicted in the following diagram.

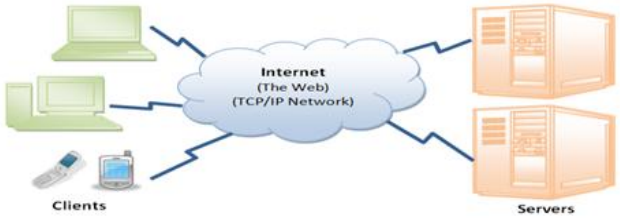

Figure-9.1: HTTP protocol

Many applications are running concurrently over the Web, such as web browsing/surfing, e-mail, file transfer, audio & video streaming, and so on. In order for proper communication to take place between the client and the server, these applications must agree on a specific application-level protocol such as HTTP, FTP, SMTP, POP, and etc.

10. WORKING PRINCIPLE/OVER ALL DESCRIPTION OF PROJECT:

In the project we found that an ultrasonic signal would be affected by environment sounds and the amplitude of the reference voltage. Those factors affect the transmission distance and the error rate of 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. In this the arrangement of our experimental environment that detect intruders in a suitable place. We place the PIR sensor on the ceiling or above the detection area. Transmitter and receiver of the ultrasonic sensor module are placed in a line direction. When an intruder enters the detection area, the ultrasonic coding signal will be blocked and the PIR sensors will detect temperature changes.

ADVANTAGES:

- Home Security applications.
- Restricted areas.
- Accuracy
- Low cost

DISADVANTAGES:

- Dependency of Internet.

11. CONCLUSION:

Our experiment shows two different types of sensors which are enhancing the overall sensing probability by using the Majority Voting Mechanism(MVM) to reduce the shortcomings of both the ultrasonic sensors and the PIR sensors. By adding an ultrasonic coding signal our design reduces the miss rate of the receiver with ultrasonic sensors by different patterns, improving the reliability of the overall system.

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