

SECURITY INTRUSION ALERT METHOD AND DEVICE TO COMMUNICATE VIA SMS

SHAILENDRA S. SIKARWAR

P.G.V. College, Jiwaji University, Gwalior, MP, India

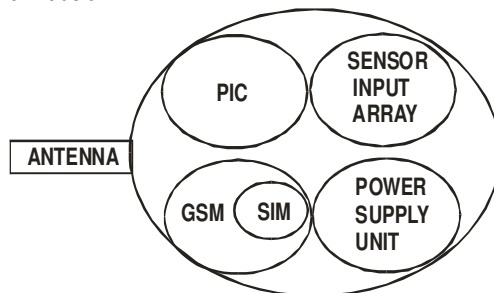
*Corresponding author. E-mail: shailendrasikarwar26@gmail.com

Abstract- The invention relates to a security device for protection of Homes, Offices, Vehicles and many other places where unauthorized foreign access is of concern. This is the invention of a device for notifying the owner when any of the above location has been accessed or broken into. The device is made up of three components : a PIC Micro-Controller, Sensors setup in a remote array depending on the application, and a GSM module.

Keywords- Remote Monitoring, Security Device, SMS, GSM, one way communication, Sensor technology

Introduction

Intrusion is the common problem in today's society, whether it is a room, vehicle or an office. In many cases these intruders act undetected by the owner until some later time. It is therefore the purpose of this invention to provide a security device which gives immediate notification to the owner at the moment the intrusion occurs. This purpose is accomplished by use of the remote sensor, which activates a Global Service Module (GSM) to send one or more SMS (Short Message Service) messages to the owner at the time of intrusion.



Description of Operation

Referring to figure -A, the design hardware prototype of the security device is shown. This is the preliminary moving prototype assembled to carry out the task. The device has a timer so that the system can reset whenever it unexpectedly stops functioning. The security device has a flexible working range of voltage; therefore it is applicable to a variety of vehicles. The system can be activated and deactivated using a remote control. The remote control is free from imitation with the integration of the frequency Hopping code, avoiding possible detection or duplication. Therefore the possibility of using an electronic learning remote controller to interfere with the activated security systems is almost impossible.

The sensor is shown as a single entity but could be composed of a number of different sensors depending on the application. The variety of sensors are given below

- Alarm Signal Sensor
- Vibration Sensor
- Electromagnetic Sensor
- Infrared Sensor
- Optical Sensor

Alarm signal sensors are used in the case of use in a motor vehicle. The device is connected to motor central lock and the key/ignition switch assembly for detection of door unlocks and engine lock intrusion. This then initiates the GSM Module to send an SMS to the owner. The vibration sensors can be used in motor vehicle or a door in the case of an office or home installation. When using the device for office or home protection, vibration sensors would be attached to the door and an alert sent through the GSM Module to the owner when the door is vibrated.

It is important to note, however, that in utilizing the device for an office or house hold, security doors or windows may not vibrate sufficiently for detection. Hence if the door or windows is opened slowly, the trigger to send the SMS would be initiated by either an electromagnetic, infrared or optical sensors. In the case of electromagnetic sensors the SMS would be initiated by a +12 V supply. This will be attached to the door and when the door is opened the +12 V will initiate a current to the security device, initiating the GSM Module to send one or more SMS to the owner. Similarly, the infrared and optical sensors initiate a current to the GSM Module when the optical or infrared reflection is cut or disturbed when the door or

windows is opened. any signal send from the remote sensors are processed by the PIC Micro controller.

Detail of Components

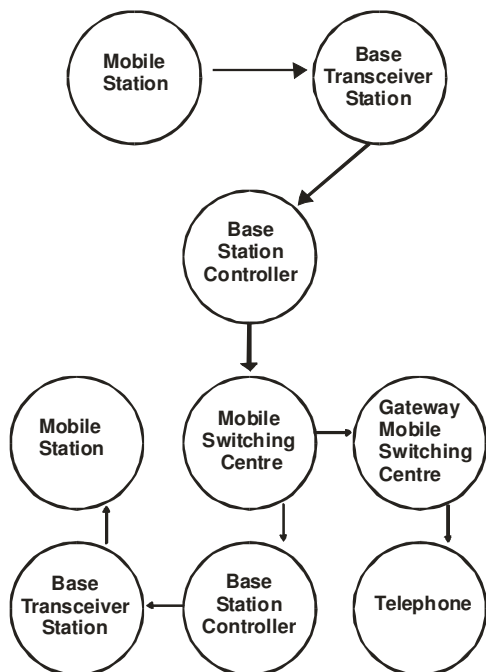
The whole processing of the device is done by PIC Micro controller. The PIC Micro controller is a small but powerful Micro controller from Micro chip.

The PIC Micro controller can handle 'C' Language application of approximately 50,000 C statements or 1 MB. Dynamic C is an integrated development system for writing embedded software and is the system used in this device. C Language system integrates the following functions in one program Editing, Compiling, Linking, Loading and Debugging.

The PIC Micro controller is connected to an actuator. The actuator work as a set or relays. In order to activate the GSM Module a relay activated from the PIC Micro controller.

GSM

The GSM Module is the only component of the device which is activated through the actuator. The GSM Module is essentially a mobile phone. It is used in this device to send SMS to the owner when a sensor is activated. The SMS service is provided by the GSM (Global System for Mobile communication). SMS sent from GSM unit are called Mobile Originated while message received by GSM unit are called mobile terminated. In figure-B The GSM network given.



The Mobile Station (MS) is the GSM Module inside the security device. The Base Transceiver Station (BTS) is the part of the network that receives and sends data from the Mobile Station (MS). When a MS crosses the boundary to leave the range of a given BTS, It flawlessly latches on to the next adjoining BTS without the end user ever realising it. The coverage of MS is

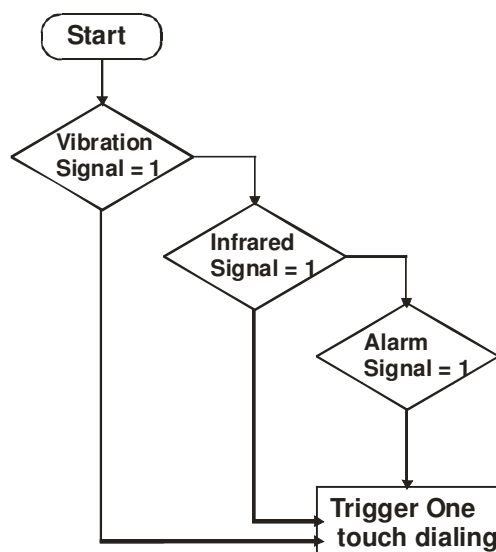
dependent on transmission of the BTS. The Base Station Controller (BSC) is a digital switching platform that connects a Mobile Switching Centre (MSC) and the BTS. It also serves to transfer signal information to and from Mobile Station (MS) and manage handover when a Mobile Station (MS) leave a cell and enter the next. The Mobile Switching Centre (MSC) deals with the calls it receives from its subscriber from its network and serves to route the call to its destination whether that is on the same network or on the network of another provider. Signal Transfer Point (STP) switch relay message between network switches and the database. They function to route Signaling System 7 (SS7) message to the correct outgoing signaling link base on the message field address. The Gateway Mobile Switching Centre (GMSC) connects a Mobile Network to a Public Switched Telephone Network (PSTN) which is the backbone of non-cellular telecommunication. The term Short Message Entity (SME) refers to any entity which may send and receive short messages. It may be located in the fixed network, a Mobile or even SMSC. The Home Location Register (HLR) acts as a database storing information on all permanent subscribers. The availability of the SMS service over different Mobile Networks depends on roaming agreement of the network, It is network operator's responsibility to inform the user.

The Mobile Antenna of this device operate on one or more frequency bands. The goal is to make it resonant in the middle of each band. The term that is important here is band width. The working of Antenna is measured by Voltage Standing Wave Ratio (VSWR). The speed and reliability in the delivery of SMS depend on many factors. The role of the network provider and supporting infrastructure very much influences the performance of message delivery. When an SMS sent by a user, the following steps occur -

1. Message is delivered to the Mobile Switching Centre.
2. Mobile Switching Centre checks with the Visitor Location Register for permission.
3. Visitor Location Register returns to Mobile Switching Centre with permission.
4. Mobile Switching Centre sends mobile user message to the SMS centre.
5. SMS centre forwards this to the Short Message Entity.
6. SMS centre returns an acknowledgement to the Mobile Switching Centre.
7. Mobile Switching Centre forward acknowledgement to the user.

The main point of congestion in the SS7 network when an excessive amount of data is receive occur about the Signal Transfer Point and Home Location Register. The Signal Transfer Point handles SMS traffic and call setup while the data stored in the HLR is retrieved almost each time any service on the network is accessed. Overloading of these points may

cause delay or failure. The performance of the SMS are dependent on capabilities of the network used and also the physical distance the message has to travel. The actual time taken to travel from one point to another is not so much the issue, However the further the distance between the point of origin and point of delivery, The more networks the data packets have to traverse. To minimize the impact of the possibility of lost or delayed warnings, the system is designed to take advantage of the message delivery confirmation service offered by most mobile network service providers. The system awaits the arrival of an acknowledgement receipt from the host network that is generated by the SMSC upon successful delivery of the message to the SME. The method also includes a timing device that activates upon the delivery of a warning SMS message. If no response is received from the message delivery confirmation service within a set time, the device may resend the message and/or execute default action that is programmed to take place should the sending of the message fail. The system should also be programmed to deliver the initial warning to several users to maximize chances of the successful receipt of warning.



The Control Program

When sufficient vibration is detected, a digital signal of 5 Volts corresponding to a logic value of 1 is generated. Similarly, an alarm of logic value of 1 is also received by the micro-controller if the door switch is open. If using the device for office security application, a pair of infrared receiver and transmitter would be used and generating a 12V input to the micro-controller if the infrared light is blocked by an opening door.

The configuration of the phone number that the security device would call can be done by a mobile phone having the "One-Touch Dialing" function and follow the steps below.

1. Place the SIM card into the mobile phone.
2. Choose "Phone Book"
3. Choose "Personal Numbers"
4. Choose "Add Entry"
5. Choose "Add to SIM card memory"
6. Enter the phone number
7. Choose "Phone Book"
8. Choose "One-Touch Dial Setting"
9. Choose "To SIM Card Memory"
10. Take the SIM Card out and place it into the device.

Repeat 2-5 to enter other two numbers.

The programming of the device enables it to send messages to several users at once to maximize the chances of reaching at least one user should the message fail to reach the primary intended recipient. The system then awaits a confirmation of delivery from the messages sent and resends the messages should it fail to receive a confirmation of a set reasonable time.

Application Areas

This unit was developed as a security device that is capable of notifying a person or several persons using a SMS message initiated by one touch dialing. The device may be used in stationary applications such as home or commercial security to monitor entrances. Using vibration switches to detect the opening of a door or window, it will effectively alert the person or persons in charge should an intrusion occur.

Mobile applications are also possible with the use of a 12V battery to power the device. Vehicles such as cars, boats or any other motor vehicle may be equipped with this device. The micro-controller of the unit may also be connected to the oil pump or an engine disabling unit on the vehicle. Upon the detection of a theft, the unit may then disable the vehicle until it receives a SMS to unlock the vehicle again.

Conclusion

This device provides a means for being able to securely monitor a stationary or mobile plant by use of sensors integrated with a micro-controller and a GSM unit. SMS provides an economical and convenient way to alert users of a possible intrusion into the property. The use of the existing GSM infrastructure provides a mature and sophisticated platform to build upon and also removes the cost of establishing a dedicated communication channel. The use of mobile handsets as a client device to receive warning messages on implies that the user will not have to carry an additional piece of equipment as most people already have a mobile phone with them most of the time.

References

- [1] Gerry christensen, Robert Duncan, Paul G. Florack, wireless intelligent networking Artech house publishers. (November 2000)
- [2] SMS and MMS inter working in mobile networks by Arnaud henry, Artech house publishers.
- [3] Amateur Radio Antenna Magazine Web Article, James G. Lee, "The effects of VSWR on Transmitted Power".
<http://www.antennex.com/preview/vswr.htm>
- [4] Schiller J., Mobile Communications, Second Edition, Addison-Wesley, 2003.
- [5] Intel Telecom Solutions - SS7 Glossary of Terms.
<http://www.intel.com/network/csp/solutions/ngn/7643gls.htm>
- [6] <http://www.iec.org>
- [7] <http://www.mobilein.com/SS7.htm>
- [8] <http://www.electronics-manufacturers.com/products/wireless-communication/mobile-switching-canter>
- [9] http://www.mpirical.com/companion/mpirical_companion.htm