Security and alert system for prohibited facilities

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Abstract:With exponential growth in technology and course of change in warfare, research facilities and confidential areas under government are in direct target. Hence improving and updating security system based on technology is essential. Many security systems exist, but they have some challenging issues like: delay non-web enabled and difficult to handle during transfer of alerts. Hence, considering the above mentioned facts, in this paper, we have proposed an advanced IoT based Security Alert System, when nobody is available there. This system is fully automated, utilizes sensors such as ultrasonic & pyro-electric Infrared (PIR) and uses the technique of echolocation which is based on ultrasonic wave radar, RF communication & Infrared technology and controlled by arduino to sms alert using GSM module & alarm system.

Following are the important components used in this project: - 1. Arduino 2.PIR sensor 3.GSM module 5.Ultrasonic sensor etc.

Key Words: Security, System, Advance technology, Alarm alert.

1. INTRODUCTION

Today our major concern is the security of the Government facilities, Bank vaults, national treasury, and Advanced Research facilities. These are guided by humans. These people encounter threat to their lives due to infiltrations, cross terrorism, heist etc. Due to these malicious elements, they make supreme sacrifice. If we could have save even half of life, we would have an even mettlesome force. These may not have been possible in past warm times, but today the scenarios are changing. We are advancing to a technological more dexterous globe. All facilities where fortunes in any form are deposited or placed like museums, banks and research facilities which are comparatively more difficult to guard after sunset and where it is more likely for humans to risk their lives and theft attempts that could result in major loss of property of individual or company can now be stopped because of the IOT based technology. If anything, which arises suspicious occurs then, execution of predetermined tasks take place. Intrusion detection system IDS are integral part of Security system. They are designed to operate in hostile environment, to monitor, detect and track, the intruders (moving targets), around the clock. As it is really tiring for Humans to keep a track 24/7 through video streaming, intrusion detection which can generate automatic alerts can prove to be of great use. This system is fully automated which needs only one or two persons for maintenance purpose and can be monitored remotely.

This paper will basically concentrate on the human interfacing & knowledge towards our project system i.e. the detection & alerting the authority to take necessary action to the problems at the security. This system has ultrasonic sensors which are responsible for the detection of intrusion. As they are mounted over the section pillars. The sensors continuously rotate back & forth in the range of certain degrees (30°-160°) & show the intrusion over the radar with its location. Another set of sensors which sense the intrusion & show over the LEDs & activation of the alarm. As the sensors detect the intrusion RF transmitter sends signal to the receiver & sending an intrusion alert.

2. RESEARCH METHODOLOGY

2.1 Surveying Existing System

Subsequent to experiencing a portion of the project with respect to usage utilizing ultrasonic sensors and ARDUINO, it was found that this idea is searched a lot and is a mainstream idea which is still in advance. The advances utilized were not just productive and solid yet in addition financially achievable. Not only this, here other very useful applications of ultrasonic sensors were observed too.

2.2 Main body

This project discusses about a monitoring system which is designed measure to speed of waves and height of river through ultra-sonic sensor using microcontroller (Arduino). On the off chance that the waterway can't oblige the volume of water, then all the water will submerge with land and this phenomenon is called as flood or surge. We can overcome this flood problem by earlier identification in height of water and observing speed. If we identify problem earlier we can overcome this problem before it become crisis. By testing the system i.e. simple water level, it was observed that ultra-sonic have accuracy of 96.6%. But when it is implemented in the rivers there are many errors because of different type of water levels due to heavy waves and speed of water and also due to floating of heavy objects.

2.3 Objective

Unlike Previous testing results, author directed this analysis on tracking of speed of water improvement or modification and level of water in flooding. The test was completed when the Arduino used as controller of application. For more research, information of depth level and speed of water of this system will be sent to database server website to be checked regularly.

2.4 References

- Arjun et al present a survey of wireless sensor networks for Border Surveillance and Intruder Detection. The aim is to devise a multi-sensing system which is developed by combining different techniques of surveillance and intruder detection, for varying

border scenarios such as, flat surface movement or water-body movement. Different sensors for human intruder detection such as, geophone, hydrophone, infrared and surveillance cameras are discussed

- Jisha et al propose a system for intruder detection which employs an object detection technique using Wireless sensor networks. PIR (Passive infrared) sensors are used which are 10 further connected to MICAz sensor node. The proposed system is expected to detect and track the intruder and report its speed and direction of movement to a central base station for further processing.
- Singh and Khushwaha propose a mechanism for smart border surveillance and automatic combat. It makes use of features extracted from optical flow information of the scene. Once the automatic detection of intruder takes place, suitable action is taken depending upon the relative position of the intruder with respect to the border fence. If the intruder happens to be behind the fence, mere tracking is followed. If the intruder is above the fence and trying to cross it, an alarm is raised. Auto-firing can be activated when the intruder has actually crossed the fence.
- Jin et al present a method for detecting and classifying a target by using seismic and PIR sensors. The target can be classified into one of the three classes of vehicle, animal or human. A wavelet method called symbolic dynamic filtering (SDF) is used for feature extraction from the sensor signals.
- Zhang and Liang Ye et al present a method to detect moving target via using the technique of background subtraction and shadow removal. The method is applied for RGB color space. Metrically trimmed mean and mean absolute deviation are the estimators used for background subtraction. The Chromacity difference and brightness difference are the estimators for shadow removal.

3. PROPOSED SYSTEM

The objective of the system is to build an implanted intruder identification framework in Security by utilizing IR sensor using IOT. There are numerous IR sensors being used today however the sensor that is utilized will identify the Infrared beams that are transmitted from the human body. It is surveillance system for the places where human deployment is not possible or strictly prohibited due to geographical, climatic or some other reasons. Multiple pyro-electric infrared sensors (PIR) are disguisedly installed on the border fencing which monitor the border area for any intrusion. In order to testify the working of this system, after its designing, construction and programming we placed few objects in front of the ultrasonic sensor. As the motor started to rotate, our monitor started to display the output through processing IDE. Hence, when the sensor crossed over the object it showed a red segment with the distance and angle where the object is paced. The first object was placed at the distance of 29.5cm measured through a ruler and the system measured the distance at 31cm.While the second object was placed at a distance of 15 cm and the system measured it as 16cm. Hence the calculated efficiency turned out to be 95%.

3.1 Functional Block Diagram

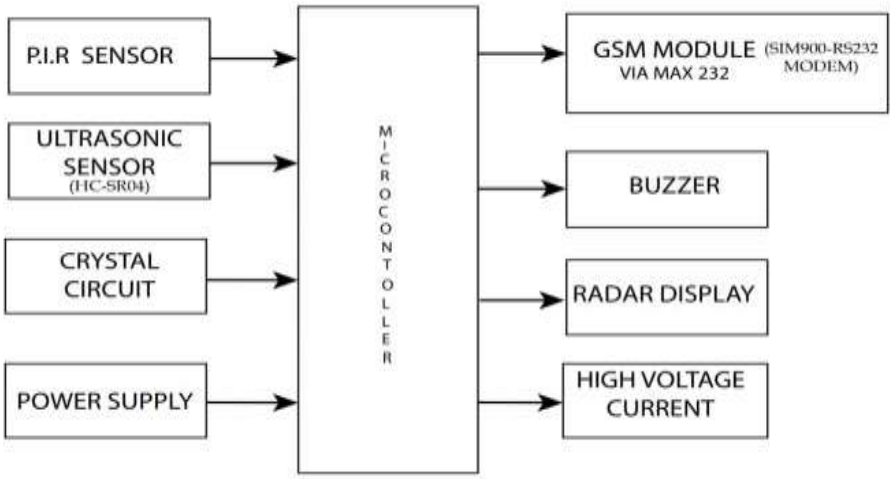


fig- 1: Block Diagram

All the components will be interfaced with microcontroller on an Ardiuno board. Ultra sonic sensor, P.I.R sensor at input of the system with crystal circuit and power supply providing necessary power and oscillation. Alarming system will be comprised of GSM module to send alert, buzzer will provide audible tone to indicate detection and with radar display the position of incident will be monitored. A high voltage current will flow through a wire to terminate possible threats till authorities arrive.

3.2 Microcontroller

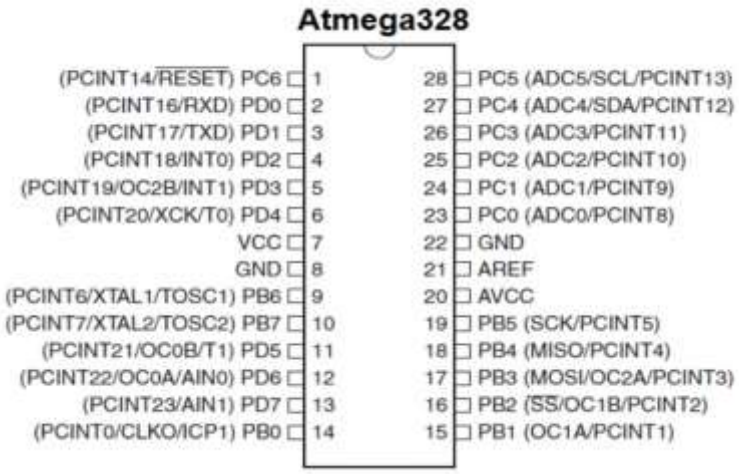


fig 2: Pin Configuration of AT-mega 328

Here we have used Arduino Uno ATMEGA 328 microcontroller which is open source to implement embedded based system. Microcontroller will sends 10µ second pulse width to ultrasonic transmitter and thus echo back signal receives by TX module of ultrasonic. After this is done receive pulse width is calculated by micro controller. Here we have used servo motor on which 6 ultrasonic module is mounted to receive 180 degree signal. Microcontroller and MATLAB are communicated through UART protocol with the baud rate of 9600. This protocol works on ASCII value. So this is calculated distance transmit from microcontroller to MATLAB COM PORT. Accordingly, sensing different obstacle which are around 180 degree and 250 cm range, visible as a red spot on MATLAB GUI. The Atmega328 chip has an analog-to-digital converter (ADC) inside of it. This must be or else the Atmega328 would not be capable of interpreting analog signals. Because there is an ADC, the chip can interpret analog input, which is why the chip has 6 pins for analog input. The ADC has 3 13 pins set aside for it to function- AVCC, AREF, and GND. AVCC is the power supply, positive voltage, that for the ADC. The ADC needs its own power supply in order to work. GND is the power supply ground. AREF is the reference voltage that the ADC uses to convert an analog signal to its corresponding digital value. Analog voltages higher than the reference voltage will be assigned to a digital value of 1, while analog voltages below the reference voltage will be assigned the digital value of 0. Since the ADC for the Atmega328 is a 10-bit ADC, meaning it produces a 10- bit digital value, it converts an analog signal to its digital value, with the AREF value being a reference for which digital values are high or low.

3.3 P.I.R sensor

fig 3 : P.I.R sensor

Pyro-electric (Passive) Infra-Red (PIR) Sensors,(PIR)sensors allow sensing thermal radiations emitted by human body, motion, infrared radiations. These pyroelectric sensors detect levels of P.I.R sensor:7 infrared radiation. These are mostly used to detect human crossing the range of the sensor. They are small, economic, consumes very low-power, easy to use and robust. We are aware that everything emits some low level radiation. The hotter elements like human body emit higher radiations. A P.I.R based sensor is basically used to detect movement of animals, people, or other objects. We have used this sensor to detect intrusion across the border. This sensor will be kept within the border. While this sensor, will detect human intrusions monitoring throughout the border, as soon as some suspicious object is detected it will inform the control room while releasing signals and by sending a message to the control room.

3.4 Ultrasonic sensor

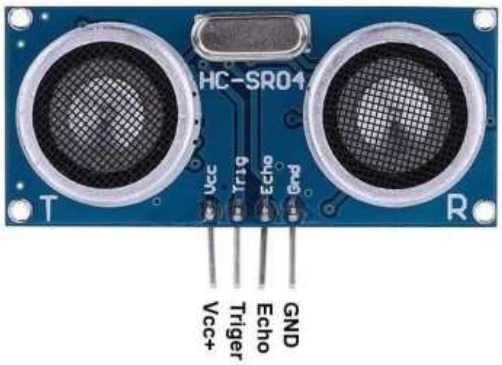


fig 4 : Ultrasonic Sensor

The ultrasonic sensor we will use are HC-SR04. This sensor will rotating back and forth to a specific degree. It works on the principle of RADAR and will be focused mainly on premises which is supposed to be empty entirely. As the sensors detect the intrusion RF transmitter sends signal to the receiver. RADAR display will assist monitoring and reveal exact position of intrusion as mentioned above this complex assembly will activate other program according to protocol including sms alert to control room and high voltage current to neutralize potential threat. Here are concerning specification about ultrasonic sensor we will be using.

- Operating Voltage DC 5V
- Operating Current 15mA
- Operating Frequency 40KHz
- Max Range 4m
- Min Range 2cm
- Ranging Accuracy 3mm
- Measuring Angle 15 degree
- Trigger Input Signal 10µS TTL pulse

3.5 GSM module

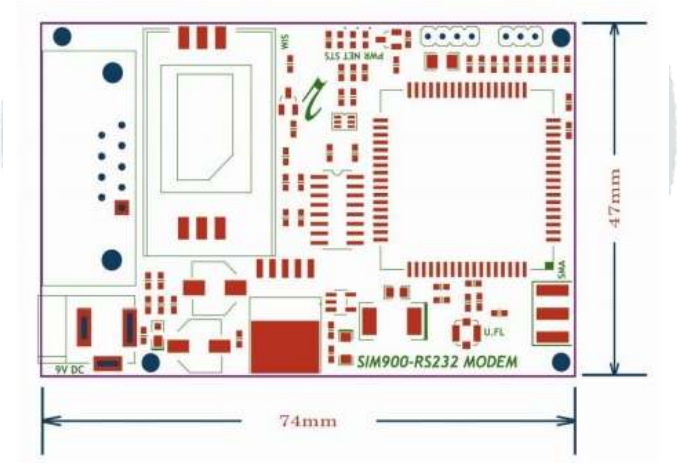
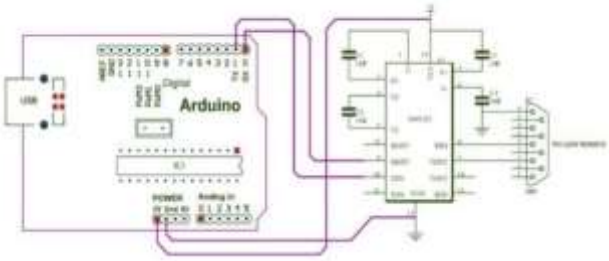


fig 5 : GSM modem

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through Radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate, controlling machines using gsm mobile sms services. The microcontroller will be interfaced with GSM Modem in mobile phone via MAX232 level convertor. SIM900-RS232 MODEM.

4. IMPLEMENTATION PLAN

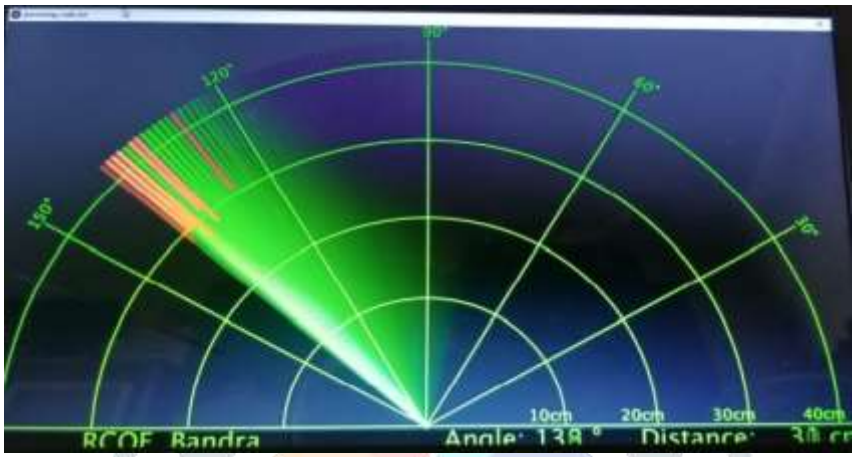
The basic objective of our design is to ascertain the distance position and speed of the obstacle set at some distance from the sensor. Ultrasonic sensor sends the ultrasonic wave in various ways by rotating with help of servo motors. This wave goes in air and gets reflected back subsequent to striking some object. This wave is again detected by the sensor and its qualities is analyzed and output is shown in screen indicating parameters, for example, distance and position of object. Arduino IDE is utilized to compose code and transfer coding in Arduino and causes us to detect position or angle of servo motor and it is communicated through the serial port alongside the covered distance of the nearest object in its way. Output of all of this working is shown in the software called processing, it will display the input/output and the range of the object. Implementations of the sensors are done in such a way that ultra-sonic sensor is attached on top of the servo motor because it have to detect the object and its distance. Arduino (micro-controller) will control the ultra-sonic sensor and servo motor and also powered will be given to both of them through micro-controller. With P.I.R sensor combined this implementation will result in more practical application.



Integrating Ardiuno with GSM modem

5. RESULT

We have received well expected result with full satisfaction output. This security system is for alarming purpose and will reduce manpower



6. CONCLUSION

Our goal here is to deliver a security system which will not just be efficient but cost effective too. Increasing technological based system will eliminate the threat of misconduct by security personnel. Even though many facilities are guarded by humans it costs much higher if it is implemented for 24x7. System will reduce this cost to half if not totally zero. System only needs to be installed once and will probably need maintenance service as required. Further update to system is possible and result in more powerful, efficient and reliable for future applications.