Security Management for Controlling Theft Using Arduino Uno

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Abstract: Nowadays theft has become a big threat to people and their property. Securing and monitoring have become the main objective for controlling theft. Several technologies have been developed to control theft. The existing technologies can control only theft but not the culprits who steal the properties. The proposed system is used to provide security to control theft and giving alert to the owner when there is a break-in, using Bluetooth. The advanced locking system technology is implemented along with the traditional locking system. There are three techniques to prevent theft. First, IR sensor which is placed in front and rear side of the house. This IR sensor senses the object passes near it. Then the passcode lock system is used to detect the passcode is correct or not. If the entered passcode is incorrect the Arduino UNO controller will be activated. The third is using indicators, it consists of two switches. The two switches are considered as the main power line and fuse box which is placed at the house. When these two switches are on-off mode it is considered as a power cut. But in case only when the fuse box switch is off the controller activates automatically and the alert is sent to the owner through the Bluetooth application which is installed in the mobile phone. If there is any interrupt in any of these techniques, the message will be sent to the owner and police station. Total system shutdown option is activated using this application. Then the security system starts monitoring the house. This shutdown option can be made on whenever necessary. This may reduce the power consumption. Such security system gives service at low cost compared to the cost of the available security systems.

Keywords: Theft, Arduino UNO, Android application, Bluetooth.

I. INTRODUCTION

In recent years theft has been seriously increased and there is no safety for people and their property. Security plays a vital role in monitoring a building in the absence o presence of people. Theft refers to the crime involving the taking of a person's property without their permission. Most of the theft happens by door break-ins. 75% of theft occurs during night time. The thief may take off the fuse, so they cannot be easily identified and if they caught, they can be easily escaped. Bluetooth is mainly used to provide the message and the application which is used to conserve the power when the system is not in use. This will also give alert to the owner through a mobile phone. In this industrialized world, stealing valuable and prosperous things has become a serious concern for police and common people. Theft may mentally affect the people because their hard work for years has been lost in a

Single day. List of crimes which are increased in recent years is given in the below Table I.
TABLE I. CRIME RATE STATISTICS

Cases	2015	2016
Burglary	449	2,132
Vehicle theft	2,893	4,447
Robbery	206	901

II.LITERATURE REVIEW

Even though many technologies have been developed to prevent and stop theft, still many thefts occur despite these techniques. Theft mainly occurs on the carelessness of the people. So a proper security system is to be developed. In some cases, people inside the house will be attacked by the intruders. All home security systems work on the basic principle of securing entry points like doors and windows. Despite the size of the house or the number of doors and windows or inner rooms a house owner needs to protect, the only difference is in the number of security components employed throughout the house and monitored.

Theft mainly occurs on the carelessness of the people. In such case, one should ensure that their house doors and windows are closed and locked. A detailed inventory must be kept of the valuable possessions.

A. Existing Methods
The existing method uses various technologies for controlling theft and providing security for houses. Technologies such as GSM, ZigBee, WSN are used. Let us consider the different existing systems as follows.

- Home security is becoming necessary nowadays as the possibilities of intrusion are increasing day by day. A traditional home security system gives the signals in term of alarm. The Global System for Mobile Communications (GSM) based security systems provides enhanced security whenever a signal from the sensor occurs and the message is sent to the given number. This also provides home automation. Conventional security systems keep owners and their property safe from the intruders by giving an indication.

- Home security plays an important role to protect valuable things at home from intruders. IR sensor is placed to detect the person. On detecting a person passcode will be opened to enter the secret code. By entering the correct passcode based on owner's reply door will be opened. Whereas on wrong passcode buzzer alert is given. The communication is carried out by GSM.[12]

- The evolution of fingerprinting technology gives security to various places. Two stage verification process are used for smart homes, they are by using device fingerprints and login credentials. It provides geographical location while computing fingerprint. This device identification can identify about 97.93% of the devices. [3]

- Microcontroller based automated home security system is password protected with a LED-based resistive screen which operates by detecting a difference in light intensity captured by photodiode which is emitted by surrounding red LEDs and reflected. Fire alarm system uses temperature sensor which senses a sudden increase in temperature and activates the alarm.

A. Home Security
Security has become an important issue. Home security is becoming a necessity as the intrusions are increasing. A traditional home security system gives the signals in the form of alarm. Monitoring systems are common in many areas in this industrialized world. Home security is the best deterrent. It should provide security and safety features for home by the alarm. These alarms can be the residents from natural and human dangers.

III. PROPOSED METHOD

The proposed method provides a safe and secure environment designed by a microcontroller which controls theft. A security system is designed to control theft at home, when there is a break-in or when they entered passcode is incorrect. In the case of any break-in, the Bluetooth connected to the controller sends a message to both the owner of the house and to the police station without any intimation to the thief. In addition to this using android, we can make the home under the total shutdown so that at any critical situation Bluetooth sends a message. Therefore people's assets and properties are saved easily from theft and the thief can be easily caught. So it will be a big warning to all the thieves who are trying to steal assets from home. By doing so we can control theft and make a safe and developed country all over the world. Thus, this project protects the theft and saves the properties from intruders.

The problem with the theft and how it occurs are identified. A microcontroller based security system is designed; by this method, the house is fully protected. The conceptual block diagram shows the concept of the proposed method, this is shown in Figure 1.
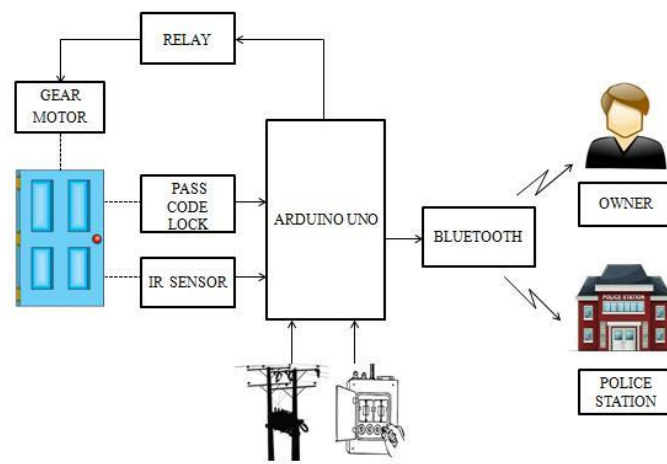
Fig. 1. Block Diagram of Proposed System

A. Working on the Design

The proposed system is placed at the door where the house is to be protected. The IR sensor is placed in front and back side of the house. When the sensor detects an object, information is given to the microcontroller, and then a passcode lock system is also placed at the door. The microcontroller is programmed to monitor the break-ins or wrong passcode at the door. When there occurs any disturbance or the entered passcode is wrong, Bluetooth will be activated. Using Android the home security can be activated when there is total shutdown in the Bluetooth application. The Bluetooth sends a message to both the owner of the house and to the police station. The indicator interfaced with the controller is to know that, the power off is in the main line or in the fuse box.

B. Sensor and Passcode Lock System

Two IR sensors and a passcode lock are placed at the door which is used to protect the house from theft. Either the passcode or ordinary lock is used or both the passcode lock and the traditional lock system. The IR sensor detects an object near it and sends information to the controller.

Whereas the passcode lock system is connected to the microcontroller. The passcode lock is always enabled to enter the passcode. In this project, a 4pin lock is set for simplicity. The buttons are pressed according to the pattern arranged. When the entered passcode is correct the door will be opened, on wrong passcode message will be sent to the owner and police station.

The mechanical connections include IR sensor, passcode lock, and a gear motor. The gear motor which is connected to the relay runs only when the controller gives intimation that the entered passcode is correct. When the instruction is given by the controller the door will be opened with the help of a gear motor. If the passcode is incorrect no connection is set then the door will not be opened.

C. Indicator

An indicator which used here is a switch. There are two switches used here are from line 1 and line 2. One line is from the main supply line to the house and another line is from the fuse box which is fixed in the house. Whenever the both switch is made off no beep sound is heard from the phone which is placed near the Bluetooth. If one line is off a beep sound from the phone is heard. This is made when the thief tries to off the switch at the fuse box. So that theft could easily happen in the dark. By the beep sound, the owner will be intimated that someone tries to illegally enter the house.

D. Controller and Output Unit

The microcontroller is the heart of the system. Arduino UNO is used. The controller continuously monitors the position of the door. If there is any disturbance, occurs at the door or the entered passcode is wrong or the fuse indicator is alone off or the sensor senses the object, the microcontroller immediately activates the Bluetooth. Output unit, this performs the important functioning of the security system. It sends a message to mobile devices via Bluetooth.

Bluetooth alert system is designed to detect intrusion from the unauthorized entry into a building area. Security alerts are used in residential, commercial, industrial and military purpose for protection against theft or property damage, as well as personal protection against intruders.

When an unauthorized person enters into a house using the wrong authentication, Bluetooth automatically generated and the security alert is sent to the police officer and owner of the house. So that within a fraction of time the properties can be protected against unauthorized persons.

IV. HARDWARE DESCRIPTION

A. Arduino UNO

The Arduino Uno is a microcontroller board, based on the ATmega328. It has 14 digital input/output pins which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. It can operate at a wide range of power-supply voltages, from 1.8V to 5.5V. Thus it can be used for battery-powered applications. ATmega328 can operate up to 20MHz frequency.

Arduino UNO board contains various models; here Arduino UNO R3 model is used. The front view of Arduino board is shown in figure 2.

Fig. 2. Arduino UNO R3 Model Board

The AVR core combines a rich instruction set with 32 general purpose working registers. All the registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The technical specification of Arduino UNO board is shown in table II.

TABLE II. TECHNICAL SPECIFICATION OF ARDUINO UNO BOARD

Parameters	Specification
Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage(recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by boot loader
SRAM	2 KB
EEPROM	1KB
Clock Speed	16 MHz

B. IR Sensor

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. A non-contact infrared sensor is a device that measures the energy radiated from an object, without touching it. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. A simple IR transmitter and receiver is shown in figure 3.
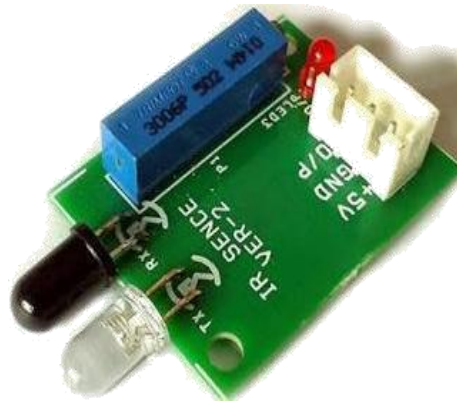

Fig. 3. IR Sensor

Owner's convenience. Whenever the mentioned interrupt occurs this will intimate the owner. The Blue Act design is given in the Fig. 4.

The IR transmitter part consists of an Infrared light-emitting diode that can capable of sending modulated data within the infrared band. The receiver module requires the incoming data to be modulated at a particular frequency and would ignore any other IR signals. The technical specification of IR Sensor is given in the below Table III.

TABLE III. TECHNICAL SPECIFICATION OF IR SENSOR

Parameters	Specification
Transmitter frequency	38.7 kHz
Receiver frequency	32kHz to 42 kHz
Maximum current	1A
Maximum voltage	1.8V
Lenses length	15mm

V. SOFTWARE DESCRIPTION

A. Installing Arduino IDE

The Arduino IDE runs on all the latest versions of Microsoft Windows. To download the newest version of the IDE from the download page access the Arduino website www.arduino.cc. In the Arduino IDE, new versions of the windows IDE are available as an installer that we can download and run, instead of downloading a ZIP file. Install drivers for the Arduino USB port and this process depends on the Arduino board. After the drivers have been installed, start the executable from the archive's main directory by double clicking on it.

B. Arduino UNO Programming

The Arduino board can be programmed using the Arduino IDE software. The editorial window will open when the Arduino IDE software is opened. This window consists of two important parts, one is setup part and the second is the main loop. The Arduino ports such as input, output, and constant functions are defined in setup part and looping conditions are coded in the main loop. Then the program is compiled for errors and warnings. On successful debugging, the code is embedded to the controller through the upload option.

C. Bluetooth Application

The Bluetooth application use here is 'Blue Act'. This is used to send message. By using this application power consumption can be reduced by simply activating the total shutdown option. The message can be typed according to the

Fig. 4. Security using Blue Act

CONCLUSION

In this proposed paper, a theft monitoring embedded security system is designed using Arduino UNO to detect theft at home from intruders. Movement of any object near the sensor is sensed and alert is given when the system is under the total shutdown. In addition passcode lock system and indicator are used as for further security. Hence the status of the house can be monitored and leads to effective security management. The system is more effective and the cast is than the previous one.

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