Assorted Security System to Defend Intrusion

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In this 21st century, technology has become a relentless process and they tend to improve the quality of any product. The World is experiencing a vast implementation of security systems. When it comes about a system, it is essential that the proposed device should be practical, impeccable, low cost and much prominent is that, it should be scalable to less modification. This paper deals with the design and implementation of security system that helps in taking fast preventive steps towards an attempt to steal an object. The principle of this paper is to develop a security system that tries to prevent the theft of an object using the current technology available in the market and furthermore gives the security against the intruder, in absence of its resident. This system consists of a security device to protect the valuable items from intruder irrespective of the things placed in the vault. Devices such as Arduino Mega 2560, LCD, Wireless Camera, Fingerprint Sensor, Vibration Sensor, Bluetooth Module, RFID Reader, DIP Switch, Buzzer, GSM Module, IR Object Detection Sensor are integrated in this system to demonstrate the feasibility and effectiveness of the system. Surveillance camera is used to provide the video footage of the entire room inside the security premises. Different layers of security systems ensures the high level of protection and in case of security breach detection, the proposed device is capable of locking the intruder inside the security premises. The developed system can be employed wherever high security is required. It allows only the authorized person to access the item and provides high security. Hence it gives comfortable and secured feel to the user.

Keyword: Arduino Mega 2560, Bluetooth Module, Embedded System, GSM, Sensors.

I.INTRODUCTION

Embedded system has faced lots of development in the past decades. The applications based on embedded system are used everywhere because of the high performance and short development period. Security systems are usually made for automating, improving security, safety and comfort. The implementation of security systems is very much essential in today's world, as there is a growing demand for security and protection from various kinds of threats and vulnerabilities. Nowadays, to reduce the high rate of crime around the World, there is crucial need of advanced security system at home, industry, organizations etc. Our work is aimed to provide a flexible and efficient way for both the design and implementation of a security system. It can provide both security and safety to private sectors such as houses, work places or other rooms that people need to protect. The system's implementation cost is concurrently low enough, considering the used resources in the project. It is

designed in such a way that, every group of users can handle them efficiently. Our work is based on an embedded system, where Arduino Mega 2560 microcontroller is used for developing the complete security device. This microcontroller will carry out the functions of these security devices in a sequential way. Due to the ease of use and low cost, our system provides a good amount of security for the user, as well as it is easy to operate and install. Several security devices such as Wireless Camera, Fingerprint Sensor, Bluetooth Module, RFID Reader, DIP Switch are included in this design. The vault has to be placed inside the room. It is protected with two stages of security, which is done using RFID Reader and DIP switch. Whereas, the room's door is protected with another two stages of security, and it is made using fingerprint and Bluetooth module. In order to enter the room, the user has to clear the two stages of securities on the door. Next, to access the objects placed inside the vault, the user has to clear the two stages of securities on the vault. Wireless Surveillance Camera is used to provide the entire video footage to the user that takes place inside the security room. The system also comprises of Vibration Sensor, GSM Module, Relay, Buzzer, IR Sensor. IR Sensor detects the presence of object and sends the information to the user when the object is accessed. Suppose, if the intruder fails to clear any stages of security on the door and if he tries to break the door, Vibration sensor will detect the impact on the door and notifies the user about the security breach with the help of GSM module. The SMS is sent to the registered mobile number stored by the user at the time of installation. Then the Buzzer creates loud noise and draws attention to the room. Electronic door is installed at the main entrance and it is controlled with the help of relay. When the intruder tries to break the door, relay automatically closes the main door at the entrance and thus the intruder is locked inside the security premises.
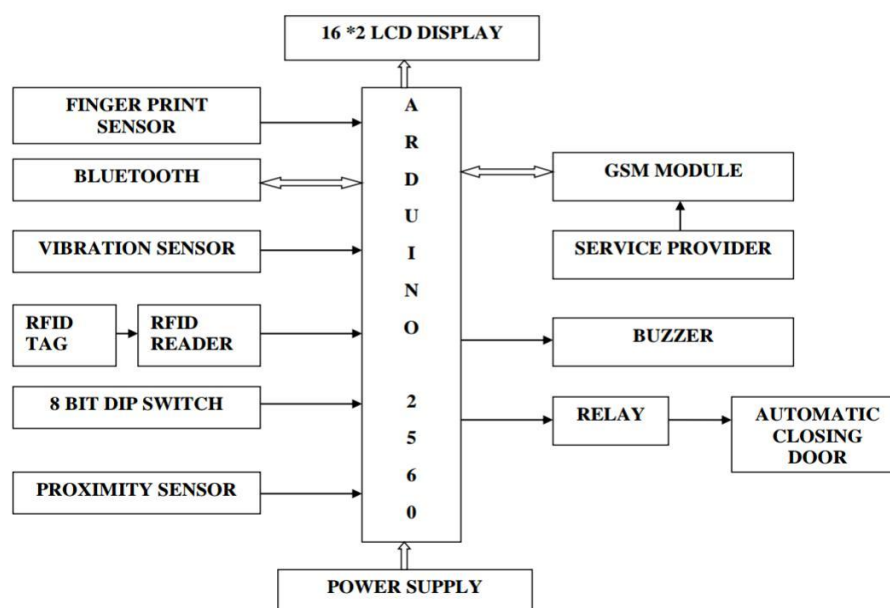
II. BLOCK DIAGRAM OF PROPOSED SYSTEM

Fig.1 Block diagram of the proposed system
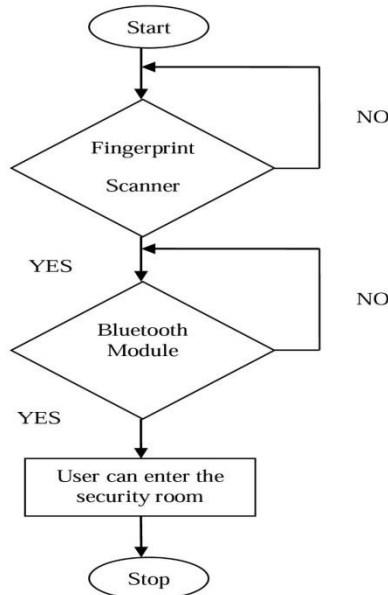
III.WORK FLOW OF THE PROJECT

Fig.2 Flow chart-Working of Primary Authentication

Step 1: If the user wants to unlock the door of security room, first the user has to place the fingerprint. If it is correct, the user gains access to the Bluetooth Module. Next, the user has to enter the authorized code to Bluetooth Module with the help of mobile application. If it is correct the user can enter the security room. If the user fails to clear this two security devices, the door remains closed.
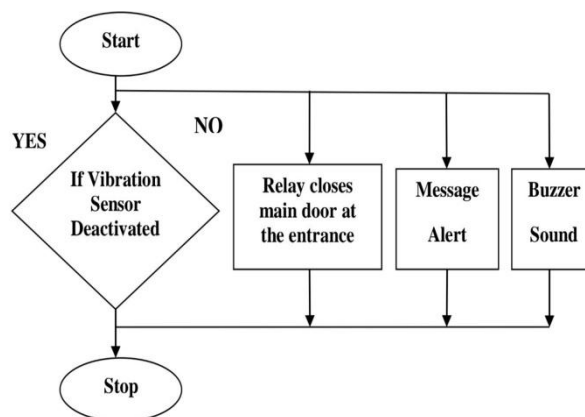

Fig.3 Flow chart – Working of Vibration Sensor

Step 2: If step 1 is successfully completed, then the Vibration Sensor is deactivated and all other security system corresponding to step 1 is deactivated. If the user fails to clear step 1 properly and tries to break the door, then the active Vibration Sensor detects the force exerted by the intruder on the door and sends signal to the Arduino

Mega 2560. Microcontroller in turn sends the signal to the relay, to close main entrance of the house, work place etc.GSM Module sends the warning message to the user. Buzzer is also enabled to produce high tone.
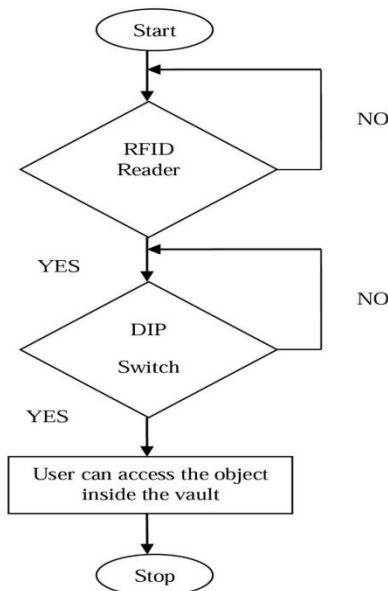

Fig.4 Flow chart-Working of Secondary Authentication

Step 3: If the user wants to unlock the door of the vault, first he has to place the authorized RFID card on the RFID Reader. If it is correct, the user gains access to the DIP switch. Next, the user has to enter the correct sequence of pin in the DIP Switch. If it is correct, the vault opens and the user can access the object inside the vault.
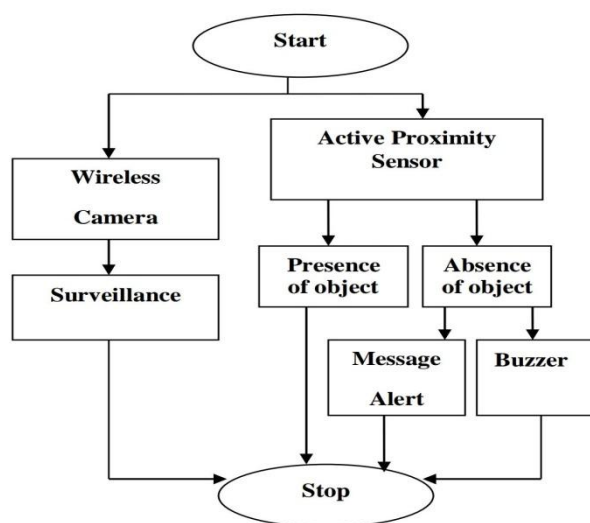

Fig.5 Flow chart–working of Camera and IR Proximity Sensor

Step 4: Wireless Camera is used for better safety and it also provide 24*7 video feed of the security room. IR Promixity Sensor is used to detect the object and it is placed inside the vault. If the object is accessed without proper authentication, alert message is sent to the user via GSM Module and Buzzer is enabled

	RFID	BLUETOOTH	GSM	FINGERPRINT	DIP SWITCH
MODEL	RS232	HC 05	SIM 900A	R305	8 BIT
RANGE	10-12cm (DEPENDS ON CARD SHAPE)	10m	Cellular Strength of SIM	Direct Contact	Direct Contact
APPLICATION	Security	Data Transfer	SMS Service	Security	Pin Selection
USER INTERFACE	RFID Tag	Smartphone	SMS	Fingerprint Scan	Switch

Table.1 Comparison of Sensors used in the project

IV.HARDWARE REQUIREMENTS

4.1 ARDUINO MEGA 2560

Arduino Mega 2560 consists of 54 digital input/output pins, out of which 14 pins can be used as PWM outputs and 16 analog inputs. It is selected as the microcontroller in this project, because it supports multiple device connectivity. Operating voltage given to this Arduino Mega 2560 is 5v. This microcontroller has 256KB of flash memory. Flash memory of this microcontroller is used for storing codes. Multiple security devices used in this project is connected to the Inputs/Outputs of Microcontroller.

4.1.1 ARDUINO IDE SOFTWARE

Arduino IDE Software is the open source software (IDE). It is easy to program the required codes in this software and it can be easily dumped into the microcontroller using this software. This software supports various platforms like windows, Mac OS and Linux.
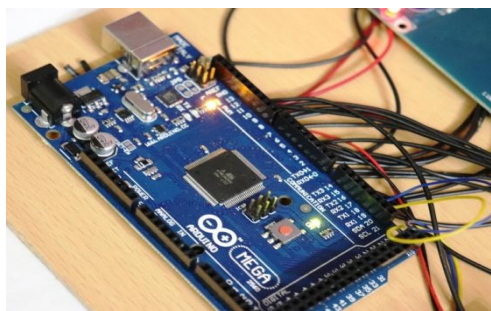

Fig.6 Arduino Mega 2560

4.2 LIQUID CRYSTAL DISPLAY

LCD is used in this project to display the status of each working components and also to display the instructions to the user. LCD used in this project is a 16x2 LCD Module. It has 2 rows and 16 Columns. LCD is lightweight with only a few millimeters thick. Power consumption by LCD is very less and so they can be powered for long duration and they are compatible with several less power electronic circuits.

Fig.7 LCD

The proposed system is divided into three different sections:

4.3 Primary Authentication

4.4 Secondary

4.5 Informative System

4.3 PRIMARY AUTHENTICATION

In this section, multiple devices like Fingerprint Scanner, Bluetooth Module, Vibration Sensor, Relay, Automatic Door Mechanism is used.

4.3.1 FINGERPRINT SCANNER

Fingerprint Scanner r305 is used in this system. It is attached to the security room's door and it is the first stage of primary authentication. To unlock the door and enter the room, the user's fingerprint has to be scanned. Once the fingerprint is matched with the stored data, the fingerprint scanner sends the signal to the Arduino Mega 2560, which process it based on the fingerprint placed. If the scanned fingerprint is mismatched with the stored data then the received signal remains unprocessed. The key point of attaching this system as first stage of primary level is to ensure that only the authorized person can enter the room.
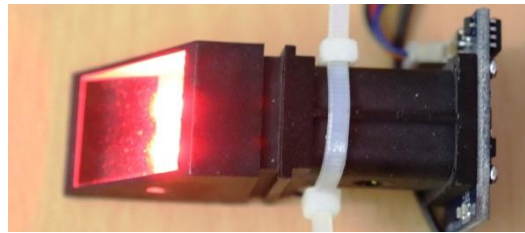
Fig.8 Fingerprint Scanner

4.3.2 BLUETOOTH MODULE

The second level of the primary authentication is supported by wireless mechanism. It is based on Bluetooth signals. Bluetooth Module HC05 is placed near the door. The communication between mobile phone and Bluetooth Module is established with the help of a mobile application named Bluetooth Terminal. When the person wants to enter the security room, the user has to open the mobile application and type the authorized code. If it is correct, the Bluetooth Module sends signal to the Arduino Mega 2560 and the person can enter the room. Bluetooth Module is used, because the authorized code is known only to the authorized person and it is a guaranteed approach for maximum security.

Fig.9 Bluetooth Module HC 05

4.3.3 VIBRATION SENSOR

If the two stages of primary authentication are properly cleared by the user, the door opens and vibration sensor is turned off and so the user can access the things inside the security room. Suppose if the intruder doesn't clear the two stages of primary authentication, the intruder has to break the door in order to access the things placed inside the room. In such cases, vibration sensor will detect the impact given by the intruder on the door and it sends the signal to the Microcontroller. Microcontroller will send an SMS about the security breach to the user with the help of GSM Module and enables the buzzer to create loud noise in order to draw attention to the security room. Microcontroller not only notifies the user about the security breach but it also automatically closes the electronic door installed at the main entrance of the house, work place etc.

Fig.10 Vibration Sensor

4.3.4 RELAY

Relays are nothing but electrically operated switches. A relay is a five terminal device which acts as an electronic switch. If the Vibration Sensor detects any impact on the door it sends signal to the Microcontroller. Then from the microcontroller, the signal is sent to the relay which acts as a switch here and it automatically closes the door installed at the main entrance and hence the intruder will be locked inside the security area.

Fig.11 Relay

Fig.12 Door mechanism-Representation

4.4 SECONDARY AUTHENTICATION

In this section, multiple devices like RFID Reader, DIP Switch, IR Sensor is used.

4.4.1 RFID READER

RFID Reader RS232 is used in this system. It acts as the first stage of secondary authentication. Each card is designed with unique identification number. System is already coded with that unique identification number. As soon as the RFID card is brought near the receiver, the code for this particular card is matched with the pre-registered code, stored in the microcontroller. If the intruder place different RFID card on the RFID Reader, the

codes do not match and RFID Reader will not send any signal to the Arduino Mega 2560. Every time a RFID card with unique identity number is used to unlock the vault.

Fig.13 RFID Reader

4.4.2 DIP SWITCH

In this project, 8 bit DIP Switch is used as the second stage of the secondary authentication. Correct password is required to unlock the vault. If the pin entered is different from already set pattern, the vault door remains closed. When the correct pin is given to the 8 bit DIP Switch, it process the given input and sends the signal to the Arduino Mega 2560 which in turn unlocks the vault's door and finally the system lets the user to access the goods inside the vault.
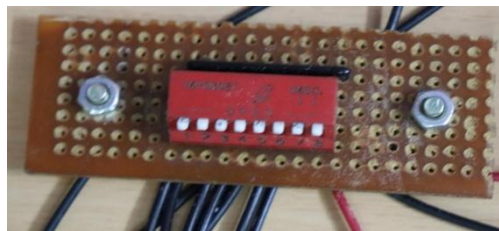

Fig.14 DIP Switch

4.4.3 INFRARED PROXIMITY SENSOR

IR Promixity Sensor is used in the project to detect the presence of object inside the vault. Whenever vault is accessed, it notifies the user. If the intruder takes the object from the vault without proper clearance of security devices, IR Promixity Sensor will detect the absence of object inside the vault. It immediately notifies the user by an SMS with the help of GSM Module.

Fig.15 Proximity Sensor

4.5 INFORMATIVE SYSTEM

As the name suggests, this system is used to provide information about security room, presence of object in the vault and security breach inside the room. This system also provides video footage inside the security premises. Devices such as Wireless Camera, GSM Module, Buzzer are included in this system.

4.5.1 BUZZER

Buzzer, an electronic device is used in this project to generate alarm tone. In case of security breach and absence of object inside the vault, the Buzzer generates high tone as security alarm. Most of the time this buzzer will be enough to drive intruder away, as it brings a lot of unwanted attention to the security premises.

Fig.16 Buzzer

4.5.2 GSM MODULE

A GSM SIM900A Module is used in this system. This Module is paired with the Arduino Mega 2560. SIM card is inserted into the GSM Module. This GSM SIM 900A Module is designed such that, whenever the objects inside the vault are accessed without the proper authentication, this Module sends out alert messages to the authorities. This Module also sends the alert message even if the proper authentication is followed. This helps to store information about the logs of the all users accessing the security vault.

Fig.17 GSM Module SIM900A

4.5.3 WIRELESS CAMERA

Wireless CCTV Camera is used in this model. Wireless Cameras are chart topping among modern security systems due to their low installation costs. This security system is used to transmit the video footage to the TV,

which live streams the video from the security premises. Wireless security cameras transmit a video and audio signal to a wireless receiver through a radio band.

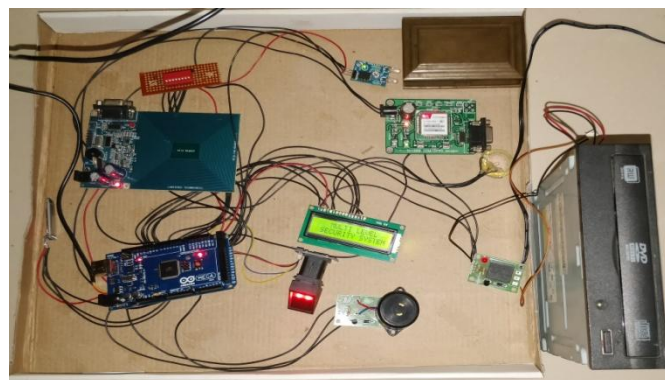Fig.18 Wireless Camera

V. RESULTS
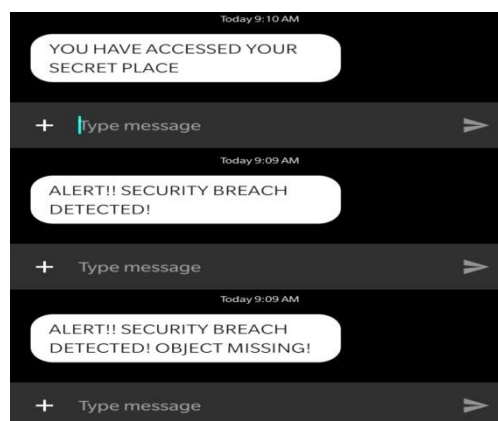

Fig.19 Complete Project Setup

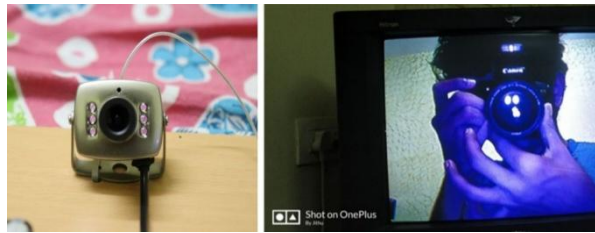Fig.20 Alert Message obtained via SMS

Fig.21 Wireless Camera Output

VI.CONCLUSION

The assorted security system is developed in this project with the help of several security devices. These security systems must be cleared with proper authentication in order to enter the room and to access the objects inside the vault. The entire system is controlled by Microcontroller Arduino Mega 2560. The Primary authentication consists of Fingerprint Scanner and Bluetooth Module. The authorized person can enter the room only after clearing these two security system on the door. Next, to access the objects inside the vault the user has to clear the secondary authentication. It includes RFID Reader and DIP Switch. Devices such as Vibration Sensor, GSM Module, Buzzer, Relay, Camera, Proximity Sensor are used in this project to ensure high security to the user. All these devices are used in this project for specific purpose. The proposed system contain different security systems to protect the security premises, according to the user's need, any combination of security devices can be selected and used.

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