

Implementation of Embedded based Bank Security System using Knock-Out Gas

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Abstract: Nowadays, the number of banks and the number of theft is increases rapidly. Most of the customers are using bank operations for savings account, keeping valuable jewels in the bank locker and availing loan for purchase of home. Most of the time, theft happens in the bank which results in major losses to bank owners and customers are also affected. The conventional bank security system is not effective and theft of money, jewels etc. happen easily. The police cannot find the robbers easily. The proposed bank security system is novel, highly secure and cost effective embedded system which ensures bank security by releasing knock-out gas. It is used only after the closing hours of banks. When any robber tries to enter the bank, the sensor kept near the locker senses and sends the signal to microcontroller. The microcontroller which inturn sends the signal to the relay circuit which activates the gas releasing equipment to release the knock-out gas for specified period of time. The signal from the microcontroller also sends to the Bank's higher officials mobile through the GSM (Global System for Mobile Communications). The novelty of this proposed security system is it releases knock-out gas towards robber which makes him unconscious and falls down for certain hours. This system allows bank manager

and police to easily catch the robber. The proposed bank security system is fully automated bank security system which ensures safety to highly valuable customer's documents, money and expensive ornaments kept in bank locker.

Keywords: Security, Arduino, GSM, Relay, Knock-out gas.

Introduction

Security has become an essential issue in banking operations. Security is the protection of something valuable to ensure that it is not stolen, lost, or altered. Every person having cash and jewels need to keep in safe place. The bank lockers are considered as the safest place to protect them. In the current situation, Bank robberies are rapidly increasing day by day due to the lack of security mechanisms in protecting the valuable assets. The manual security system is not effective and theft may happen easily because of security is not alert especially during night time. The conventional bank locker security system is not powerful and it can be easily breakable by robbers. The CCTV (Closed Circuit Television) camera may be broken by the robbers and theft of valuable jewels and money is possible. The CCTV cameras are inefficient due to significant amount of memory utilization and it is expensive. The alarm based security system may alerts the robbers and it allows escaping the robbers easily.

The frequent theft is happening in the banks. The conventional bank security system is not enough to secure the customer's assets and bank properties. Bank is a place where lot of money transactions takes place and storage of highly valuable ornaments by the customers. The security system for banking sector should not only protect the assets but also ensures customer's privacy. The personal information such as account number, ATM number, jewel locker number etc. should not be accessed by the unauthorized parties. In addition, security is most important in internet banking operations because majority of customers availing the internet banking facilities for money transactions.

The bank locker security system proposed [1] which adopted MEMS (Micro-Electro Mechanical System technology along with RFID and microcontroller

devices. MEMS accelerometer is used to sense the motion in three dimensional axes. A predetermined password can be set by the user for a fixed set of motions. The microcontroller senses the motion and asking for a password if motion is detected. The system will be blocked if the wrong password is entered. The drawback of using MEMS is that the sensors used are not cost effective and it is complex to use in real-time applications. The bank security system is implemented with the help of RFID and GSM technology [2]. RFID technology is used for identifying the objects and GSM is for sending the message to the authorities. It allows access only to the authorized users of the bank lockers. The drawback is that the user needs to remember the password to open the locker. The proposed bank security system [3] is based on Internet of Things (IoT) for secure accessing of bank lockers only by authorized person. When any person tries to access the bank locker, Raspberry Pi captures the image, processes it and sends it to the user's whatsapp account as picture message. The authorization should be provided by the user to the Raspberry Pi from his whatsapp account number to open or shut the locker.

The proposed bank locker security system [4] which is raspberry Pi based face recognition technique in order to identify the authorized person entering the locker room. RFID and GSM technology together used for secure access of the locker. When the person tries to access the locker, the access code is sent to the user mobile. The access code is sent only to the authorized person and the unauthorized person cannot access the locker. The sensor detects the entry of unauthorized person and sends the control signal to raspberry Pi which generates audio alarm. The drawback is alarm signal alerts the robber and he escape easily. Automatic locker system can overcome the drawbacks of manual security system. RFID tags can be used which holds the customer's details such as username, locker number etc. The Radio Frequency Identification (RFID) method is used to identify the person using radio frequency transmission for securing bank lockers [5]. It is an automatic identification technology where digital data encoded in an RFID tag is read by the RFID reader.

The bank locker security system is proposed which uses web camera to capture the image of the robber [6]. The raspberry Pi will generate the One Time Password (OTP) and send it to the authorized mobile number. The user needs to enter the OTP in order to open the locker. The locker cannot be open if the OTP entered is incorrect. The drawback is the CCTV camera is expensive because it requires computer to monitor the image. The security attacks and vulnerabilities in online banking systems are addressed [7]. The major online banking attacks are obtaining authentication and identification information. The end users of online banking require secure entry of login and password as well as secure money transactions. It is most important to secure the data during transmission over a network. The bank locker security system is proposed which is based on face recognition and GSM technology [8]. Face Recognition is done by using active appearance model algorithm with Bayesian classifier, which is used to identify the persons and verify their identity with the Raspberry Pi processor.

The bank security system proposed [9] in which the user will get the four digit random number as a password during the access of locker. When the user enters the password, the locker can be open. If the password entered is wrong, the locker cannot open. The unauthorized person cannot access the locker. The problems in online banking and its need for security testing is addressed [10]. The system allows the user to perform secure transactions from anywhere and anytime. The SMS messages are encrypted using symmetric key IDEA algorithm. The customer can perform secure transaction in the online banking.

The security is a major issue in current situation. The bank should take the responsibilities of customer's savings account, documents and jewels kept in the locker. The unauthorized access increased in the banking operations. The robber targets the highly valuable customer's money and ornaments kept in the locker. The customer's information should be kept confidential. A bank locker security system is proposed [11] which are based on fingerprint and GSM technology. It allows only the authentic person to recover money or accessories from bank locker. The user name, fingerprint and mobile number are enrolled in this

system. If the fingerprint matches, then four digit code will be sent to authorized customer's mobile through GSM Modem and the locker door will be opened. This system can be applied mainly in banks and automatic door opening and locking systems.

Zarka Zahoor et.al [12] addressed the challenges in privacy and security as well as countermeasures against security attacks in banking sector. The web browser is the target of the most of the attackers. The security mechanism is required to protect the web browser against reverse engineering. The banks should tighten the security mechanisms and take appropriate countermeasures to ensure safety and privacy to customer's valuable assets.

Block Diagram and Description of the Proposed Bank Security System

The proposed bank security system releases the knock-out gas towards robber with the help of PIR (Passive Infra-red) Sensor, Arduino, Relay and Gas releasing equipment. The fig. 1 shows the block diagram of bank security system by releasing knock-out gas and it sends the information about unauthorized person entry to the bank manager's mobile through GSM.

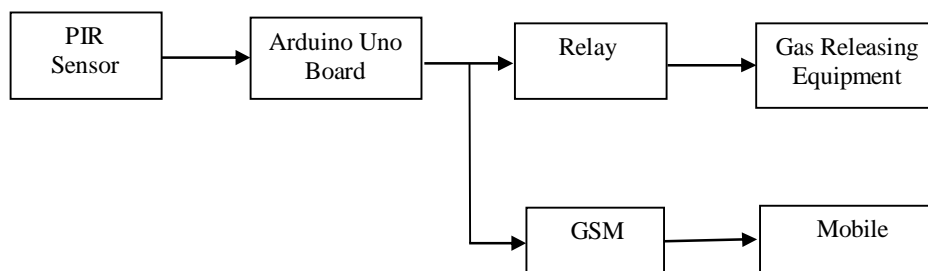


Fig. 1 Block diagram of Bank Security System by releasing Knock-out Gas

Any robber tries to enter the bank, PIR sensor detects the robber and sends this detected signal to the Arduino board. The signal from the arduino is also sent to bank manager through GSM. The gas releasing equipment is AC powered in which knock-out gas such as methyl propyl ether or methoxyflurane is filled. This gas releasing

equipment is kept near the locker. The arduino is programmed to activate the relay circuit which inturn connected to the gas releasing equipment to release the knock-out gas. When the robber tries to enter the locker room, the knock-out gas starts releasing towards robber. The released knock-out gas reduces the conscious level of the robber and makes him fall down for few hours.

When the bank manager hearing the continuous ringing from his mobile and alert message, he informs to police. The police will come immediately to the bank location and catch the robber easily. The proposed bank security system allows to safe the valuable ornaments, money and documents.

Flowchart

The flowchart of the proposed Bank Security System is shown in figure 2. The PIR sensor plays a major role in identifying the robber especially during Bank closing hours.

Implementation of proposed Bank Security System

The figure 3 shows the implementation of proposed bank security system by releasing knock-out gas.



Fig. 3 Arduino based Bank Security System by releasing Knock-Out Gas

The Arduino Uno board is programmed to read the PIR sensor data and it sends the signal to bank manager's mobile through GSM. It also sends the signal to the gas releasing equipment to spray the knock-out gas towards robber. When the robber comes near the locker, he falls down due to release of knock-out gas. Once

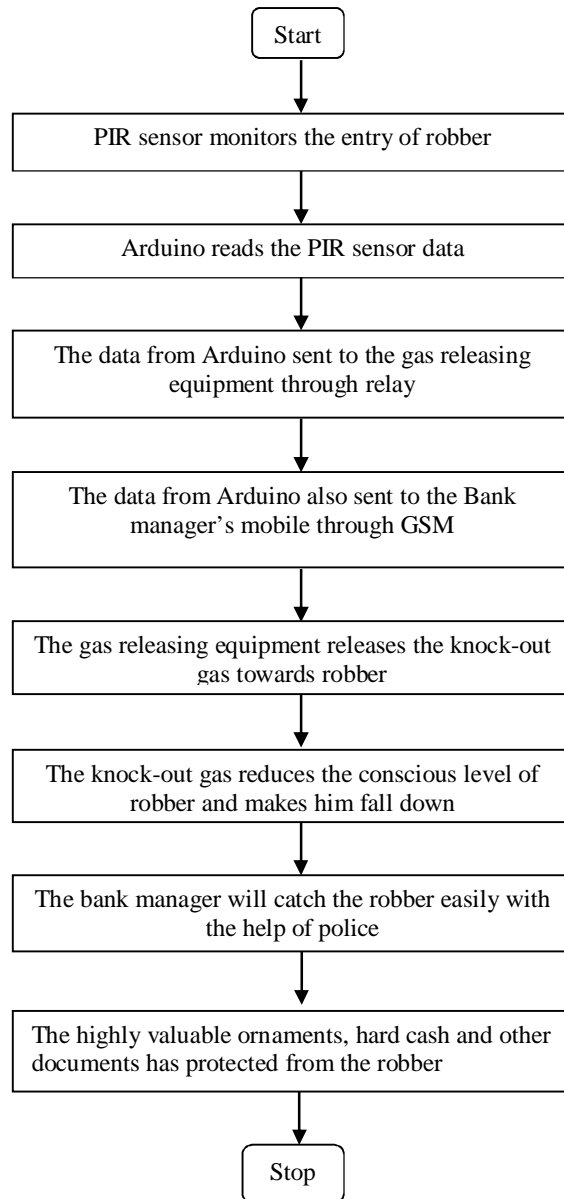


Fig. 2 Flowchart of the proposed bank security system

the bank manager receives the signal, he informs police immediately and catches the robber.

Comparison of Proposed Bank Security System with Existing Bank Security System

The table 1 shows that bank proposed bank security system allows catching the robber easily and it is cost effective as compared to conventional CCTV camera security, Alarm based security, RFID and MEMS technology.

Table 1. Comparison of Proposed Bank Security System with Existing Bank Security System

Method	Developed by	Approach	Benefits	Drawback
GSM Based Bank Locker Security System using RFID, Password and Fingerprint Technology	HiloniDetroja, PruthaVasoya, DishaKotadiya, Bambhroliya [5]	RFID method is used for securing bank lockers	RFID tag provides location to the reader along with its ID	RFID systems are expensive and less reliable
Camera Based Monitoring and Security System	Jhansi Rani, Ramya [6]	Web camera is used to capture and uploads the image of the robber	Monitor the image of the robber in the system	CCTV camera may be broke by the robber and it is expensive
Banking Security System Using MEMS and RFID Technology	Abhijeet Kale, AniketDeshmukh, MangeshBenodkar, Prasad Nage, Suyog Fukate [8]	MEMS accelerometer is used to sense and detect the motion	The system will be blocked if the wrong password is entered	MEMS sensors are expensive and it is complex to use in real-time applications
Raspberry Pi based Face recognition technique	Elaveni, Balasundari [9]	Raspberry Pi generates audio alarm	Correct access code is required to open the locker	Alarm signal alerts the robber and it allows robber to escape easily
Proposed method: Bank Security System using Knock-out gas	Prasath, Natesan	Arduino is programmed to read the entry of robber and to spray the knock-out gas towards robber	It is cost effective, to catch the robber easily, it secures the highly valuable assets	NIL

This proposed bank security system not only secures the highly valuable customer's assets but also catch the robber easily and quickly. The bank security system proposed which is novel and it is not yet implemented in real-time. The proposed security system is also applicable to the jewel shop, accounts

department in the institutions, public and private sector, home security etc. to secure the highly valuable money.

Conclusion

The security is top most priority in the bank operations. It is essential to secure the ornaments, cash and documents from the robber. When any robber tries to enter the bank, the security system allows catching the robber easily by releasing knock-out gas. This knock-out gas reduces the conscious level of the robber and makes him fall down. The information about entry of robber also sent to the bank manager's mobile through GSM. The bank manager will catch the robber and handover to the police. The proposed bank security system not only catches the robber but also protects the highly valuable customer's ornaments, hard cash and other important bank documents from the robber. The future work is to implement this proposed bank security system in all banks.

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