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Simulation and Implementation of Loop Based Bank Locker Security System Using Cost Effective Microcontroller and GSM Module

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ABSTRACT: Nowadays almost all the part of the world, bank-theft is happening causally. Bank locker security is very important, to protect any kind of properties from thieves. This project is developed with simple loop, which will provide security for the bank locker by giving the alarm signal. Also this system will give the alert SMS to the bank manager. This system can be implemented in anywhere to provide security, where the device is movable. In this project bank locker door is considered for providing the security. This system is simulated using Proteus 8 software and then it is implemented with hardware module. A Triac BT136 and a Transistor BC547 are used to supply the alarm to provide the sound. A micro-controller and a GSM module are used to send SMS alert.

KEYWORDS: Arduino uno microcontroller, GSM, Proteus, Triac, Transistor, Phone and Buzzer.

I.INTRODUCTION

In recent years, there are many thefts occurring in banks. Even we are reading this kind of news in the newspapers and watching in TV channels, in our daily life. As technology continues to grow, the need for safe and secure cabinets continues to increase. A solution to this problem can address this paper.

The main objective of this paper is to protect the bank locker from thief by using an alarm signal and an alert SMS. In most of the banks, no proper security system, hence many thefts happen in the banks. This paper is proposed to give proper security for the banks by providing the alarm and alert SMS in case of any theft, by opening the bank door. In this project simple loop based circuit using transistor, triac, Arduino Uno and SIM 900 GSM module were used. A loop wire is fixed in the door opening place; in such a way that the door opens the loop will cut. The circuit is designed that the loop is opened then the buzzer will give alarm, to alert the bank security staff, also an alert SMS will send to concern person. Hence the theft may be avoided by using the loop based security system and hence the bank properties will be protected.

II. LITERATURE SURVEY

Presently every newspaper we may find different kind of theft happened in different places around the world. If any of the bank door opened by unknown person (thief) the alarm will ring to protect the bank property from thief [1]. The door locker system which is integrates fingerprint reader in it so as to provide a good level of security. The main goal of fingerprint door locker with image capture project is to provide security with no manual security flaws [2& 6]. Usage of finger print (Biometric) sensor causes the system will be more costly and bulky. The unique password technique to be applied in bank security system because this kind of technique is effective and fast, and after entering the first door user has to enter OTP which is being sent through android application so that IR is disabled and second door is opened [3]. The OTP some time may not be received or will take long time to receive because of the network issues.

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A bank locker security system based on RFID and GSM technology were implemented and which can activate, authenticate, and validate the user and unlock the door in real time for bank locker secure access. The main advantage of using passive RFID and GSM is more secure than other systems [4-10]. RFID systems are often more expensive. RFID technology is harder to understand also can be less reliable. The security system contains a microcontroller, keypad, GSM module and LCD display. By using keypad it is needed to enter the password that is provided to the authenticated persons [11]. But in some cases the password may forget, hence the password based security system is not advisable.

In order to provide security system for social safety, the IOT based authentication is utilized. They designed an advance security system which will ensure the genuine access of the locker overcoming all the misuses. For this we are using unique password technique, password verification and lastly the OTP verification [12]. Ultimately the system utilizes the regular passwords and OTPs. A complete literature survey has been taken in [14] about all the following techniques which is used for security systems. Those are Password based, Biometric based, GSM based, Smart card based, RFID based, Door phone based, Bluetooth based, Social networking sites based, OTP based, Motion detector based, VB based and Combined systems [13]. All the above mentioned methods result certain drawbacks in terms of cost, complication, and uncertainty.

The proposed system is simple loop based security system with less cost. This system will provide alarm signal as well as alert SMS. Here triac is used as a switching device, hence once the bank locker door opened by any unauthorized person, the buzzer will continuously ring even the person again close the door until switch off the main power supply to the circuit. It is the main advantage of the system also the system can be developed with cost effective.

III. BLOCK DIAGRAM OF THE PROPOSED SYSTEM

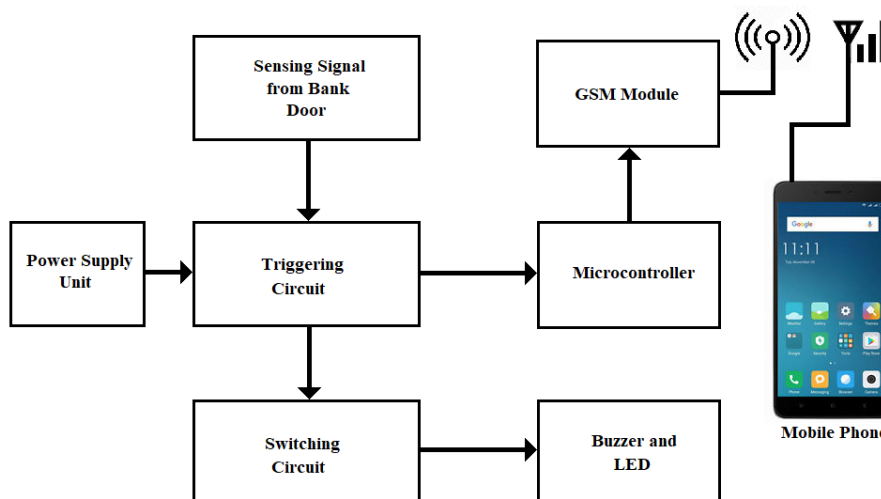


Fig. 1 Block Diagram of Proposed System

The figure1 shows the block diagram of the proposed system. The power supply block supplies 12V DC power to the whole circuit. The sensing signal is getting from simple loop wire, this loop wire gives signal to the triggering circuit, there by the triggering circuit gives pulse to the switching circuit and also gives pulse to the microcontroller. Hence the switching circuit is used to switch the buzzer and LED to give sound and light indication. At the same time the microcontroller transmit signal to GSM module and it will sends the alert SMS.

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IV. CIRCUIT DIAGRAM AND SIMULATION

The circuit diagram of proposed system is given in figure 2. The major devices used in the circuit are Arduino Uno, GSM SIM900 Module, transistor and triac. The power supply consists of transformer, diode and capacitor, which will supply 12V DC to the circuit. There is a loop wire used to sense the door opening. One end of the loop wire is connected to the base of the NPN transistor and another is grounded.

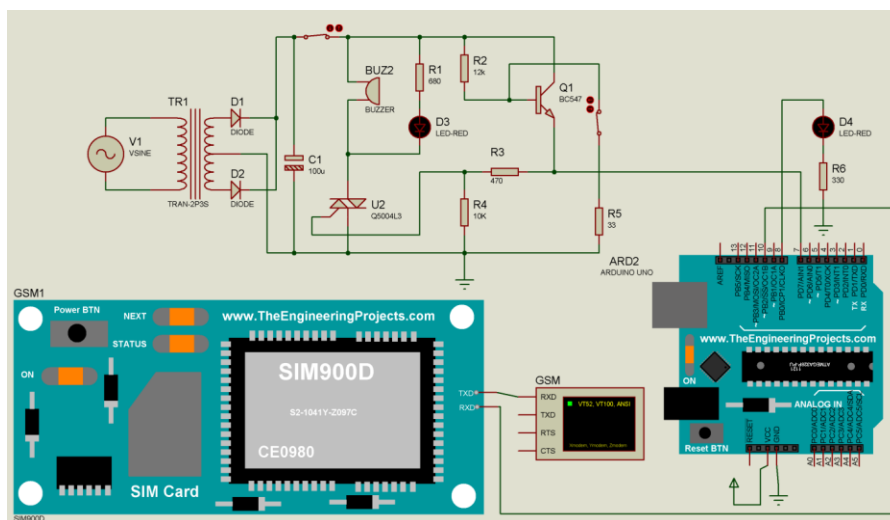


Fig. 2 Block Diagram of Proposed System

When the loop wire cuts (During the opening of the door) the transistor base gets positive voltage and it will be ON. If the transistor is ON, the positive voltage triggering is given to the gate of the triac BT136 and it will be ON, at the same time microcontroller also receives signal from the transistor and it will transmit the signal to the GSM module and hence it will send an alert SMS to the concern mobile number. The triac is connected with the buzzer and LED, so the buzzer will ring continuously and the LED also will glow. Once the triac is ON, it will not turn OFF even if we remove the triggering pulse by the way of closing the loop (By closing the door), because the triac will not be turned OFF in DC supply by natural or self-commutation. Hence, if any thief opens the door immediately the buzzer will give an alarm continuously and SMS will be sent, even if the thief closes the door, until we turn off the main switch of the circuit, it will sound continuously.

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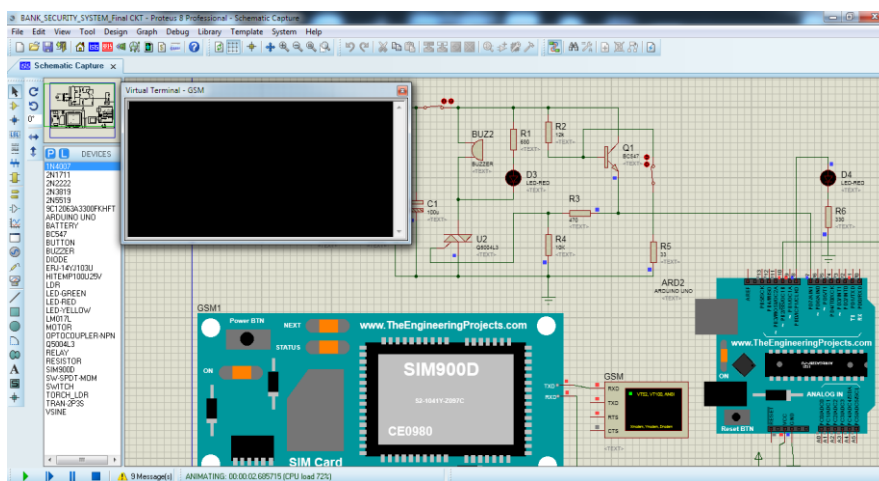


Fig. 3 Simulation circuit before locker door open

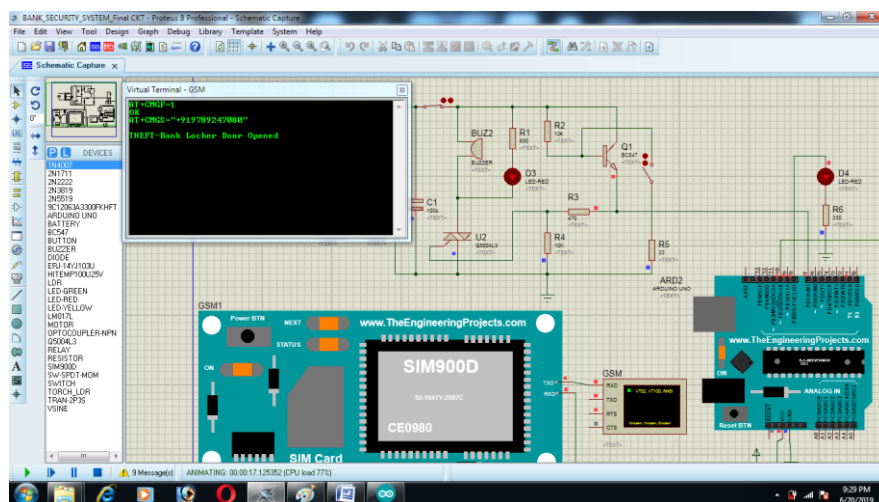


Fig. 4 Simulation circuit after locker door open

The 680Ω resistor is used to limit the LED current. 12K and 10K resistors are the pull up and pull down resistor for the transistor and triac respectively. The 33Ω and 470Ω resistors are also for current limiting purpose.

The simulation of the system was done using Proteus 8 software. The figure 3 and 4 shows that the Proteus simulation circuit, which displays the status before and after bank locker door (loop wire cut here in this circuit) open respectively. From the figure 4 it is visible that when the loop wire is open then the LED is glowing and the alert SMS sent.

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IV.HARDWARE CIRCUIT

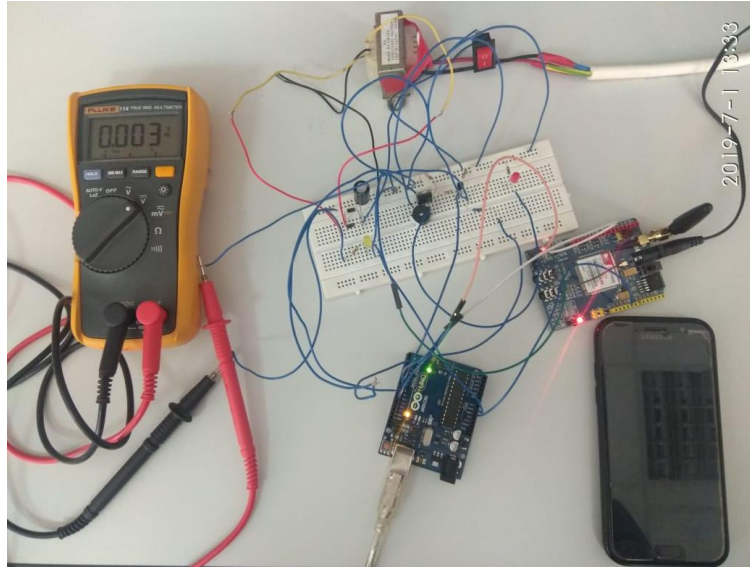


Fig. 5 Hardware circuit before loop open

The figure 5 displays the hardware circuit of the proposed system. The circuit is tested using bread board. Connections were made as per the circuit diagram. The loop wire is used as sensor for bank door opening and closing. When we open the loop, the circuit is working properly same as simulation, it will gives buzzer sound, LED indication and the alert SMS. The figure 6 exhibit the working of the hardware circuit when the loop open and the figure 7 the screen shot of the alert SMS.

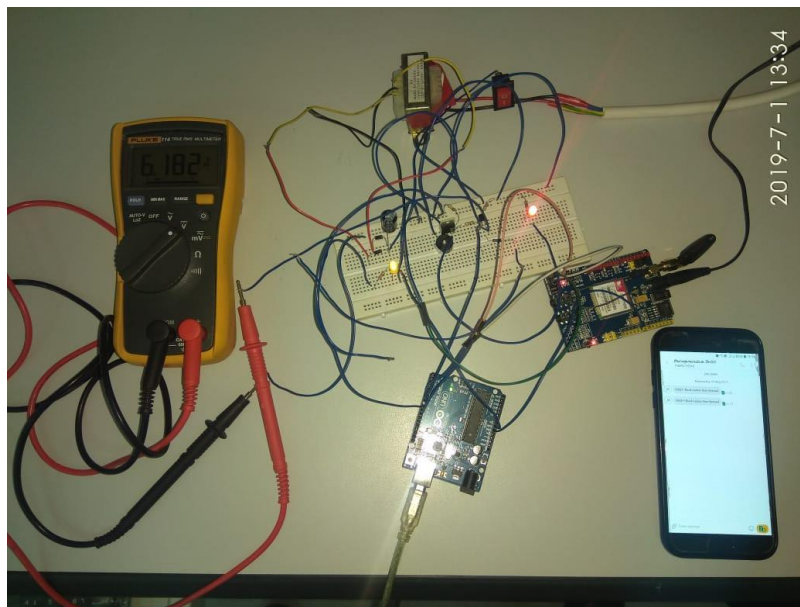


Fig. 6 Hardware circuit after loop open



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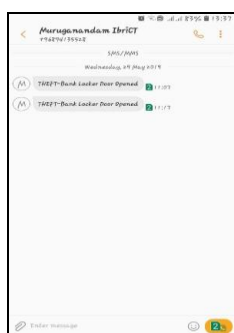


Fig. 7 Screen short of the alert SMS

The table 1 provides the details of the list of components utilized for the proposed work and the figure 9 shows the Arduino Code of the proposed project.

Table. 1. Required Components, Devices, and Materials

S.No.	Component Name	Specification	Quantity
1.	GSM Module	SIM 900	1
2.	Arduino Uno	Uno	1
3.	Transformer	230/12-0-12V, 300mA	1
4.	Piezo buzzer	12V	1
5.	Transistor	BC547	1
6.	Triac	BT136	1
7.	Diode	IN4007	2
8.	LED	-	1
9.	Resistors	10K, 12K, 680E, 33E, 470E	Each 1
10.	Capacitors	25V, 100µF	1
11.	Switch	ON/OFF	1
12.	Wires	Single Strand	Few
13.	Bread board or PCB		1

V.CONCLUSION

We have developed a loop based bank locker security system using Arduino and GSM module to protect the bank properties from thieves. According to our objective, in the event of any theft in the bank, this system will work and alert the security staff by giving continuous alarm and alert SMS. As soon as the bank door is opened by thief, automatically it sounds through the buzzer also the LED light will glow and SMS will sent to the higher officials. At first we designed and tested using Proteus 8software and we checked the operation by opening the loop manually. Then we developed the circuit with bread board and tested the circuit with the proto type model. It was working properly. The main advantage of the proposed work is very simple circuit and low cost to implement. Thus, we conclude that the proposed work will be fully suitable for any where that security is needed for movable objects.

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