



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**ATM SECURITY SYSTEM WITH GSM INTEGRATED
TECHNOLOGY**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Electronics Engineering Technology (Industrial Electronics) (Hons.)

by

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follows:

.....
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ABSTRACT

The need of security for all things that exists in this world of technology nowadays is very crucial. There are various types of security system that have been created to give an assurance to the people to live more safely in a peaceful environment. This includes the ATM machine which is used daily by all people to withdraw money from their saving accounts. As the crime rate is increasing, security system for ATM is extremely essentials. With this high-tech ATM security system, the implementation of using Global System for Mobile communication (GSM) technology will focus on the security elements to notify the authorized personnel whenever the ATM machine being stolen or taken away from the bank, especially during the wee hours and at public places with a small crowd. For further implementation of the technology used, we need to interface the sensing elements such as the limit switch which is installed to a door and a vibration detection sensor with a GSM module to an Arduino controller which is programmed by using IDE software. The usage of GSM in this project was a great choice as this network system has a worldwide coverage compared to other network systems such as Bluetooth, RFID, Wi-Fi and etc. In order to achieve this, the detectors has been installed to the ATM machine body parts and if there is a contact that will change the condition of the sensor or the voltage of the circuit, alarm will trigger. As a result, the GSM will act as an informer to the bank security and police forces informing them about the robbery by sending SMS. The efficiency and effectiveness of the GSM network to send the Short Message Service (SMS) within seconds could be a great help in informing the authorized forces regarding the unfortunate incident.

ABSTRAK

Keperluan kepada keselamatan untuk semua benda yang wujud di dunia teknologi pada masa kini adalah sangat penting. Terdapat pelbagai jenis sistem keselamatan yang dicipta untuk memberi jaminan bahawa manusia boleh hidup didalam persekitaran yang selamat dan aman. Ini termasuklah mesin ATM yang digunakan seharian oleh manusia untuk mengeluarkan wang daripada akaun simpanan. Dengan peningkatan kadar jenayah, sistem keselamatan untuk mesin ATM adalah sangat diperlukan. Pelaksanaan sistem keselamatan ATM yang berteknologi tinggi ini menggunakan teknologi GSM yang mempunyai liputan di seluruh dunia akan menumpu pada unsur-unsur keselamatan untuk memberitahu pihak atau kakitangan berkuasa pada bila-bila masa sahaja bahawa mesin ATM telah dirompak atau dibawa lari dari bank, terutamanya pada waktu dinihari, awal pagi dan ditempat umum yang mempunyai orang yang sedikit. Untuk pelaksanaan yang selanjutnya, perantara diperlukan untuk mengantara unsur-unsur pengesan dan modul GSM kepada pengawal Arduino yang diaturcarakan menggunakan perisian IDE. Penggunaan system GSM didalam projek ini merupakan satu pilihan yang baik kerana sistem rangkaian ini mempunyai liputan seluruh dunia berbanding rangkaian yang lain seperti Bluetooth, RFID, WiFi dan lain-lain. Untuk menjayakan pelaksanaan ini, kita perlu memasang pengesan-pengesan tersebut kepada bahagian badan mesin ATM dan jika terdapat sebarang hubungan yang akan mengubah keadaan pengesan atau voltan litar tersebut, penggera akan diaktifkan. GSM modul akan bertindak sebagai pemberitahu kepada pasukan keselamatan bank dan pihak polis mengenai rompakan yang berlaku melalui penghantaran Khidmat Pesanan Ringkas (SMS). Kecekapan dan keberkesanan rangkaian GSM untuk menghantar Khidmat Pesanan Ringkas dalam masa beberapa saat boleh menjadi bantuan yang besar dalam memaklumkan pihak berkuasa mengenai kejadian yang tidak diingini.

DEDICATIONS

Alhamdulillah, praise to Allah S.W.T.

This thesis is dedicated to,

My beloved parents,

My family,

My supervisor,

My lecturers,

And all my friends.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

AT command	-	Attention command
ATM	-	Auto Teller Machine
BSC	-	Base Station Controller
BSS	-	Base Station System
BTS	-	Base Transceiver Station
CDM		Cash Deposit Machine
CDMA	-	Code Division Multiple Access
DC	-	Direct Current
GPS	-	Global Positioning System
GSM	-	Global System Mobile
ICSP	-	In-Circuit Serial Programming
IDE	-	Integrated Development Environment
IMEI	-	International Mobile Equipment Identity
IR	-	Infrared
LED	-	Light Emitting Diode
MS	-	Mobile Station
MMS	-	Multimedia Message Service
NC	-	Normally Close
NO	-	Normally Open
PWM	-	Pulse Width Modulation
RF	-	Radio Frequency
RFID	-	Radio Frequency Identification
RX	-	Receiver
SIM	-	Subscriber Identity Module
SMS	-	Short Messaging Service
SS	-	Switching System
TX	-	Transmitter
USB	-	Universal Serial Bus

CHAPTER 1

INTRODUCTION

This project of ATM Security System with GSM Integrated Technology is specially built to provide a security system for the auto-teller machine (ATM) with a high-tech security system from being robbed. It will use a wireless technology, which is GSM, and this is done by sending an auto-generated SMS to inform or alert police and bank security whenever ATM robbery occurs. This chapter will briefly discuss the general background of this project, its objectives, problem statement, scope of the project and project methodology.

1.1 Project Background

In this economically deteriorating world nowadays, the crime rate is getting worse. Under such circumstances, there are people who decide to do things that are against the law in order to get money; one of them is stealing people's money by robbing the ATM.

In this proposed system, if the robber tries to steal the ATM, the sensor will detect the ATM machine is being stolen and the Arduino gets an interrupt through a switch mechanism connected to the system and commands the GSM module to send an SMS.

Global System for Mobile Communication (GSM) is a digital mobile telephony system that is widely used in Europe and other parts of the world. A GSM module is a specialized type of module which accepts a SIM card, and operates over a subscription to a mobile operator just like a mobile phone. This is because these GSM modules are most frequently used for sending and receiving SMS and MMS messages.

1.2 Problem Statement

Nowadays, in Malaysia, the numbers of ATM theft and robbery cases has been increasing. The problem was that whenever the incident occurs, the current ATM security system only gives out alarm warning siren sound at the exact location where the incident took place. Let say the incident took place at wee hours as an example in Figure 1.4, where nobody happens to be around the ATM. The triggered alarm will not be heard by anybody at that particular time, including the security guard. The robbers or the theft will just have to cut off the circuit connection of the alarm and continue to destroy or ran away with the ATM machine.

This deteriorating condition of robbery cases has made the bank losses public's trust to save money in the bank. They also face with huge monetary losses whenever ATM was robbed.

Due to this problem, a new high-tech ATM security system is needed in order to help in reducing the increasing number of ATM robbery cases in Malaysia. This new high-tech security system introduced will be using GSM technology and equipped with two types of sensor. The GSM will act as an informer by sending notification SMS to bank authorised personnel and local law enforcement.

Compare to other network systems, the GSM which has worldwide coverage is believed to work effectively and efficiently in this new system. It is also hoped to be a new step in providing a better security system for ATM nowadays.

For a clearer vision about the ATM robbery problem, news article labelled as Figure 1.1 to Figure 1.4 will show what has really happened nowadays.

Mesin ATM dipecahkan, pencuri bawa lari lebih RM224,570



KUALA LUMPUR: Dua pencuri melarikan wang tunai dianggarkan RM224,570 dari sebuah mesin pengeluaran wang automatik (ATM) apabila mereka memecah masuk sebuah stesen minyak di Persiaran Kewajipan, Subang Jaya, hari ini.

Figure 1.1: News article 1

[<http://malaysianreview.com/5947/mesin-atm-dipecahkan-pencuri-bawa-lari-lebih-rm224570/>]

Figure 1.1 shows a CCTV recording video of ATM machine were forced open by two thieves and an amount of more than RM 224,570.00 were taken away. The incident was reported taking place at a petrol station located at Persiaran Kewajipan, Subang Jaya.



Figure 1.2: News article 2

[http://ww1.utusan.com.my/utusan/Jenayah/20140919/je_08/Rompak-mesin-ATM-polis-berkas-lima-suspek]

Figure 1.2 above shows the victory of police forces in capturing five suspects, including women who were believed involved in two incidents of ATM and CDM robbery attempt at Plaza Damai, Luyang and Plaza Alamesra in Kota Kinabalu, Sabah. All suspects were captured in a house at Likas Court, Jalan Tuaran.

ATM hackers seem to target older machines

Posted on 30 September 2014 - 10:00pm



Last updated on 1 October 2014 - 08:46am

Presenna Nambiar

newsdesk@thesundaily.com

PETALING JAYA: Banks which were hit by the spate of fraudulent withdrawals from automated teller machines (ATM) were those which still have older machines without up-to-date anti-virus software.

Apparently, all the banks which were targeted for the fraudulent withdrawal of about RM3 million so far, were those using older generation ATMs.

Police sources today confirmed that ATMs targeted thus far were all from a company which still supplies ATMs that have not been upgraded with anti-virus software.

Preliminary investigations showed that the fraudulent ATM withdrawals were executed with the use of a handheld electronic hacking device and a mobile phone SIM card.

Figure 1.3: News article 3

[<http://www.thesundaily.my/news/1185298>]

Figure 1.3 stated that the ATM hackers more focus on hacking older generation machines with no anti-virus software upgraded, which causes loss for about RM3 million. Investigations showed that the fraudulent ATM withdrawals were executed with the use of a handled electronic hacking device and a mobile phone SIM card.

GUNA BAHAN KIMIA PECAH ATM, LESAPKAN RM126,000

on May 27, 2013 in Social

Like Share 5 people like this.

Professional valet service for all event

<http://nusapark.com/>



KUALA LUMPUR – Empat lelaki melarikan wang tunai sebanyak RM126,000 selepas memecah sebuah mesin pengeluaran wang automatik (ATM) dalam premis sebuah bank di Jalan 1/91, Taman Shamelin Perkasa, Cheras di sini awal hari ini.

Dalam kejadian kira-kira 3.30 pagi itu, mereka dipercayai menggunakan gas oxy-acetylene untuk memecah mesin ATM sebelum melarikan wang rompakan.

Ketua Polis Daerah Cheras ACP Mohan Singh Tara Singh berkata pihaknya menerima maklumat mengenai kejadian itu daripada seorang pengusaha pusat tuisyen pada 11 pagi.

"Ketika pengusaha membuka pintu pusat tuisyennya, beliau terkejut melihat eril pintu belakang pecah.

Figure 1.4: News article 4

[<http://www.kualalumpurpost.net/guna-bahan-kimia-pecah-atm-lesapkan-RM126000/>]

The news article of Figure 1.4 stated that four men took away RM 126,000 by using oxyacetylene gas to force open the ATM machine. The incident was reported took place at Taman Shamelin Perkasa, Cheras, Kuala Lumpur at around 3.30 a.m.

1.3 Objective

The main objective for this project is to design and develop a security system for the ATM machine to prevent it from being robbed. This project includes the research and study on how a sensor and GSM module would work. The objectives of this project are:

- To design and develop a compatible system which can help to assist in the issue of ATM robbery or stolen ATM
- To test and analyse the performance of the hardware.

1.4 Project Scope

The scope of this project will focus on how the ATM's security system works. A model or a prototype will be made by using Arduino, vibration alarm sensor module, limit switch sensor and GSM module demonstrate how the circuit functioning. The project circuit also will be equipped with Alarm LED and a buzzer. The circuit will function when the vibration sensor detects any excessive vibration occur towards the ATM machine body. This will trigger the vibration sensor to send signal to the Arduino. The limit switch sensor also will be placed underneath the ATM body and also at the ATM's door.

When the ATM machine is lifted up to a certain height, the connection of the limit switch will be activated and sends an input voltage signal to the Arduino. The Arduino will process the input signal and sends an output signal to the alarm LED and buzzer. The buzzer will sound on and light up the alarm LED. At the same time, the GSM is activated by the signal from the Arduino and will send SMS to the bank security and the police.

1.5 Project Methodology

This project is carried out into two main parts which are the stages of system designing and evaluation of the performance as follows:

1. Design of the system
 - i) Electrical circuit construction and simulations: Arduino UNO board and Arduino IDE software
 - ii) Hardware construction and integration by doing the connection and soldering of the components.
2. Evaluation of the product performance
 - i) Product testing and analysis: Sensors sensitivity to detect the changes on its connection.
 - ii) Overall evaluation when the product is employed in the real environment.

1.6 Project Outline

Chapter 1 consists of the introduction of the project, including the project background and problem statement. Besides that, the objectives, scope of the project, and methodology of the project also are discussed and mention in this chapter. Then, a little explanation related to this project is discussed.

Chapter 2 covers on the literature review of the project. The literature review was obtained from journal paper, article, books and technical papers in order to get deep knowledge. The literature review includes three parts which are previous project study, hardware development and software development.

In chapter 3, project methodology is fully covered with discussion and explanation about the methods and approaches applied in this project. The method of designing ATM Security System with GSM Integrated Technology includes the electrical connection process and simulation. All steps of the design are explained in detail in this chapter.

The result of this simulation is analysed and explained in a very detailed statement in Chapter 4. The findings on analysis results are presented in this chapter.

Chapter 5 is the last chapter, which contains an overall conclusion of the project. The future works of the project are also mentioned and described in this project.

CHAPTER 2

LITERATURE REVIEW

The literature review is done by gathering information about this project from journal, articles, books and papers to gain deeper knowledge. This chapter describes some literature related to the information which utilizing the Global System of Mobile Communications (GSM) and the Arduino. Basically, this chapter is divided into two sections which are the hardware development and software development. The literature review is necessary before initiating the project and literature researches regarding the project are important in understanding the concept of the overall project.

2.1 Previous Project Study on the GSM Technology

Some case study and review of previous researches is performed to gain more information and understanding on GSM module. Previous study shows that there are many projects that are based on GSM applications that can be revised as a guideline towards completing this project.

2.1.1 Anti-Theft ATM Machine Using Vibration Detection Sensor

Ajaykumar and Bharath Kumar (2013) developed the Anti-Theft ATM Machine using Vibration Detection Sensor by using embedded system. The project was designed to provide a security system at the ATM centre where only authorized card will be detected by the sensor and only then the door will open automatically. With the development of sensor technology, vibration sensors will play an increasingly important role in scientific research and automate production process, and its

development will profoundly affect the development of national economy and national defence science and technology.

2.1.2 Development of Anti-Theft Vehicle & GPS Locator Using GSM

Nurul Afiza binti Othman (2012) developed an anti-theft vehicle and GPS locator using GSM. This project mainly focuses on the alarm system of safety element where it will trigger the alarm if there is any invasion or theft occurred. This alarm system introduces a combination of multiple electronic devices. When there is a change of electrical capacitance due to human touch, the detector will be activated and send a warning SMS to users.

2.1.3 Anti-Theft Alarm System Using GSM

Normaizatul Nabila binti Zakari (2012) has design and develop a GSM and GPS tracking system to prevent vehicles from stolen. It functions to enable and disable a vehicle using hand phone if the vehicle gets stolen. An SMS warning will be sent to user if someone trying to open the car door of the vehicle.

2.1.4 Automobile Anti-Theft System Based on GSM and GPS Module

Jian Ming, Li Jie and Guang Hui (2012) have developed an automobile anti-theft system based on GSM and GPS module. This system is developed based on the high speed mixed type single-chip C8051F120 and detect automobile stolen to the automobile owner by vibration sensor. Automobiles location can be obtained with the GPS module integrated in the anti-theft system. The system also can keep in touch with the automobile owner via the GSM module to monitor the safety and reliability of the automobile.

2.1.5 Secured ATM transaction Using GSM

Mistry, Kumar and Prasa (2013) has developed a secured ATM transaction using GSM through an embedded system. This project provides a foundation for the ATM industry. In order to maximize ATMs' effectiveness and profitability, card users

must feel safe and the ATM's vault must be secure from theft. New features have been introduced to the card user and account holder that allows the accessing of the account. Any unresolved acceptance messages will result in the denying of the access. Other features that has been installed together is the usage of infrared (IR) based sensor setup. Any misusing of the cards will result in notification SMS will be sent to both user and the bank manager through an RF wireless communication system.

2.2 GSM Module

According to Cohen (2009), GSM module is a hardware component that allows sending and receiving SMS to and from the system. RS232 serial port allows communication with the system takes place. A cellphone can be attached at GSM hardware, but it limits the hardware functionality, for example sending or receiving of SMS.

A GSM module is a module which accepts a SIM card and functions like a mobile phone because it operates over a subscription to a mobile operator. Basically, a GSM uses a circuit switching. This circuit switching allows a path to be established between two devices and when the two devices are connected, a constant stream of digital data is relayed. Three major systems in GSM networks, which are the Switching System (SS), The Base Station (BSS) and the Mobile Station (MS) (K. Maurya, M. Singh, and N. Jain).

a) The Switching System (SS)

The Switching System or called as SS is operating system and holds five databases within it which performs different functions. The databases are HLR, MSC, VLR, AUC and EIR. The major tasks of Switching System are performing the call processing and subscriber related functions (K. Maurya, M. Singh, and N. Jain).