UNIVERSITI TEKNIKAL MALAYSIA MELAKA

INTELLIGENT RECEIVING BOX INTEGRATED
WITH GSM NETWORK

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

by

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TAJUK: **Intelligent Receiving Box Integrated with GSM Network**

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DECLARATION

I hereby, declared this report entitled "Intelligent Receiving Box Integrated with GSM Network" is the results of my own research except as cited in references.

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Author's Name   :   Nur Liyana Binti Azizan

Date   :   06 January 2015

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Bachelor's Degree in Electronics Engineering Technology (Telecommunications)) (Hons.). The member of the supervisory is as follow:

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Mrs. Eliyana Binti Ruslan

(Principal Supervisor)

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(Co-Supervisor)

ABSTRAK

Pada abad ke-18-an, revolusi perindustrian membawa perubahan besar dalam sektor pembuatan, perlombongan, komunikasi, pengangkutan, elektronik dan pertanian. Pada masa kin terdapat banyak perkhidmatan atau sistem yang boleh membantu manusia untuk memudahkan kerja atau kehidupan mereka. Peti Menerima Pintar Bersepadu dengan Sistem Global untuk Telefon Mudah Alih (GSM) adalah berbeza dari peti simpanan lain yang menjual di pasaran. Ia akan membolehkan pemilik untuk diberitahu bila-bila masa dan di mana sahaja melalui penerimaan mesej. Para pengguna kotak pintar hanya perlu menunggu dan mengumpul dokumen penting mereka. Komponen paling penting projek ini adalah pengawal mikro yang bertindak sebagai fikiran sistem yang akhirnya mengawal sistem melalui pengaturcaraan. Fungsi unit kawalan ialah "Peripheral Interface Controller" (PIC) 16F877 pengawal mikro. Oleh itu, jika sensor telah dicetuskan, PIC akan memproses data yang diterima daripada sensor dan juga bertanggungjawab untuk menghantar isyarat kepada "Liquid Crystal Display" (LCD) skrin yang akan memaparkan jumlah dokumen. Selain itu, ia akan mempunyai bekalan kuasa dan juga bateri boleh dicas semula sebagai sandaran. Sistem kotak penerima direka bentuk untuk menggunakan rangkaian GSM. PIC, akan diprogramkan, oleh itu ia akan melaksanakan program untuk dapat mengira dokumen dan menghantar pemberitahuan melalui telefon mudah alih.

ABSTRACT

In the late 18th centuries, the industrial revolution brought about major changes in manufacturing, mining, communications, transportations, electronics and agriculture sectors. Those days there are so many services or systems that can help human to ease their work or life. The Intelligent Receiving Box Integrated with Global System for Mobile (GSM) Network is different from other pigeon holes that were selling in the market. It will allow the owner to be notified anytime and anywhere through receiving a message. The users of the intelligent box just have to wait and collect their important documents. The most important component of the project is the microcontroller that acts as the system's master mind which ultimately controls the system through a "Pro programming". The controlling unit is the Peripheral Interface Controller (PIC) 16F877 microcontroller. Consequently, if the sensor has triggered, the PIC will process the received data from the sensor and will also be responsible for sending the output to the Liquid Crystal Display (LCD) screen that will display the total amount of documents. Additionally, it will have a power supply and also a rechargeable battery as a backup. This intelligent receiving box system is designed to use a GSM network. The PIC, will be programmed, thus it will carry out the program to be able to count the documents and send a notifications through a mobile phone.

DEDICATION

To my beloved parents,

Mr. Azizan Bin Ab. Rashid and Mrs. Siti Ramlah Binti Hamid

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

IRB	-	Intelligent Receiving Box
SMS	-	Short Message Service
IR	-	Infrared Sensor
PIC	-	Peripheral Interface Controller
IC	-	Integrated Circuit
GSM	-	Global System For Mobile Communications/
		(Groupe Spéciale Mobile)
LCD	-	Liquid Crystal Display
SIM	-	Subscriber Identification Module
RF	-	Radio Frequency
RFI	-	Radio Frequency Identification
LED	-	Light-Emitting Diode
EEPROM	-	Electrically Erasable Programmable Read Only Memory
A/D	-	Analog To Digital
TDMA	-	Time Division Multiple Access
FDMA	-	Frequency Division Multiple Access
3G	-	Third-Generation (3G) Network
4G	-	Fourth-Generation (4G) Network
LTE	-	Long-Term Evolution
E (EDGE)	-	Exchanged Data Rates for GSM Evolution

CHAPTER 1

INTRODUCTION

Chapter 1 will be discussed about an introduction of the project. The main idea is about the background and objectives of the project will be discussed.

1.1　Project Background

Nowadays, pigeon hole seem to be the most important system for submitting personal document or student's assignments in a university. Commonly pigeon hole used by lectures but however regular people who work in an office are also regular user of pigeon hole or others might called it as a mail box. In order to receive an important document without worrying it will be lost or stolen, it must be able to register the receiving document and alert the owner. The intelligent receiving box acts like a pigeon hole but it is different from normal pigeon holes that are sold in the market.

Although there is a lots of expensive pigeon hole in the market still, it is not guaranteed that it will satisfy most of the customers' needs. With the aid of a technology that will be incorporated into the pigeon hole box this will improve and expand a lot of functions and also can reduced the problems that most user will encounter such as loss of important documents. Intelligent Receiving Box (IRB) is the new generation of a pigeon hole. IRB is able to notify the owner through Short Message Service (SMS) and at the same time it will notify the total amount of document that the user receives by end of the day. User can set whether to notify by specific time intervals or ended of working time.

By using the infrared (IR) sensor, it will detect the document that relayed or inserted into the box. After the sensor has triggered, it will automatically send information to the PIC to be accounted. The infrared sensor will count the total number of documents based on the total amount of insertions made. Subsequently, it will display on the liquid crystal display (LCD) screen the total amount of the documents in the IRB. The proposed system consists of two parts, namely the transmitting unit and receiving unit. The Transmitting unit involves a sensor and microcontroller that will transmit the signal to the Global Service for Mobile Communication (GSM) Modem when the sensor is triggered.

After the GSM has transmitted according to the user's specification, then it will receive the signal or Short Message Service (SMS) through the owner mobile phone. The Peripheral Interface Controller (PIC) will be programmed to detect input and send output to the owner's mobile phone. In addition added security features will be incorporated into the intelligent receiving box so as to fortified security and to avoid data tampering or invasion. This will make the user of IRB to feel more secure and safe about their important documents. By using a keypad 4x3 input, it is easy for the user to enter their password. After entering their password correctly the box will automatically unlock the door. In Figure 1.1 shows the layout of this project.
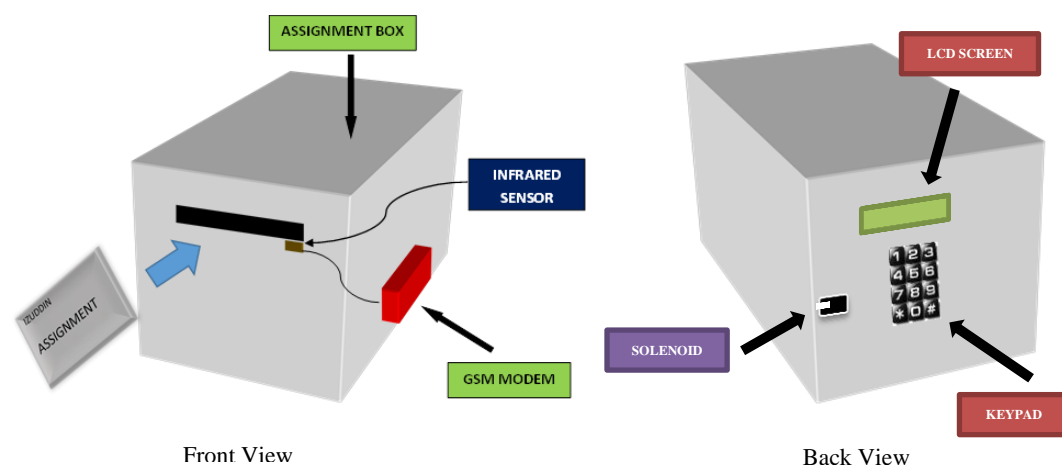

Figure 1.1: Layout of Intelligent Receiving Box

1.2 Problem Statement

Loss of documents and unaware receiving important documents can at times caused huge problem to the user. Imagine important documents that need urgent attention are unattended immediately because the users are not alerted or aware about it. This sometime will cause miss opportunity especially if it involved business dealings' documents. Thus based on this problem, there is certainly a need to develop the Intelligent Receiving Box or IRB. IRB will provide the impeccable security system for deposited documents and at the same time will ensure that any received documents will be alerted to user on real time basis. IRB will also filter and ensure that documents delivered are for the intended recipients only. Obviously IRB will instil confident among student knowing that their assignments or documents sent to their respective lectures are safe and secured.

This proposed project also has some limitations because this GSM modem operates just like how a cell phone operates. It will able to operate or send a SMS when the SIM attached in. However, the user needs to top up the Subscriber Identity Module for a mobile phone (SIM) regularly to maintain its operation period validity. Another important limiting element for a GSM modem is that the system needs a good coverage to make the process of sending SMS happens quickly without any interruption.

Another limitation in this project is that the system can only count the amount of assignment inserted in the box by using infrared sensor. Unfortunately, the infrared sensor can only detect one incoming document at any one time. Hence, if any students send more than one assignments at any one time, it will be considered as one document only. So the lecturer cannot get the exact amount of assignments that they need to know at the end of day.

1.3   Objectives

The objectives of this project are to:
a) develop and implement an intelligent receiving box, which uses Global System for Mobile Communication (GSM) modem to send the Short Message Service (SMS) to the owner.
b) demonstrate this system can count the amount of assignment inserted in the box with an additional infrared sensor
c) design a user friendly interface and where the user can easily understand the instructions of the product.
d) study the art of programming in C language and C++ language.
e) focus on all hardware skills, electronic knowledge and technology idea with some software development in building this project.

1.4   Scope of Work

This project will focus on these few scopes. Firstly, on the Global System for Mobile Communication (GSM) must support all the numbers whether it is under the telecommunication provide such as Celcom, Digi, Maxis or others. Secondly, it will focus on the PIC programming using PIC16F887 and the combination of all components in a circuit.

Thirdly, this project will also focus on the sensor that will able to detect any documents that the intelligent receiving box received one by one. Fourthly, the focus will be on the security system that will secure the documents if the inputted password is entered wrongly. Lastly, the scope focuses on the smart, easy and compact design of the box as an additional feature to satisfy aesthetic demand of the users.

1.5   Project Significance

By inventing this intelligent receiving box, it will gives a lot benefits to students and lecturers. Students are able to send their assignments without worrying that the assignment will be loss or stolen by other students. Other than lecturers also will gain some benefits such as they can be notify if the assignments or documents is not the right amount to be receive. In addition, the system will send SMS the total amount of assignments or documents should be receive in a certain period. Moreover this application can also be implemented in the offices or libraries. Lastly, the contribution of this project is the real time alert system that uses Global System for Mobile Communication (GSM) modem to send the Short Message Service (SMS) to the user and the technology of the infrared sensor that is able to sense a document or assignment entered through the hole of the box.

1.6   Thesis Structure

Chapter 1 will discuss about the introduction of the project. The background and objectives of the project will be discussed in this chapter.

Chapter 2 will cover the literature reviews of the project. This chapter will elaborate the concept of the research involved, the differences between projects to the related field and various types of components that are utilized in this project.

Chapter 3 will detail out the methodology and process that will be under taken to complete the project. This chapter will elaborate the detail development of this project such as the equipment used, software development and others.

Chapter 4 is about the result obtaining based on the methodology used. The obtained result will be analyzed and based on the objectives and problem statement.

Chapter 5 is about the discussion and summary of project achievement. It also includes the conclusion and recommendation that can be taken for future improvement of the project.

CHAPTER 2
LITERATURE REVIEW

Chapter 2 will cover the literature reviews of the project. This chapter will elaborate the concept of the research involved, the differences between projects to the related field and various types of components that are utilized in this project.

2.1   Introduction

This chapter will discuss the overall overview of the project - the Intelligent Receiving Box Integrated with GSM Network. This Intelligent Receiving Box is the new improved technology that is applied or incorporated to the normal pigeon hole box. In addition, this project is the solution for the problem statement that was stated in chapter 1. Once these ideas are expressed then the next crucial step is to evaluate whether these ideas are achievable or not. This can only be done by summarizing previous research on related topic and this step it is also commonly known as literature review. The purpose of literature review is to list out the strength and weakness of an established idea and knowledge to the reader. It also shows the method used and the selection of devices and software to build up other related systems. The literature review can be either from thesis, scientific journals, part of research project and current or existing system.

2.2   Project Review

Although there are many pigeon holes product on the market currently, but none of these products have the features of the Intelligent Receiving Box Integrated with GSM Network. Therefore, based on the literature review that has been extensively carried out it could be concluded that Intelligent Receiving Box Integrated with GSM Network is a new such technology to be developed. Without any previously developed technology or system to base upon, the task of building or inventing the Intelligent Receiving Box Integrated has to start with focusing on hardware structure, system design and implementation. Here are some projects obtained from online survey and that are found to have some basic connection to this project.

2.2.1   RFID and GSM Mailbox

This project is made by Madhan Mohan Reddy B that implements a RFID tag to the courier and sends the identity number to the receivers mobile. The receiver of the courier will have a letter box which has a Radio Frequency (RF) reader and a dedicated GSM modem in it. As soon as the courier boy drops the letter into the mailbox, the RF reader reads the identity number of the tag and informs the same to a micro controller. Next it will then compare it with the identity number send by the courier office and if both the same then it sends message to the receiver and also to the courier office about the arrival of the courier. This system has used a microcontroller which acts as a medium of communication between the RF reader and the GSM modem.

Other than that, by looking at the design of this project, the whole system also requires a microcontroller. The PIC is the important part which will function as the brain of this system. (Madhan, 2011) in his written document entitled "Rfid And Gsm Based Intelligent Mail Box" stated that PIC also will communicate between the RF and the GSM modem. In addition this project stated that it has some advantages which are the presence of the GSM modem that enables the device to communicate

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with the receiver anywhere. Although this project has advantages, however this project also have some disadvantages too.

The advantages of this project are that, it is not suitable to place a RFID tag on each letters. Other than that, if the letters have defects of the RFID tag, this system may not sense the tag at the mailbox and will not operate properly. Lastly, this project does not implement the security to keep the letters safe. In Figure 2.1 is the example project of RFID and GSM Mailbox.

Figure 2.1: RFID and GSM Mail Box

Besides that, this project uses RFID and also GSM. RFID is used to describe a system that transmits the identity in a form of a unique serial number of an object using wirelessly or using radio frequency. This application uses typical RFID tags that consist of a microchip. It is attached to a radio antenna. However is not very suitable to use at a mailbox, this is because this technology needs a reader. Tag readers that read bar code, or number or others that will emit radio waves and receive signals back from the tag.