IN-VEHICLE SIGNING SYSTEM USING RFID

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This report is submitted partial fulfillment of the requirement for the award of Bachelor of Electronic Engineering Computer Engineering With Honours

Faculty of Electronic and Computer Engineering
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Tajuk Projek : **IN-VEHICLE SIGNING SYSTEM USING RFID**

Sesi Pengajian: **2010/ 2011**

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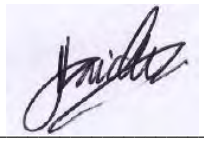

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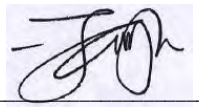

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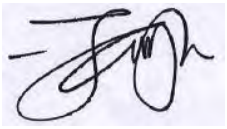
Signature : 

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Especially for

My beloved mom(Hasidah bt Ayob) and dad (Arobi b. Bakar)

My lovely sister(Rasimah bt Arobi), My Family

My supervisor
Mr Ahmad Nizam Bin Mohd Jahari@Johari

All beloved friends

Thanks for everything...

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ABSTRACT

Road traffic sign is very important and has been used as common guidance to vehicle drivers globally. Usually, traffic sign located at the roadside are likely to be overlooked than dynamic visual information during driving. In this report, the development of In-Vehicle Signing System using Radio Frequency Identification (RFID) technology is discussed. The system is designed to alert the vehicle driver on the speed limit signboard at low speed area such as at school, university campus and curve area. This project system was designed to read traffic sign depend on the signal data stored in RFID tags. The data was presented as an alarm and image data on vehicle terminal screen using Visual Basic 6 (VB6) software as Graphical User Interface (GUI). Microsoft Comm. Control 6.0 is used to connect the Visual Basic with serial port for RFID communication. The process of programming in VB6 will drive the output as a sign display in the vehicle terminal (computer). The GUI was connected with Microsoft Access 2007 database that store the tag data using Microsoft ActiveX Data Object (ADO) tool in VB6. As a result, this system was able to alert the driver about the speed limit at the low speed area. The in-vehicle signing system is suggested to replace the existing static traffic sign that located at the road side.

ABSTRAK

Papan tanda isyarat adalah sangat penting dan secara umumnya digunakan sebagai petunjuk kepada para pemandu kenderaan. Akan tetapi, papan tanda isyarat dan maklumat visual statik biasanya akan terlepas pandang berbanding dengan maklumat visual dinamik atau visual bergerak semasa pemanduan dilakukan. Di dalam laporan ini, Sistem Paparan Isyarat dalam Kenderaan menggunakan RFID akan dibincangkan. Projek ini merekabentuk sistem yang akan memaparkan isyarat jalan di dalam kenderaan menggunakan teknologi *Radio Frequency Identification* (RFID). Sistem ini dibina bertujuan untuk memastikan pemandu kenderaan sentiasa dalam keadaan berwaspada dalam mematuhi had laju yang telah ditetapkan terutamanya di kawasan-kawasan berkelajuan rendah seperti kawasan sekolah, kampus universiti dan kawasan selekoh tajam. Sistem paparan isyarat papan tanda ini direkabentuk bergantung kepada data yang disimpan dalam tag RFID. Paparan isyarat papan tanda di dalam kenderaan dihasilkan dalam bentuk imej visual dan berpenggera menggunakan perisian Visual Basic 6 (VB6) sebagai grafik antaramuka atau GUI. Dalam perisian VB6, perkakas *Microsoft Comm. Control 6.0* digunakan untuk menghubungkan perisian dengan RFID. Proses merekabentuk dan pengaturcaraan dalam perisian VB6 akan menghasilkan GUI bagi sistem ini. GUI berhubung dengan pangkalan data menggunakan perkakas *Microsoft ActiveX Data Object (ADO)* yang terdapat pada perisian VB6. Sebagai hasil, sistem ini dapat memastikan pemandu lebih berwaspada ketika pemanduan terutamanya di kawasan berkelajuan rendah. Sistem Paparan Isyarat dalam Kenderaan menggunakan RFID ini disaran dapat menggantikan isyarat trafik yang terdapat di pinggir jalan.

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INTRODUCTION

1.0 Introduction

Traffic signs visually provide drivers with regulatory, warning and guide information. Vehicle drivers are requested to collect dynamic visual information such as traffic signals and static visual information including traffic signs. However, traffic signs and other static visual information are having less benefit and tendency to be overlooked than dynamic visual information during driving are higher. The traffic signing system can be improved by using RFID technology.

The RFID technology is a wireless sensor technology which is based on the detection of electromagnetic signals [1]. Electromagnetic passive RFID tags require no power source, are highly resistant to dust or obstacles and of very small size. Tags are so cheap that they can be installed in large numbers [2]. An in-vehicle signing system is built and assessed that uses general-purpose RFID tags as digital traffic signs and communications between the road surface and vehicle equipment.

1.1 Problem Statement

Nowadays, too many accident happened because of lose control of the vehicle due to over speed driving. Besides that, drivers are lacking of concentration during driving, their comfortable vehicle and does not notice and realize about the traffic signing especially speed limit signboard. This contributed to increase the number of vehicle accidents from time to time. In addition, many drivers are not focuses on their driving because of not aware of the traffic signs, especially speed limit signs. As a solution to this problem, the signal display system in a vehicle has been built to make driver more alert on every condition when their driving. The system will display traffic signs in the vehicle using RFID technology as an alternative to replace the signal board on the existing road.

1.2 Objective

i. To study and understand the RFID system and implementation
ii. To create a system that aims to make drivers be more cautious when approaching the sign board area.
iii. Design interface of traffic signal display system in the car.
iv. Building a database to store data related to traffic signs

1.3 Scope

The scope of work in this project is:

i. Build an interface and assessed an in-vehicle traffic signing system using passive frequency identification (RFID) tags. For example accessed in vehicle speed limit, especially in low-speed areas such as area schools, hospitals, university campuses and the sharp bend / hill.
ii. Build a database by using Microsoft Access 2007 to store RFID tag data and data on the signal board
iii. GUI is developed by using Visual Basic 6 that connected with RFID
iv. Design circuit using PIC 16f877A and connected with RFID
v. Testing display systems in vehicles that have been designed

1.4 Report Outlines

This thesis is a written documentary that contains records such as the idea generated, concepts applied, activities done and the final year project product itself. It consists of five chapters. Following is a chapter-by-chapter description of information in this thesis.

In Chapter 1, discussion on what the project is really all about, such as the introduction of the project, the project objectives, problem statement and the scopes of project that been elaborated.

Chapter 2 looks into the literature review that has been done especially on the theoretical concepts on the various methods and applications in stability monitoring systems of high rise buildings currently being practiced. This chapter discusses the background study, the stability monitoring system and the optical technique being used.

Besides that, this chapter provides the preview on the concepts and fundamentals of Radio Frequency Identification (RFID), Image Processing, Global Positioning System (GPS), Dedicated Short-Range Communication (DSRC) and the basic concepts of the system applicable to achieve the objectives of the project.

Chapter 3 is regarding the project methodology that involves the necessary tasks and activities to be undertaken to complete the project such as hardware development and software development that form the major bulk of the project. Besides that, this chapter also describes how to integrate the hardware and software to function as complete system.

Chapter 4 discusses about the results from the research and literature review and the option that is suitable for the project development. It also discusses on the improvement that can be done in this project.

Finally, Chapter 5 contains the summary of the final year project. Problems encounter during progress of the project will also be discussed in this chapter. The conclusion, suggestions or recommendations for improvements can be implemented in future are discussed as well.

CHAPTER 2

LITERATURE REVIEW

2.0 Literature Review

This chapter will be focusing on the technology and software that can be used in this project. The previous studies or project that has been done by previous researcher will also be discussed.

2.1 Radio Frequency Identification (RFID)

Radio-frequency identification (RFID) is a technology that uses communication via electromagnetic waves to exchange data between a terminal and an object such as a product, animal, or person for the purpose of identification and tracking. Some tags can be read from several meters away and beyond the line of sight of the reader. Radio-frequency identification involves interrogators (also known as readers) and tags (also known as labels) [3]. RFID systems can be classified into two categories according to the tags power supply: active RFID systems or passive RFID systems. In passive RFID tags require no power source, are highly resistant to dust or obstacles and of very small size. Tags are so cheap that they can be installed in large numbers.

RFID tags store information by a small integrated circuit that will communicate via antennas that located on the tag reader. RFID readers are capable to reading information on the tag and send the information to a computer terminal [5].It will receive a radio frequency from RFID tag before it sends to computer. RFID reader and tag must follow the same standard to make a communication between readers and tag successfully Figure 2.1 shows the components block of RFID systems.

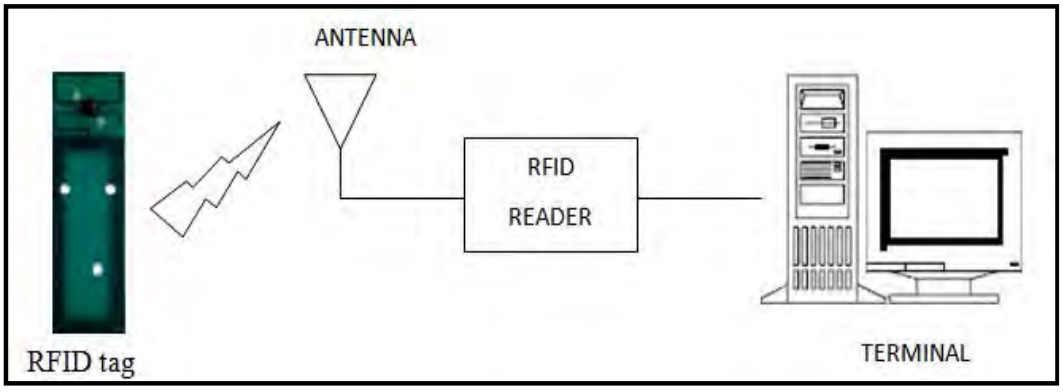


Figure 2.1: The Components Block of RFID Systems.

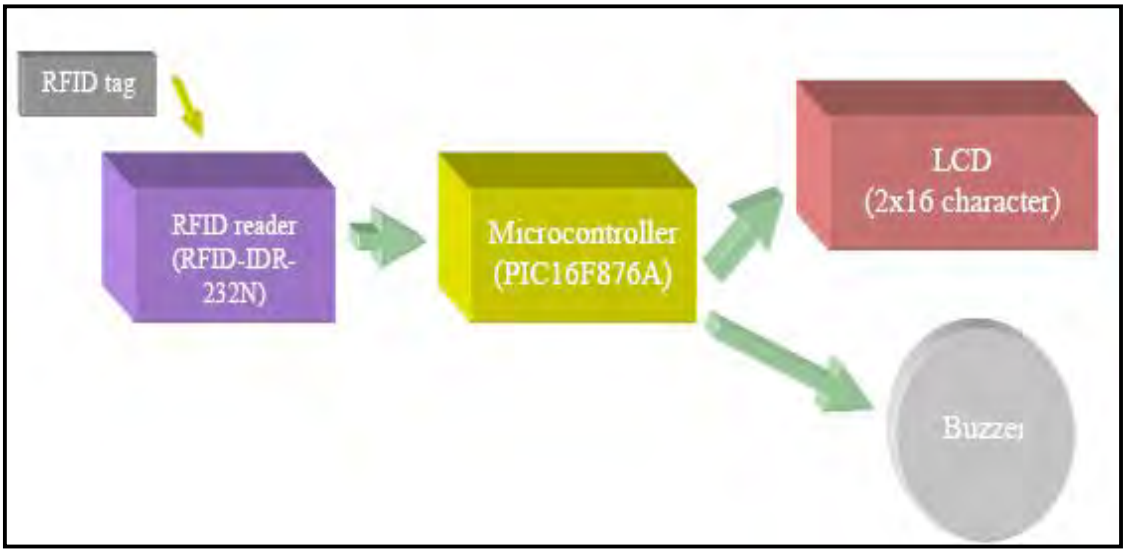


Figure 2.2: System Overview RFID with PIC 16F877A

RFID tag also can be read and display using microcontroller (PIC 16F877A). RFID-IDR-232N can be connected to PC or microcontroller as part of embedded system. In this project as shown in figure 2.2, the reader will be interface to a microcontroller. Assembly language or C compiler (depending on microcontroller type) can be used to write program in microcontroller. RFID-IDR-232N will read the ID from RFID tag if the tag is near enough to RFID Reader. The ID is normally 10 digit of number. RFID-IDR-232N will automatically send this ID with 1 byte of Start of heading (0x01), followed by 10 byte of ASCII character (ID) and 1 byte of Start of text (0x02).

When the RFID tag is place near the RFID reader, the RFID reader read the RFID tag, further sends the tag ID to the PIC microcontroller. PIC microcontroller process the tag ID, the user name and the tag ID will be display on the LCD display.

In general, low frequency RFID passive tags have the capability of communication distance of about 30cm. While high frequency passive tags within 1m and Passive Ultra High Frequency tags (UHF) have an effective range of 3-5m. Comparison of the specification of passive RFID and active RFID are shown in table 2.1.

Table 2.1: Comparison of the specification of passive RFID and active RFID

	Active RFID	**Passive RFID**
Tag battery	Required	Not required
Availability of power	Continuous	Only in field of reader
Range	Up to 100m	10mm up to 5m
Tag power source	Internal to tag	Energy transferred using RF from reader
Required Signal Strange From Reader	Very low	Very high
Available Signal Strange from Tag to Reader	High	Low
Size	Larger	Small
Multi-Tag Collection	• Collects 1000s of tags over a 7 acre region from a single reader • Collects 20 tags moving at 100 mph	• Collects hundreds of tags within 3 meters from a single reader • Collects 20 tags moving at 3 mph^2 or slower
Sensor Capability	Ability to continuously monitor and record sensor input; date/time stamp for sensor events.	Ability to read and transfer sensor values only when tag is powered by reader; no date/time stamp.
Data Storage	Large read/write data storage (128KB) with sophisticated data search and access capabilities available.	Small read/write data storage (e.g. 128 bytes)

2.2 Software

Nowadays, various applications are available for building and managing databases system. There are ranges of database management software that can be used. Each software comes with different features and used for different applications. The database management software that is usually used is MS Access, SQL Server, and Oracle. Studies are done in choosing database management software to be developed accordance with the In Vehicle signing Systems. The criterions for identified software are choosing the best software and compatible with the system. Among the criteria to be considered are:

i. The database can accommodate the number of total number of data is high.
ii. User-friendly GUI.
iii. Reasonable prices for commercial purposes.

2.2.1 Visual Basic

Visual Basic (VB) is a software and programming language developed by Microsoft Company. It is derived from the BASIC and can be used in Rapid Application Development (RAD) for advanced graphical interface or Graphical User Interface (GUI). VB on the database is using tools such as Data Access Objects (DAO), Remote Data Objects (RDO), or ActiveX Data Objects (ADO) and ActiveX objects.

Writing programming languages such as VBA and VBScript is commonly used in VB through in different methods. Programming in VB is a combination of a visual component parts or control over the form, setting properties and actions of each component. Lines are addition to writing code for the display system of multiple functions. Because of the properties and actions have been determined for each component, it can facilitate the process manual for the construction of more simple program.

Due to its advantages, the use of Visual Basic development system has been applied extensively in various fields such as project "Development of a Modern Control System Analysis Package Using Visual Basic Programming" by M. F. Khan Rahmat and Shu, Lee [4].

2.2.2 Microsoft Access

Microsoft Access (MS Access) is a database management system from Microsoft that can connect to the Microsoft Jet Database Engine with a GUI interface and tools for software development. MS Access is one of the software in Microsoft Office 2007 system.

MS Access software to use and retrieve data stored in Access or Jet, Microsoft SQL Server, Oracle and others. MS Access is usually used in small businesses, departments within large companies, and the programmers to design ad hoc customized desktop systems in handling and manipulating data [6].

From the perspective of the functions that programmers, one of the advantages of this software are comparable to the Structured Query Language (SQL). Queries can be displayed graphically or edited as SQL statements and SQL statements can be used directly in Macros and Visual Basic Applications (VBA) Modules to manipulate tables in MS Access. Other than that; it allows the data to be viewed and modified easily at any time. It can create different types of interface objects that allow working with the data in the databases become simple and efficient. Users can combine and use both VBA and Macros for programming procedures.

MS Access is software that is most suitable for use in accessing the database from VB6. By using the relationship Jet 4.0, MS Access database from VB6 to be linked with more easily. Thus, MS Access was chosen for use in the construction of a database for the development for the In Vehicle Signing System.

2.3 Previous work

There are several hardware and technologies that has been used in line to in vehicle signing system. Several of those technologies that have been implemented are as follows:

i. Digital Short Range Communication (DSRC)
ii. Image processing
iii. Global Positioning System (GPS)
iv. Radio Frequency Identification System (RFID)

2.3.1 Dedicated Short-Range Communications (DSRC)

Dedicated short-range communications (DSRC) are one-way or two-way short-to medium-range wireless communication channels specifically designed for automotive use and a corresponding set of protocols and standards. It offers communication between the vehicle and roadside equipment. It is a sub-set of the RFID technology. This technology for Intelligent Transporting System (ITS) applications is working in the 5.9 GHz band (U.S.) or 5.8 GHz band (Japan, Europe). Table 2.2 below shows the specification for DSRC [7].

Table 2.2: Specification for DSRC

Carrier frequency	5.8Ghz-band
Modulation method	Amplitude shift keying (ASK)
Transmission bit rate	1024 kbps
Communication type	Broadcast and two way
Communication zone	30m or less

The project by Hiroshi et. al. proposed for The Japanese Advanced Cruise-assist Highway System (AHS).This system provides driving support services through collaboration between the system and vehicle. *AHS* used Dedicated Short-range Communications (DSRC) for road to vehicle dialog that requires real time and high reliability operation. AHS-DSRC constitutes a small radio zone that provides driving support information. DSRC incorporates a marker beacon and an information beacon that are successively positioned at the roadside. The marker beacon is located at the starting point of the service area, while the information beacon is located at the information-provision point. The combination of marker beacon and information beacon lets the vehicle know the direction of driving and decides whether the service is required. Figure 2.3 shows the layout of the beacons [7]

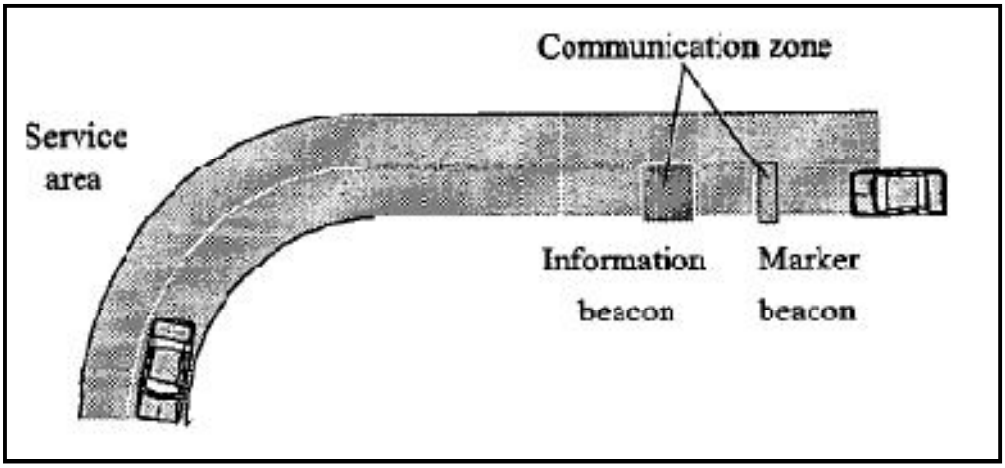


Figure 2.3: The Layout of the Beacons

The studies also have been made of traffic signing systems using DSRC and systems using digital road data. The project by Oki et. al. [8] describes a verification system for roadside-to-vehicle communications by the Dedicated Short Range Communication (DSRC) system for prevention of vehicle overshooting on curves. It also describes the results of AHS service effectiveness verification, drivers' evaluations, and verification of the reliability of the AHS support system. This system help the driver safely maneuver through a curve by providing such messages to the driver as "No over speeding" and "Slow down" before the vehicle enters the curve via 5.8-GHz short range communications. Systems using DSRC offer reliable communications but involve problems of cost and space if they are to be installed on ordinary roads.

2.3.2 Image Processing

Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video. The output of image processing can be either an image or a set of characteristics or parameters related to the image. The recognition process, the camera captures the scene images continuously and forwarded the captured image to the computer for further processing. The process of image recognition is shown in figure 2.4.

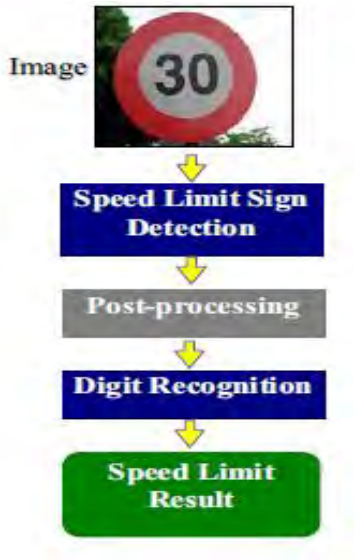


Figure 2.4: Process of Image Recognition

Studies have also being carried out on image processing in which traffic signs are automatically detected by camera captures the scene images continuously and forwarded the captured image to the computer for further processing. Khairul, Salina, and Aini [9] have made possible the recognition of traffic signs and signals based on the data on their color and shape by eliminating from the image other types of data that are not to be recognized. Figure 2.5 illustrates the overall system configuration. Allow cost web camera is mounted on the driver's side roof rack, looking outside to road. This position was chosen to allow the camera to share the same viewpoint as the driver. In this way, both the camera and driver will have nearly the same visibility of speed limit signs that are placed beside a don the road. During the recognition process, the camera captures the scene images continuously and passes the captured image to the computer for further processing.

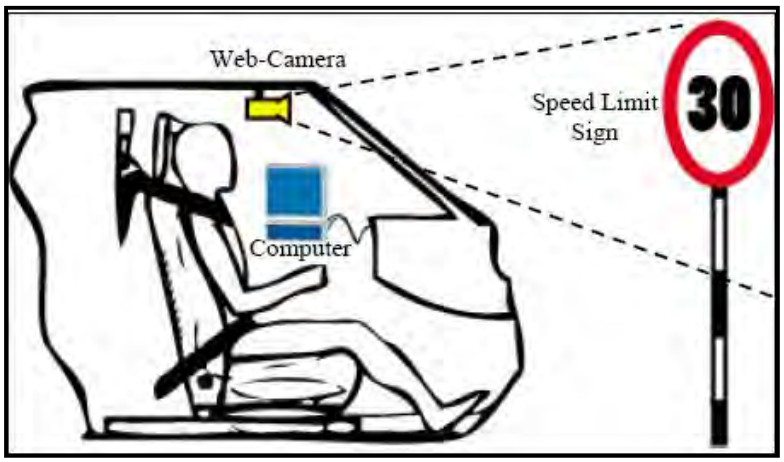


Figure 2.5: Overall System Configuration

Detecting and recognizing road sign objects in an image frame involves a wide range of operations and algorithms. The speed limit sign recognition system will perform two major tasks: detecting speed limit sign and digit recognition. The speed limit sign detection module is the primary engine of the system. It receives an input image, performs noise filtering, object segmentation and localizes the object. Note that, the input data are the colored video taken from a moving vehicle. The object of interest is extracted from the original image. The next phase is handled using the post-processing module that will enhance the possible digit region and remove unnecessary objects

.Lastly, each digit will be fed to the digit recognition module for the classification process. This project proposed a system to alert drivers with a speed limit sign recognition process. The system notifies the drivers the allowable speed limit. This will alert them to reduce their driving speed [9].

Kohashi et. al. [10] have made possible the recognition of traffic signs and signals based on the data on their colour and shape by eliminating from the image other types of data that are not to be recognized. Makanae and Kanno [11] have proposed traffic signs designed to be recognized by computer and evaluated their visibility. Image processing systems are inapplicable where visibility is poor because of the weather or the visibility ahead of the vehicle is deteriorated by large vehicles.

2.3.3 Global Positioning System (GPS)

Jean Marie Zogg [12] state that GPS is a process used to establish a position at any point on the globe The following two value can be determine anywhere on earth:

i. One's exact location (longitude, latitude and height co-ordinates)
ii. The precise time (Universal Time Coordinated, UTC)

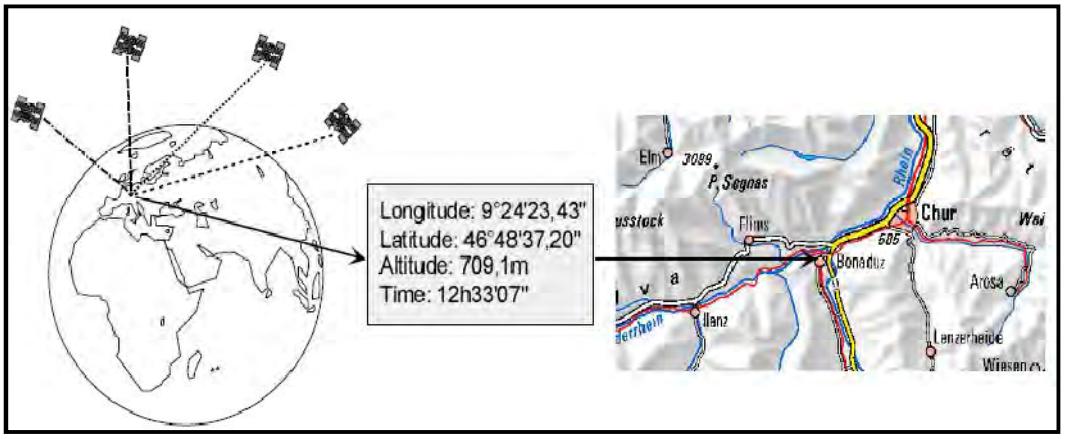


Figure 2.6: The basic function of GPS

GPS receivers are used for positioning locating, navigating, surveying and determining the time and are employed both by private individuals (e.g. for leisure activities, such as trekking, balloon flight and cross-country skiing etc.) and companies (surveying, determining the time navigation, vehicle monitoring etc.)[12].The latter systems by Uchimura et. al. [13] extract positions of traffic signs from an image of a road scene incorporate the position data into digital road data and present traffic sign data with geographic information using a GPS-based car navigation system.

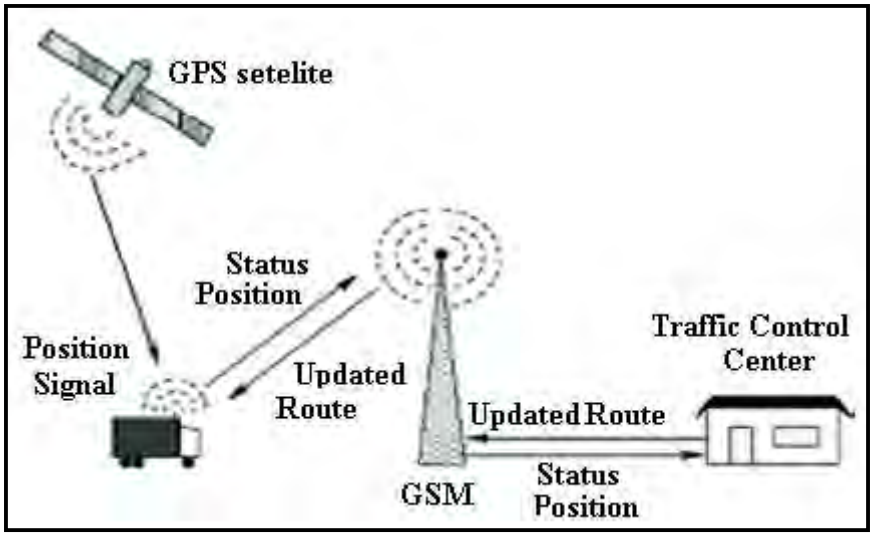


Figure 2.7: The information flow between the vehicle and the traffic control center

Intelligent Transportation Systems (ITS) and Traffic Management Systems try to provide passengers with efficient instructions, in order to avoid congested roads and reach their destination sooner. Traffic Management Systems (TMS) are an ITS's functional area that is responsible for gathering information about traffic and deliver it to drivers. TMS involve detection, communication and control. The main idea is a surveillance system that detects traffic conditions and transmits the information to a traffic management center. The traffic management center processes the real-time traffic data and sends them to the drivers. The contribution of Global Positioning System (GPS), which give the position of the vehicle with accuracy of a few tens of meters, is of great importance for the development of ITS. The information flow between the vehicle and the traffic control center is shown in figure 2.7 [19].

GPS-based systems do not provide for dynamic update of signs on the map and provide less accurate position data in places where GPS is unavailable such as tunnels and other structures.

2.3.4 Radio Frequency Identification (RFID)

Nowadays, the RFID technology has been widely used such as medical surgeries, animal identification, baggage handling, library service and real time location tracking. Referred to Yoon, Chung and Lee [14] , RFID is an automatic identification method, whereby identification data are stored in electronic devices, called RFID tags (transponders), and these data are retrieved by RFID readers (interrogators) using radio frequencies. RFID systems can be classified into two categories according to the tags power supply: active RFID systems or passive RFID systems.

The specification project and configuration policy of RFID tag system which is to be an infrastructure for pedestrian navigation applications. These project systems combined with various kind of information provision function contribute to helping those who have, so-called, “digital-divide” such as elderly and disable people, overseas and domestic visitors etc.

Based on the studies of M. K. Yeop Sabri, M. Z. A. Abdul Aziz, M. S. R. Mohd Shah and M. F. Abd Kadir, RFID has been used as a web-based attendance record for attendance problems among students [15]. This system receives 5 different levels for each accessed the Administration, Student, Lecturer, and University Administration and accessed, where each guest has access to a limited extent on the level of a consumer. In addition, Whai-De Chen and Hsuan-Pu Chang also applying RFID technology in the development of projects related to recording the presence and traffic problems [16].The system will send information to parents of student attendance through mobile phones in the morning and monitor the traffic situation around the nursery, especially when parents want to take their children.

The flow of this project is illustrated in Figure 2.8. When a student goes into the school, the reader will respond the student's tag and write his/her information into the roll file. At the same time, the system reads the information of the student and sends message to his/her parent through the massage sender. It proves that the student has reached school safely, and let his/her parent work without worry.

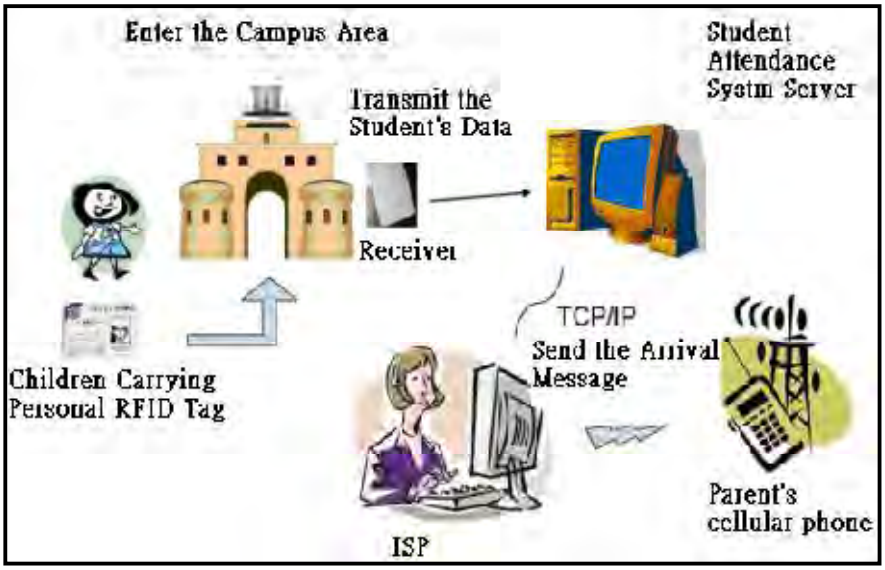


Figure 2.8: Usage for an active attendance system when entering school

Other than that, RFID technology also has been used to monitor transportation systems which refer to project of Transportation Quality Monitor Using Sensor Active RFID [18]. Active RFID has been used to monitor the container tracking from Yokohama Port to Kobe Port with our active RFID Systems.

Active RFID tags are constantly powered, whether in range of a reader or not, and are therefore able to continuously monitor and record sensor status, particularly valuable in measuring temperature limits and container seal status. Additionally, active RFID tags can power an internal real-time clock and apply an accurate time/date stamp to each recorded sensor value or event. The results show that our active RFID system has the capability to acquire a movement history and sensor data easily with low power consumption without GPS.

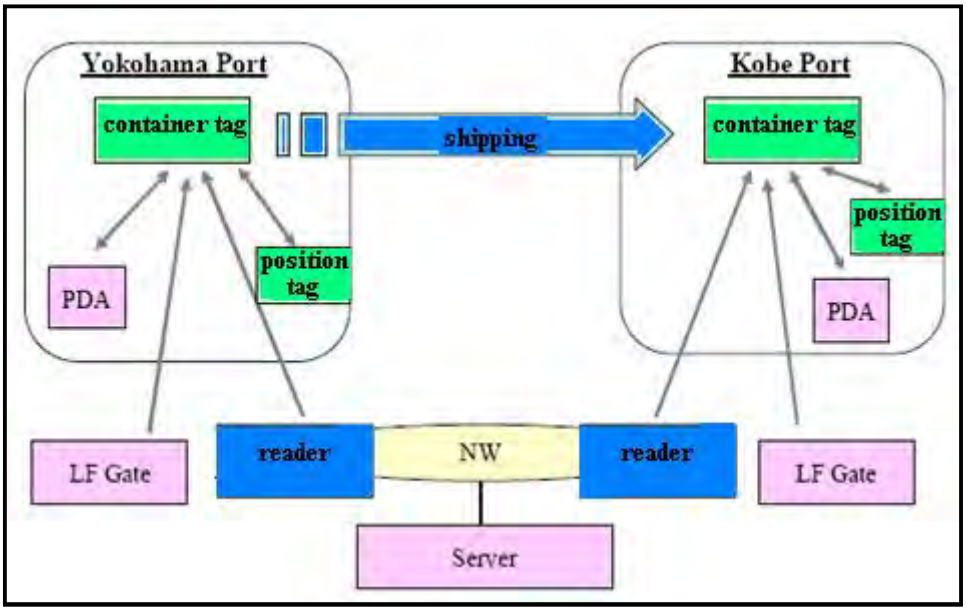


Figure 2.9: Configuration System "*Transportation Quality Monitor Using Sensor Active RFID*"by Kohei Mizuno and Masashi Shimizu.

For this project the RFID technologies is been chosen because RFID tags are therefore free from the problems related to the cost and location of installation of DSRC, accuracy of position data provided by GPS or visibility where image processing is adopted. RFID offers communications only in a limited area because it uses feeble radio waves. RFID can provide information in specified areas, so it can identify positions highly accurately. Electromagnetic passive RFID tags require no power source, are highly resistant to dust or obstacles and of very small size. Tags are so cheap that they can be installed in large numbers.

2.4 Summary from Previous Study

This indicates that the methodologies and technologies have been used and a summary of previous projects that have been made. The summation is shown in Table 2.3.

Table 2.3: Comparison of previous projects

	This project by Hiroshi et.al. (2003)[3]	**This project by John Fawcett et. al (2000) [5]**	**This project by Uchimura et. al (2002) [4]**	**This project by Kohei et. al (2007)[6]**
Technology	Dedicated Short Range Communication (DSRC)	Global Positioning System (GPS)	Image Processing	Radio Image Processing (RFID)
Project Purposed	System help the driver safely through a curve by providing such messages to the driver as "No over speeding" and "Slow down" before the vehicle enters the curve	System attract positions of traffic signs from an image of a road scene, incorporate the position data into digital road data and present traffic sign data with geographic information using GPS based car navigation system	To recognition of traffic signs and signals based on the data on their colour and shape.	Used to monitor the container tracking from Yokohama Port to Kobe Port with active RFID Systems.
Range	30m or less	-	-	Up to 100m
Disadvantage	DSRC offer reliable communications but involve problems of cost and space if they are to be installed on ordinary roads	Do not provide for dynamic update of signs on the map and provide less accurate position data in places where GPS is unavailable such as tunnels and other structure	inapplicable where visibility is poor because of the weather or the visibility ahead of the vehicle is deteriorated by large vehicles	Active RFID-high cost and larger size than passive RFID

CHAPTER 3

METRODOLOGY

3.0 Methodology

The project is to design a system that will display the signal path in the vehicle using Radio frequency identification technology. The entire system is divided into five main phases in order to complete the design requirements. The phases are preliminary investigation, analysis and identifying, design, implementation and development and maintenance and troubleshooting. These projects are divided in two methods, namely software development and hardware development. And both methods will be combined with RFID separately as shown in figure 3.1.

3.1 Phase 1: Preliminary Investigation

For this stage the problem from traffic sign is identified. Traffic sign are more likely to be overlooked than dynamic visual information during driving especially at low speed area. This project is designed to display the sign and present the data as alarm and image data on vehicle terminal screen and can alert the driver about the speed limit a low speed area. To accomplish the preliminary investigation phase involves on:

1) List problems, directives and opportunities
2) Negotiate preliminary scope
3) Assess project worth
4) Plan the project

3.2 Phase 2: Analysis and Identifying

In-vehicle signing system using RFID will be created in software and hardware**.** In software, the system is created that analyzed to use a passive RFID as hardware because of its benefits such as cheap, small in size and can be installed in large numbers .Visual Basic 6 interface is used as a display unit. . All the programming will be stored in Visual basic. This system has two main hardware components which are reader including tags and circuit. The tag ID will be stored in the database include the data of speed limit at certain area. The tag will be detected by the reader and the speed limit sign will displayed at terminal using Visual Basic 6 as user interface. In hardware, circuit are include in this project by using PIC 16F877A that be connected to RFID reader. ID will be stored in the program that been stored in PIC 16F877A.The tag will be detected by the reader and the speed limit sign will displayed at LCD display.

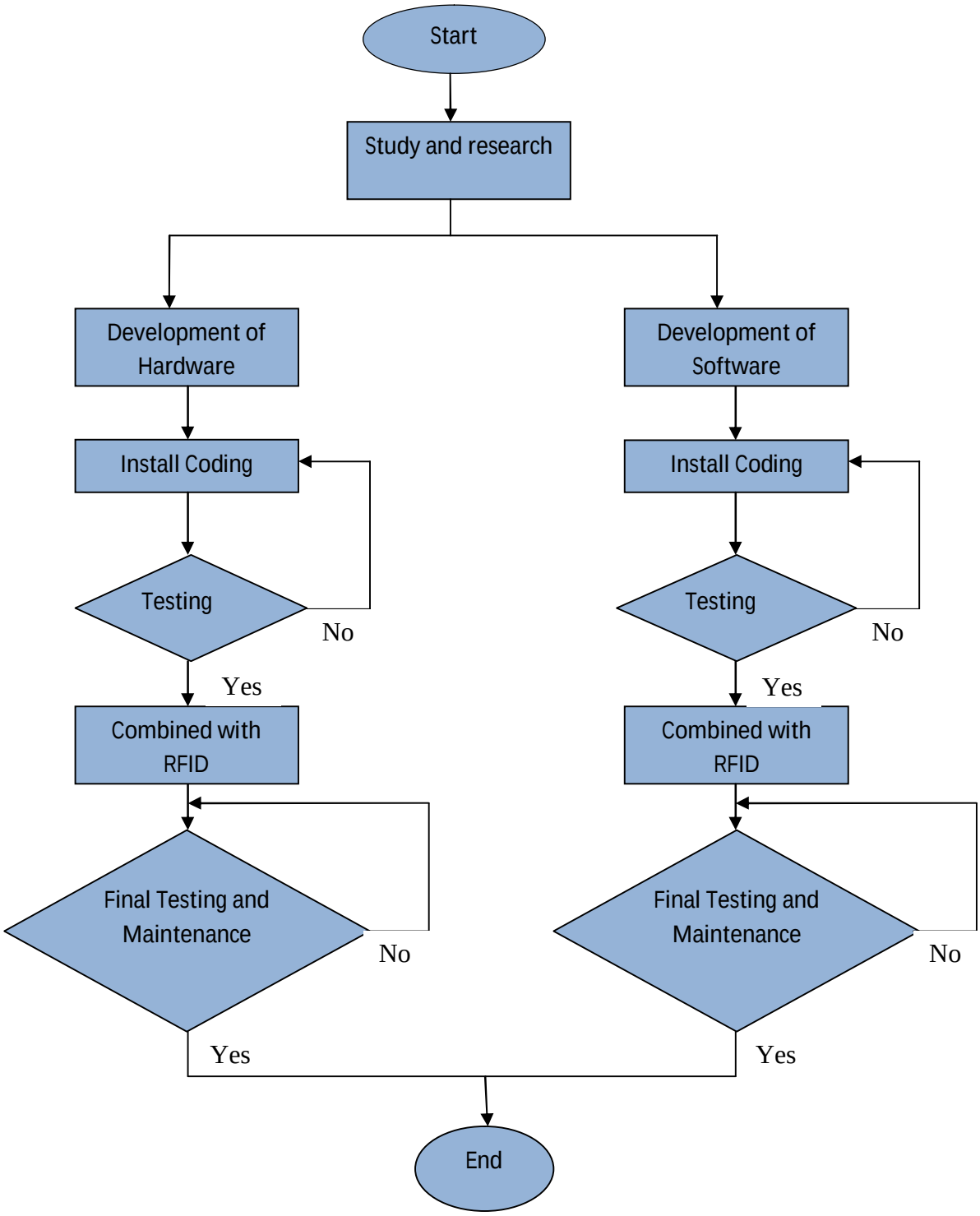


Figure 3.1: Flowchart of Project Developing

3.3 Phase 3: Design

This is a phase to determine system design's specifications. For this project, the developing flows as shown in figure 3.2. The developing flow are important to make sure the project will be done as planning especially on part of the integration between hardware and software.

The overall of the system will be designed which started with detecting of RFID tags until system displaying the sign data in vehicle terminal. The development flowchart illustrate that when a RFID tag is detected or identifying, tag data are read to determine the type of tags. RFID reader will be connected to the computer using a serial interface base (Serial Port) and will be converted using USB converter. Tags will be placed in the road surface in areas such as school, university, sharp bend and hump.

When the vehicle through the tag ID, the RFID reader will detect the frequency of tag in 125kHz. The program will pass and can continue with combination within hardware and software. RFID reader will send the signal to the display unit that is constructed using VB6. If tag cannot be detected, process must be repeated until it passes. Display of data on the traffic sign before will terminated automatically depend on the tag ID detected by the reader.

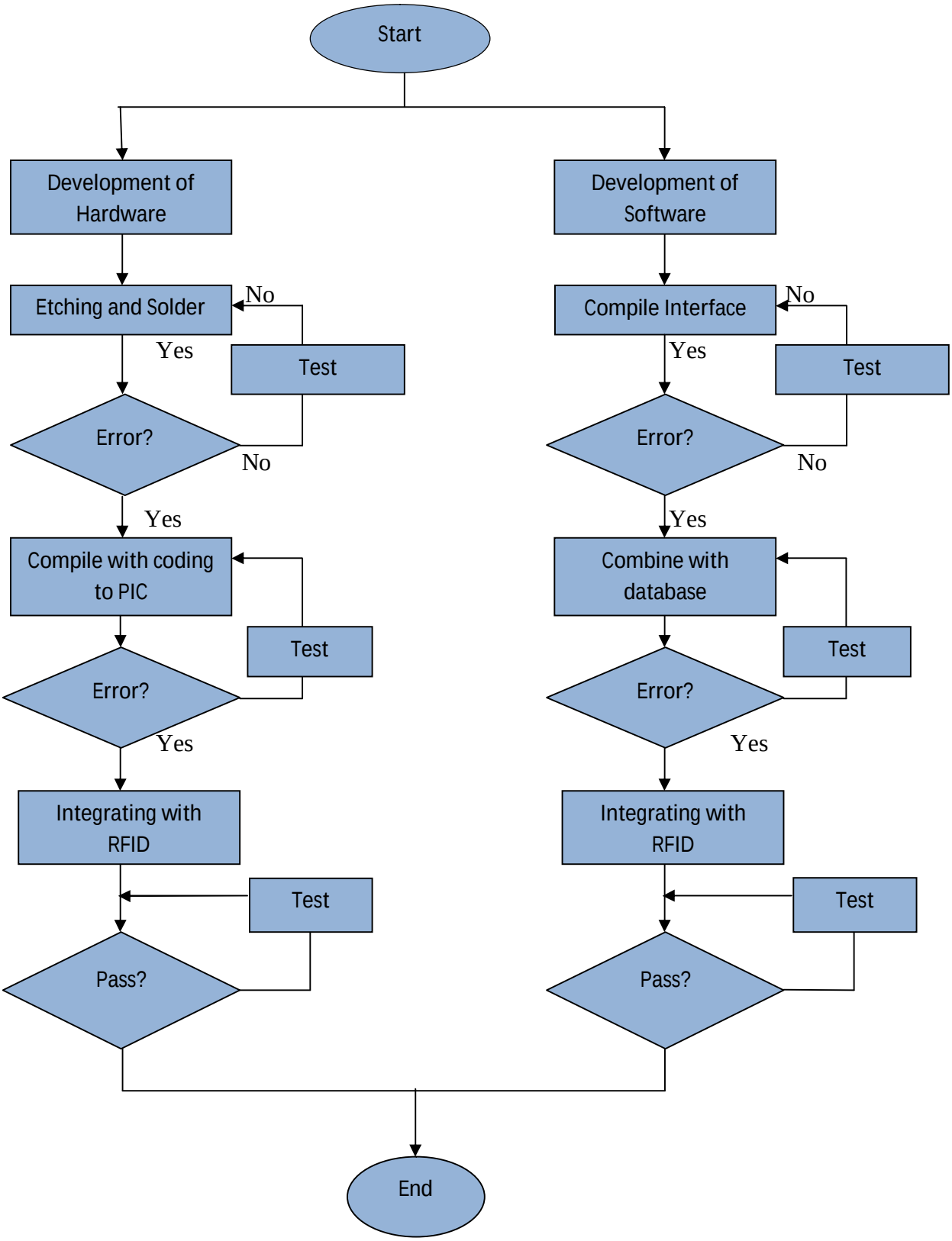


Figure 3.2: Flowchart of Design System

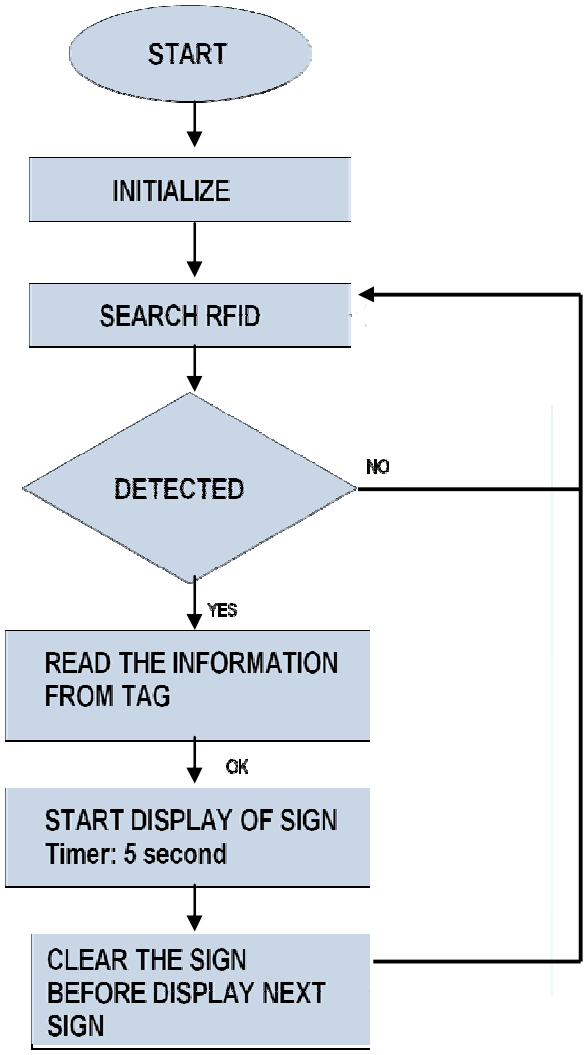


Figure 3.3: The overall of the system

RFID reader need to be configured and +5V power supply before it can be function properly. The LED will indicate green RFID reader ready locate the ID tag frequency 125kHz. Display system alerts the vehicle is urged to use RFID to replace traffic signal in the roadside. RFID tag will be placed on the surface of the road in three areas of low speed limit within the scope of the project at area UTEM which is have crossing path, sharp bend and hump. The RFID reader will be placed in the car as illustrated in figure 3.4. As a result, the traffic sign and sound will be appearing at the terminal in the car.

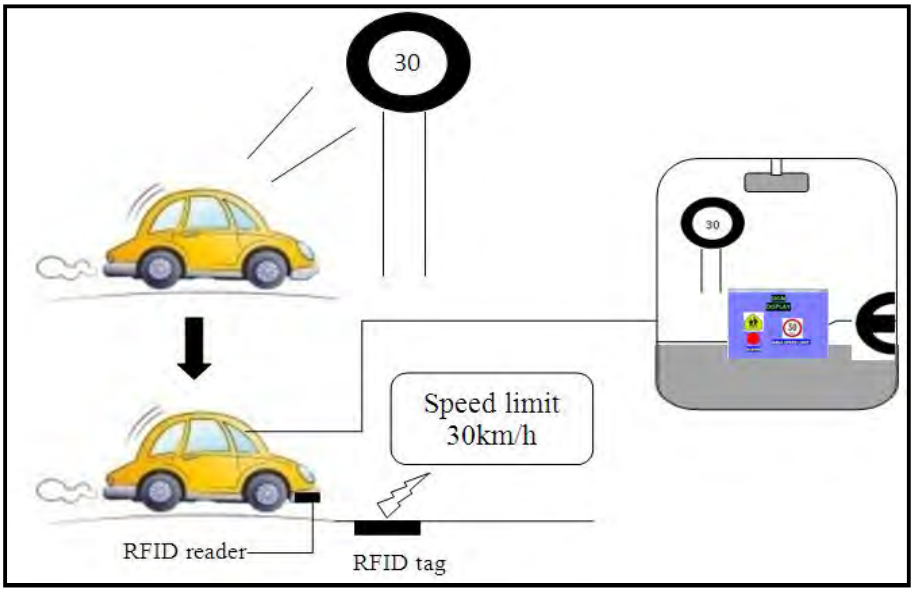


Figure 3.4: System Overview

3.4 Phase 4: Implementation and Development

3.4.1 RFID Reader

RFID readers are antenna that will receive a radio frequency from RFID tag before it sends to computer. The RFID reader is a device that transmit radio frequency when powered ON. When the RFID tag is place near the RFID reader, the RDIF tag will receive the radio frequency via the antenna inside RFID tag. The radio frequency received will be converted into electrical power that is enough for the RFID tag to transmit the data back to the RFID reader. Further, the RFID reader will transmit the tag ID to PIC or PC via serial communication. Figure 3.5 shows example of passive RFID reader used in this project. Effectiveness depends on the RFID reader which is:

1. The power output and cycle time
2. Subsystem interface project
3. The design and location of the antenna

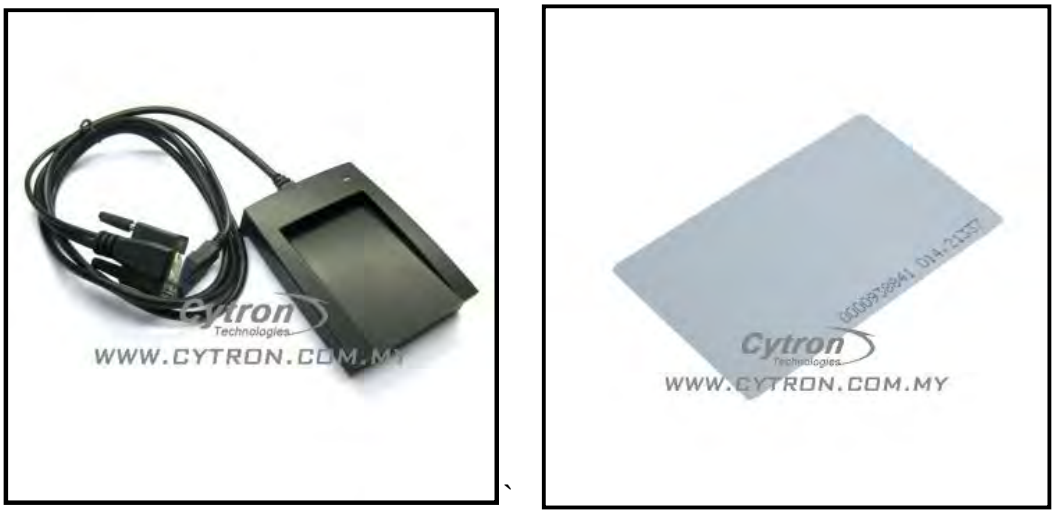


Figure 3.5: RFID reader and RFID tag

Referring to figure 3.6, the reader microcontroller controls the radio frequencies in the communication that receives from the tag and will process all the tasks such as communication protocols and responses from tag.

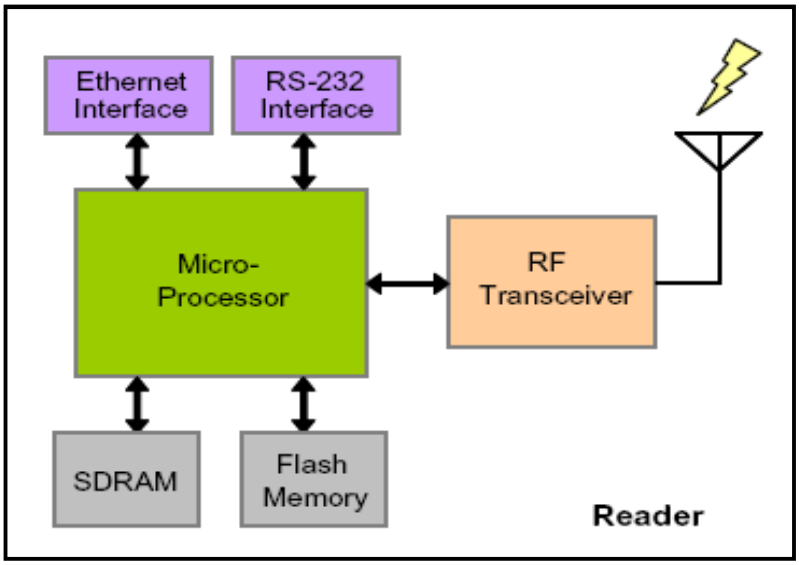


Figure 3.6: Architecture of RFID reader

This system reader has 125 KHz operating frequency with 9600 baud rate and using RS232 serial interface (output only) to PC. It fully operated with 5VDC power supply. RFID-IDR-232N will read the ID from RFID tag if the tag is near enough to RFID Reader. The ID is normally 10 digit of number. RFID-IDR-232N will automatically send this ID with 1 byte of Start of heading (0x01), followed by 10 byte of ASCII character (ID) and 1 byte of Start of text (0x02). This protocol is only valid for RFID-IDR-232N.

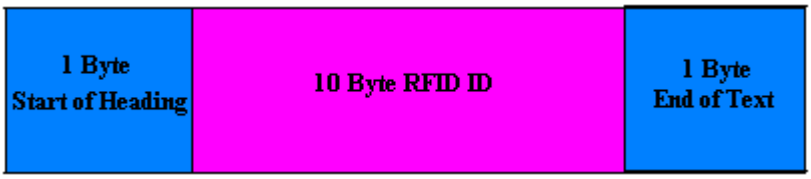


Figure 3.7: Configuration of RFID tag

Different types of RFID reader sometimes have different protocol. The 1st byte will be read is “Start of heading” followed with 10 bytes of RFID Identification number. The last 1 byte is “Start of Text”. This system RFID reader was installed on the vehicle at height of 5cm from the ground surface. The reader will detect the tag ID and connected the data stored in database to the display unit. The buzzer will sound and LED will turn to green when the tag has been detected. Display of data on the traffic sign before will terminated automatically depend on the tag ID detected by the reader.

3.4.2 Software Development

The implementation of software development was carried out using two computer software that is, MS Access 2007 and Microsoft Visual Basic6 (VB6). MS Access 2007 is used in creating the database that will store all information on traffic signal signs. Graphical Interface or Graphical user interface (GUI) is built using VB6 to create programme and simulation. This software is selected in the traffic signing system because it's providing the easy and simple programming language and it is more users friendly. Therefore, it is suitable for used in enhancing this traffic signing system.

i. Database using MS Access 2007

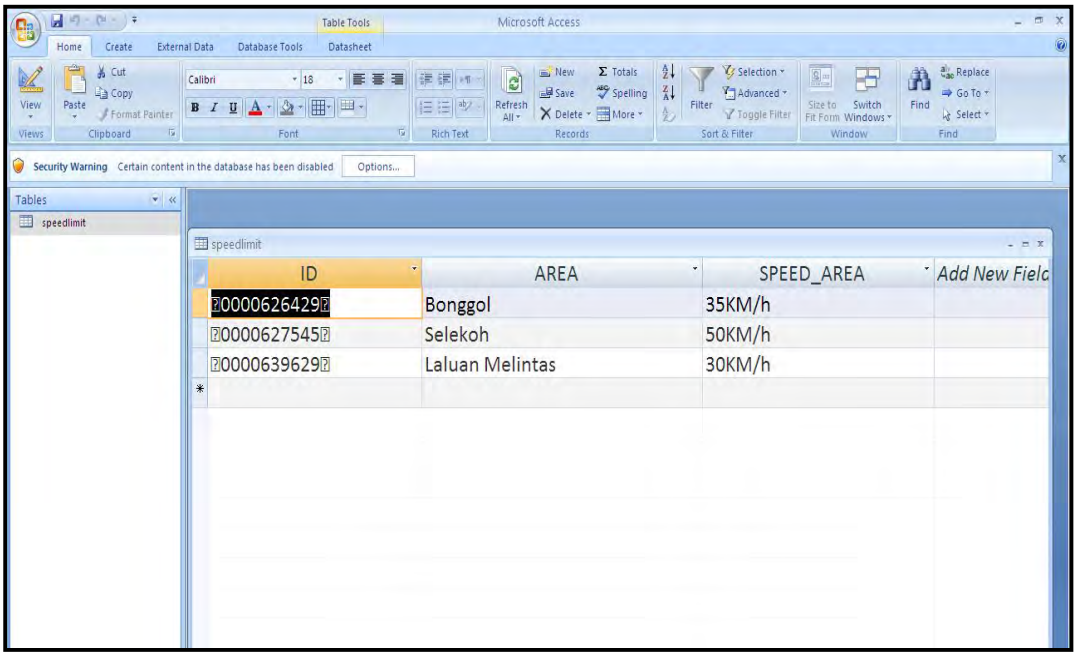


Figure 3.8: Framework of MS Access 2007

The database can store information on traffic signal signs that built using MS Access 2007. Figure 3.8 shows the main frame and the data information based on tag ID. We can see the information on traffic signal stored in third column of tag ID, area and speed limit. In the first column shows the data of RFID tag ID while the second column is area of low speed data and hence the last column shows the speed limit of traffic sign.

ii. Graphical User Interfaces (GUI)

Figure 3.9: Framework of Visual Basic 6

VISUAL BASIC is a VISUAL and events driven Programming Language. These are the main divergence from the old BASIC. In BASIC, programming is done in a text-only environment and the program is executed sequentially. In VB, programming is done in a graphical environment. In the old BASIC, you have to write program code for each graphical object you wish to display it on screen, including its position and its color. However, In VB, we need to drag and drop any graphical object anywhere on the form, and can change its color any time using the properties windows. The display unit of is using the Visual Basic 6 software as a GUI to display the sign data to the driver at the computer. The interface will be connected with database that stored the displayed data. Sign display depends on the tag ID that stored in database. Different tag ID will

present different sign at the computer terminal. Figure 3.9 shows the main frame of VB6 software that been used as a GUI. By using this software, the interfaces will more attractive to built. This software also provide a simple programming language that uses the BASIC language and has the function of the system more user friendly and suitable for enhancing the traffic signing system.

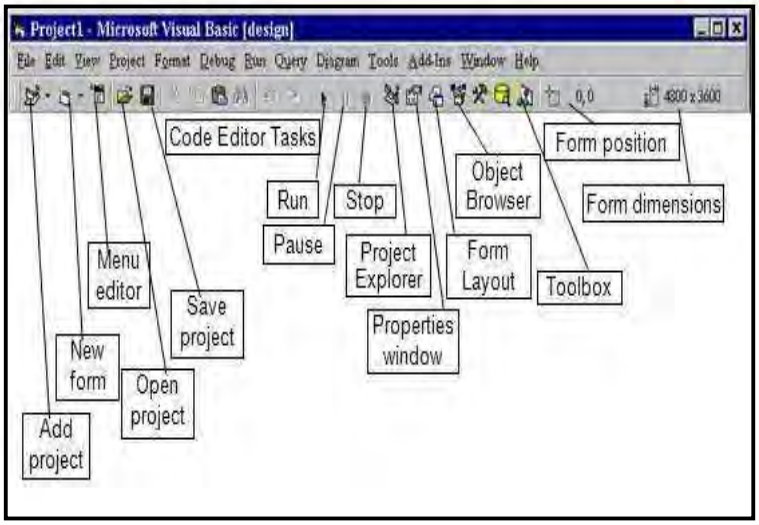


Figure 3.10: The main window of Visual Basic 6

Figure 3.10 shows the main window in VB6. The items available in this window are the title bar, menu bar and bar equipment. The title bars shows the name of the project, the operation mode and form the basis of the current Visual Basic. Each menu bar is available in other menus, which allow the user to control the operation of this software environment. In the menu bar there are buttons to devices that provide shortcuts to some menu options. In the main window also shows the location of the relevant form at the top, left corner of the screen and the width and length of the current form. Docked on the right side of the screen, just under the toolbar, is the Project Explorer window. The Project Explorer as a quick reference to the various elements of a project namely FORMS, CLASSES and MODULES. The entire object that makes up the application is packed in a project. A simple project will typically contain one form, which is a window that is designed as part of a program's interface. It is possible to develop any number of forms for use in a

program, although a program may consist of a single form. In addition to forms, the Project Explorer window also lists code modules and classes.

In properties window for a form, we can rename the form caption to any name that we like best. In the properties window, the item appears at the top part is the object currently selected. At the bottom part, the items listed in the left column represent the names of various properties associated with the selected object while the items listed in the right column represent the states of the properties. Properties can be set by highlighting the items in the right column then change them by typing or selecting the options available. We also change the properties at runtime to give special effects such as change of color, shape, animation effect and so on. For example the following code will change the form color to red every time the form is loaded. VB uses hexadecimal system to represent the color. You can check the color codes in the properties windows which are showed up under Fore Color and Back Color.

The Object Browser allows us to browse through the various properties, events and methods that are made available to us. It is accessed by selecting Object Browser from the View menu or pressing the key F2. The left column of the Object Browser lists the objects and classes that are available in the projects that are opened and the controls that have been referenced in them. It is possible for us to scroll through the list and select the object or class that we wish to inspect. After an object is picked up from the Classes list, we can see their member (properties, methods and events) in the right column. A property is represented by a small icon that has a hand holding a piece of paper. Methods are denoted by little green blocks, while events are denoted by yellow lightning bolt icon

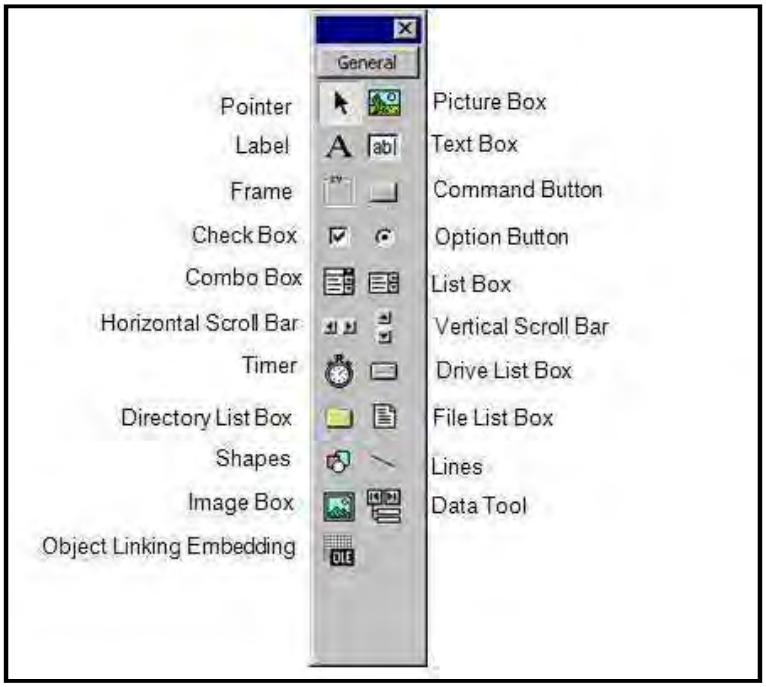


Figure 3.11: The Toolbox of Visual Basic 6

The Toolbox contains a set of controls that are used to place on a Form at design time thereby creating the user interface area. Additional controls can be included in the toolbox by using the Components menu item on the Project menu. A Toolbox is represented in figure 3.11. In the display system of signs in the vehicle, the equipment plays an important role is a command button, text box, list box, combo box and the timer.

Command button in this system acts as a button to get out into the system as the 'ENTER' to enter the system and the 'EXIT' to exit the system. In addition, Button command also serves as a link and decided to switch the line of communication between RFID and GUI display system. Showing the speed and the area of speed traveled by the vehicle will be displayed in text boxes that have been designed. Timer in the system acts in determining the time of the alarm signal is sounded, to clear the history of data in list box and to display form in the system that been in terminal the vehicle. Timer for the alarm system is set to read in 5 seconds, while the visual signal speed limit signs will be displayed on the terminal is a vehicle within 5 seconds. Figure 3.12 shows the interfaces design.

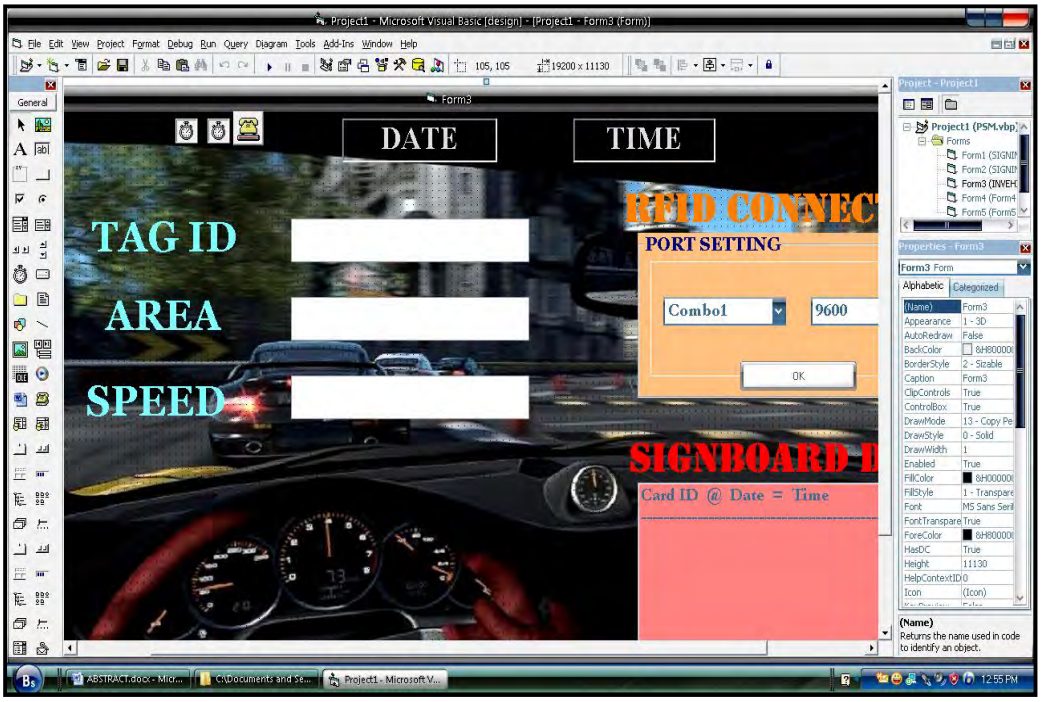


Figure 3.12: Interface design

3.4.3 RFID with PIC 16F877A

The designation of the circuit is developed based on the research and information that being were made and after discussion with the supervisor. After that, all the components and parts that meet the specifications and requirement were purchased. The specifications and requirement of the components and parts have to be identified carefully in order to avoid non-compatible and redundant parts. The functionality of the circuit has to be tested, analyzed and determined using circuit simulation. This is to ensure that it fulfill the requirements of the project and to avoid problem while developing the real circuit.

However, a comprehensive simulation is not possible as there is no such software available in the laboratory for optical circuits. The nearest to doing is the testing using Proteus, Protel and etc. Figure 3.13 shows the circuit design using Proteus by applying PIC16F877A. This project will use PIC16F876A and the RFID reader (IDR-232) to control LCD (2X 16 characters), LED and Push Button.

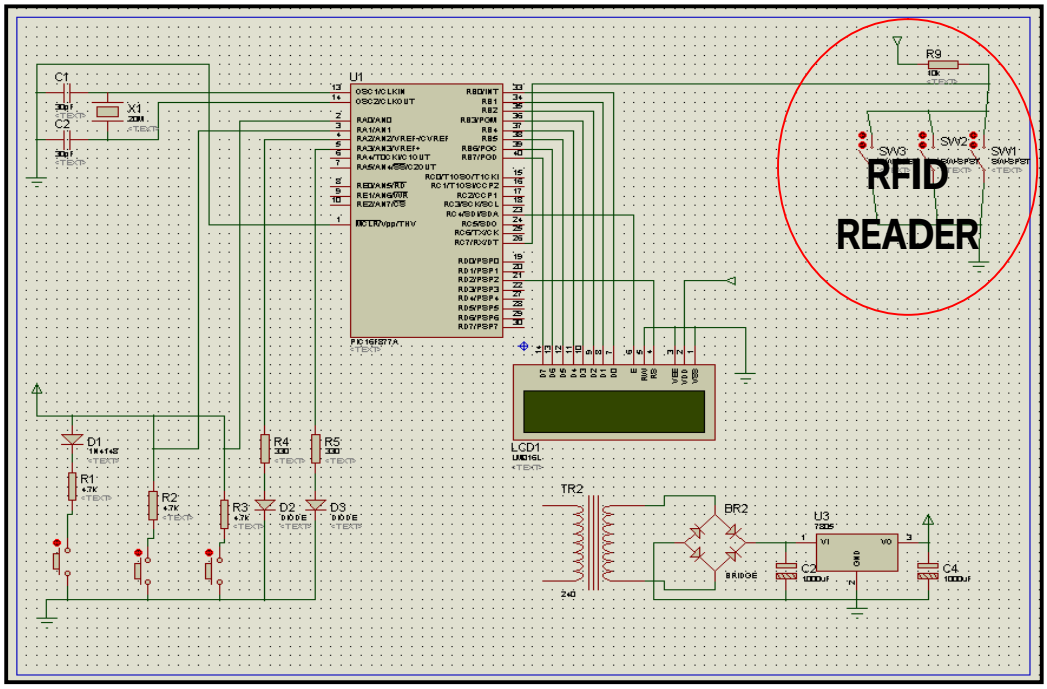


Figure 3.13: Circuit design using Proteus

3.4.3.1 PCB Development

After the simulation is done, it is time to develop the real circuit. However, the connections of the components have to be tested first by connecting the circuit on the breadboard before it was transferred to the PCB board. Breadboard is used as the connection medium since it is easy to replace the components and for easy alteration. The circuit that been converted into PCB layout design using PCB Wizard is printed onto transparency paper using laser jet printer.

The printed PCB layout is also called artwork and its line must be dark enough for the next step purpose. Make sure the board that is used is a positive type and from the right type. After that, they are then been exposed to the ultraviolet light. The UV Expose machine is set to 25 second. Then, put the laminated board onto the artwork. Make sure that the artwork is put correctly due to the right position of the real circuit. The board that been exposed to UV Ray light is put in the Developing machine for at least 2 to 4 minutes.

Next insert the board in the Etching machine with the printed part of the board or the circuit is on the top. The etching process took about 4 minutes. This process is necessary to remove the uncovered cuprum layer to form a perfect circuit board. Put the board in resist strip tank to removes the hard polymerize resist from the remaining copper foil circuit pattern. Leave it there for about 5 to 10 minutes. Then take it out and rinse it with water and it is now ready to be cut.

Cut the board according to the circuit size by using cutter. This process is to separate the circuit part from the unwanted part on the board. Besides, it is to make the circuit board to look neat. Lastly, the board is ready to be drilled to make holes. Drilling is a process to make holes on the PCB before the components can be mounted on it. Holes through a PCB are typically drilled with tiny drill bits made of solid tungsten carbide. The drilling is performed by electric PCB drilling machines in a stand

3.4.3.2 Mounting Component and Soldering

The most important thing that has to be done before mounting the components on the PCB is to recognize its polarity by referring to the schematic circuit and schematic layout. They also can be identified by using equipment such as multimeter. This is necessary because a mistake in arranging the component as example wrong polarity arrangement will damage the component itself and the circuit will probably not functioning. After we place the component, we can solder it to the PCB. Soldering is a method of joining metal parts using a filler material (solder). In soldering component on the PCB, a 60/40 solder (60% tin and 40% lead) is used.

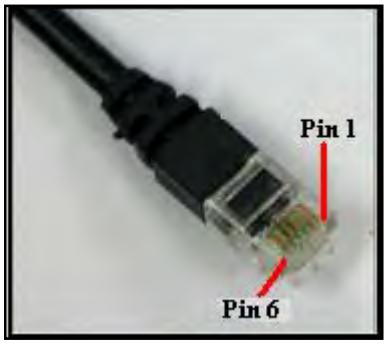
3.4.3.3 Interface RFID reader (RFID-IDR-232N) with PIC16F877A

The RFID reader comes with a cable for data communication. The cable is consist DB9 serial port for data communication to PC, RJ-11 connector to connect to RFID Reader and a USB connector to supply 5V for the reader. For this project, user has to cut the wire of the DB9 Serial Port and connect the wire to a 2510-04 female connector. Table below is example of output wire when user cut the wire of female DB9 Serial Port. The display unit of traffic sign is using LCD to display the sign data to the driver that are located inside the car. Sign display depends on the tag ID that stored in program that be burned in PIC. Different tag ID will present different sign at the LCD. Example of wire color output shown as table 2.4:

Table 3.1: Pin Configuration

Color	Pin function	Connection
Orange	Vcc	5V
Red	Tx	Data
Brown	Rx	NC
Black	Ground	GND

However, user need to refer color Figure 3.14 and table of output pin configuration for output color function. It is because different types of RFID reader sometimes have different color of output wire. Orange is not necessarily Vcc, red; brown and black also are not necessarily Tx, Rx and GND pin.



Pin	Pin function
1	5V
2	NC
3	NC
4	Tx
5	Rx
6	GND

Figure 3.14: Output Pin Configuration

After cut the female DB9 Serial Port, connect four of the wire to 2510-04 female connector according to the color of the wire on figure 3.14 and pin configuration. For example, from figure 3.15 pin 1 which is orange color will connect to Vcc of PR8, pin 4 which is red color will connect to data pin of PR8.

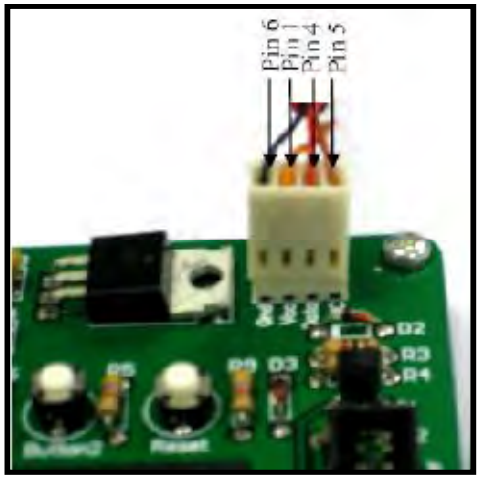


Figure 3.15: Pin Connection from RFID reader to PIC circuit

3.5 Phase 5: Maintenance and Troubleshooting

This phase is focused on two of testing part. One is the GUI and database and second is testing coding of PIC with RFID. During design the GUI for each form, there will use a lot of programming. For every button in form, it will test to make sure its work. The test of the database with the system is very importance. The link of the ADO that connect the database and the location of the database and table must same. For every time of system been upgrade, it must be run to make sure there no problems occurred. Then system is combined with the hardware. The test done to checked for any connection problems between the RFID and the system. The troubleshooting is done for errors occurred that happened in test. If there is an error or problem it will try to solve and run to make it better.

The In-vehicle signing system using RFID that contains three main parts which are RFID tags RFID reader and computer as a display unit. The block diagram for this system is shown in Figure 3.16

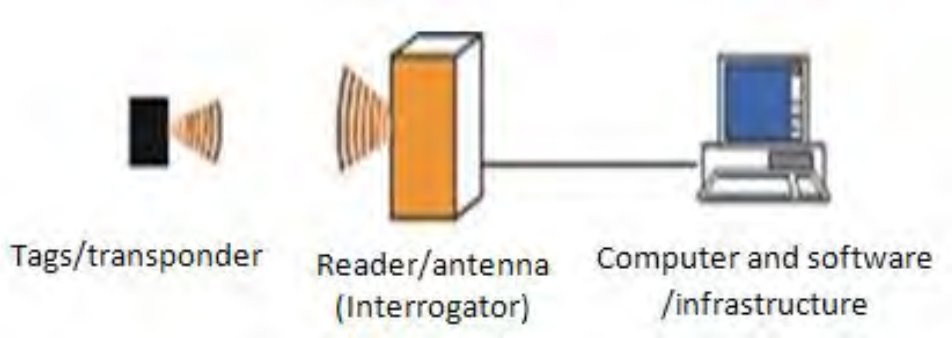


Figure 3.16: The block diagram for this system

To testing program with PIC, we apply MPLAB software with PICkit2 programmer to download the program into PIC. To turn the source code into something that can be programmed into the actual PIC microcontroller chip, we need to assemble the code. When the program is done, we can compile the program and make sure no error are occurs. After it's successfully done, it automatically will create HEX file in

folder that been created. We need to download the HEX file and program it. When the program already burn into PIC, we can test to circuit. The test done to checked for any connection problems between the RFID and the circuit. The troubleshooting is done for errors occurred that happened in test. Also check the connection between circuits with RFID, make sure the wire are solder properly in the right position. Refer table if not confirm and if there is an error or problem it will try to solve and run to make it better.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Results

This section discusses the results and analysis for the whole of this project. The system is built to read traffic sign and signal data stored in RFID tags placed on the road by an in-vehicle RFID reader. The tag data is stored in database and presented as alarm and image data on vehicle terminal screen. By using the Visual Basic 6 software and RFID, this system will be able to alert the driver about the speed limit at the low speed area and capable of displaying signing on a terminal in the vehicle. In the future in-vehicle signing system can replacing the existing static traffic sign that located at the road side. This project is done in two parts, hardware and software. Description of the results will be discussed in more detail in this topic.

4.1 Testing Equipment

In this system, the hardware is tested and configured with set of specifications so that can operate within the system that is design using VB. This section is divided into several sub-topics of configuration and testing of the RFID reader and tag position.

4.2 RFID reader configuration

RFID readers in the vehicle signing system in this vehicle should be configured to activate it. Figure 4.1 show that there are two cables on RFID to be configured with the RS232 cable and pin DB9 (female) cables. The communication line has to be connected to serial port of PC. RS232 cable on RFID is used to communicate with a computer or communications system. RFID-IDR-232N power source is from USB connection, it shows as figure 4.2. 5V are needed to ON the RFID reader. After providing power to RFID-IDR-232N, the LED will light ON with the RED color and buzzer will beep.

Figure 4.1: Cable Configuration

Figure 4.2: USB Configuration

Once RFID is supplied with power supply, the LED on the RFID reader will be colored red. These marks the RFID readers are ready to locate the ID tag passive 125 kHz frequency. The LED on the RFID reader will turn green after a tag is detected. For this project, RFID readers will be put in the car model. For RFID systems that do not use a computer (PC), modifications to the hardware and the interface is needed. USB connector 5V supply cable and grounding to RFID. For more detail about the configuration of each pin on DB9, USB and RJ11, it will discuss as below.

If RFID-IDR-232N is require on embedded system where no PC is available, hardware modification and interface is necessary. USB will provide 5V and ground to RFID-IDR-232N, while female DB9 is communication line to PC. Below show the pin configuration of USB, RJ11 and DB9 of RFID-IDR-232. The pin in USB that most important for the system is on the USB cable pins VCC and GND while for the DB9 cable pin RD, TD and GND. It shows in figure 4.3 and 4.4 as below.

PIN No	Function
1	VCC
2	NA
3	NA
4	GND

Figure 4.3: Female Configuration

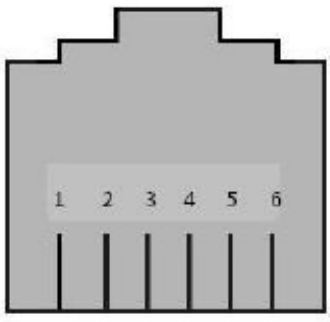
PIN No	Function
1	NA
2	**Tx**
3	**Rx**
4	NA
5	**Gnd**
6	NA
7	NA
8	NA
9	NA

Note: TD-receive data from RFID to the terminal

RD-send data from PC to RFID

SG-giving the signal logic 0

Figure 4.4: DB9 Configuration



PIN No	Function
1	**5V**
2	NA
3	NA
4	**Tx**
5	**Rx**
6	**Gnd**

Figure 4.5: Female Socket Configuration

Figure 4.6: RJ11 male pin Configuration

Referring toDB9 cable in Figure 4.4, the reader only receives data from RFID tags to be sent to the system via pin number 2. The Response back from the RFID system via pin 3 does not apply. This is because the traffic signal display system in this vehicle is only using one-way communication system. This system only can receives signals from RFID signals to display Traffic sign unit. Figure 4.5 shows output pin configuration for output color function. It is because different types of RFID reader sometimes have different color of output wire. Orange is not necessarily Vcc, red, brown and black also are not necessarily Tx, Rx and GND pin. Location 1 and 6 of RJ11 is show as figure 4.6. It's important to allocate the wire accordingly as figure 4.5. In hardware configuration between circuit and RFID, we can refer Interface RFID reader (RFID-IDR-232N) with PIC16F877A that been discussed in chapter 3.

4.3 Communication between the RFID and test computer with Hyper Terminal

Hyper Terminal is used to test the existence of communication between RFID readers and a computer via RS232 cable. This is used to determine whether a computer can receive the ID tag that was traced by the reader to be used for further processing. It's important to check whether the RFID reader is function correctly r not.USB toRS232 converter is used in making the connection to the system.

Figure 4.7: Selection terminals communication in the hyper terminal.

Starts with Hyper Terminal on the computer is set to use COM3 (terminal numbers that have been used) as shown in Figure 4.7. To check what the available port that been used in RFID, we can check it by right click on **Computer** then select->**Properties->Device Manager->Ports**. Further, the COM3 port is configured to ensure that the received signal corresponding to the RFID reader in terms of speed, data bits, stop bits and flow control to ensure that RFID readers are willing to read the address on the ID tag 125 kHz passive. Then configure the properties of COM3 as below that show in figure 4.8:

i) Baud rate (Bits per second) = 9600

ii) Data bits = 8

iii) Parity = None

iv) Stop bits = 1

v) Flow control = none

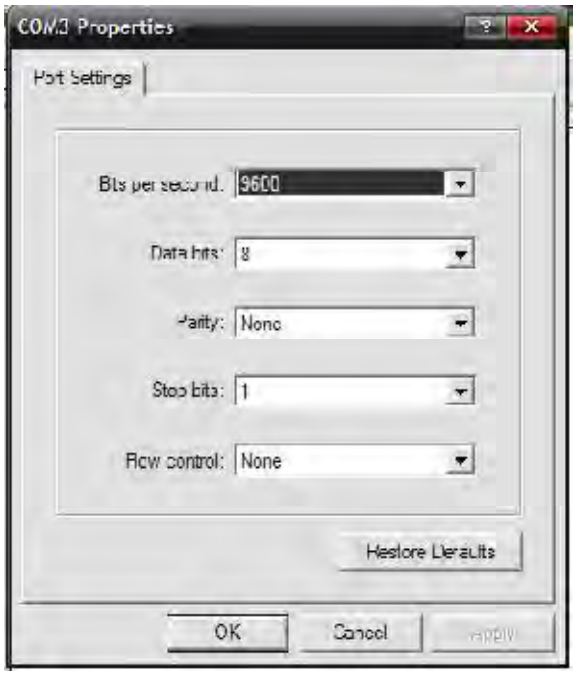


Figure 4.8: COM3 Properties Configuration.

Baud rate is set according to the specifications of the RFID reader. 9600 baud rate (bits per second) is the third highest attainable by the system. Baud rate is the number of elements or pulse input or output that sent on a communication line in a moment. While the data bits have been set to 8 bits per second of data bits transmitted over communication lines. Parity has also been configured to none (no) is used to detect certain errors in data transmission. Stop bit has been set to one of the number of bits to be added at the end of that character.

Now, RFID-IDR-232N is ready to read address of a 125 KHz passive tag. Move the tag slowly towards RFID-IDR-232N (top), at approximately 2cm from the casing, the buzzer will sound, LED will turn to green when the tag move slowly towards RFID-IDR- 232N and HyperTerminal will show the tag's ID in ASCII. Data ID is detected from an RFID tag is shown in Figure 4.9 the number 0000797447.

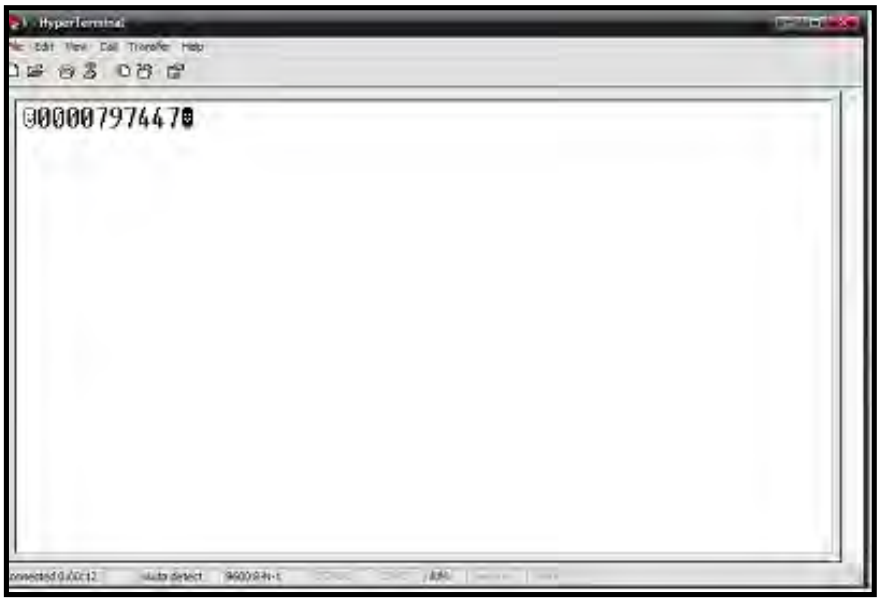


Figure 4.9: Display ID tag through the proper configuration

4.4 Tag position

In this project, a system is built to read traffic sign and signal data stored in RFID tags placed on the road by an in-vehicle RFID reader. The tag data is stored in database and presented as alarm and image data on vehicle terminal screen as Figure 4.11. The position of the tags will be located 100meter before the low speed area. When the vehicles detect the first tag, the school speed limit sign will be displayed. If second tag is detected, another sign is displayed and the first sign will replaced automatically. It shown as figure 4.10 as below:

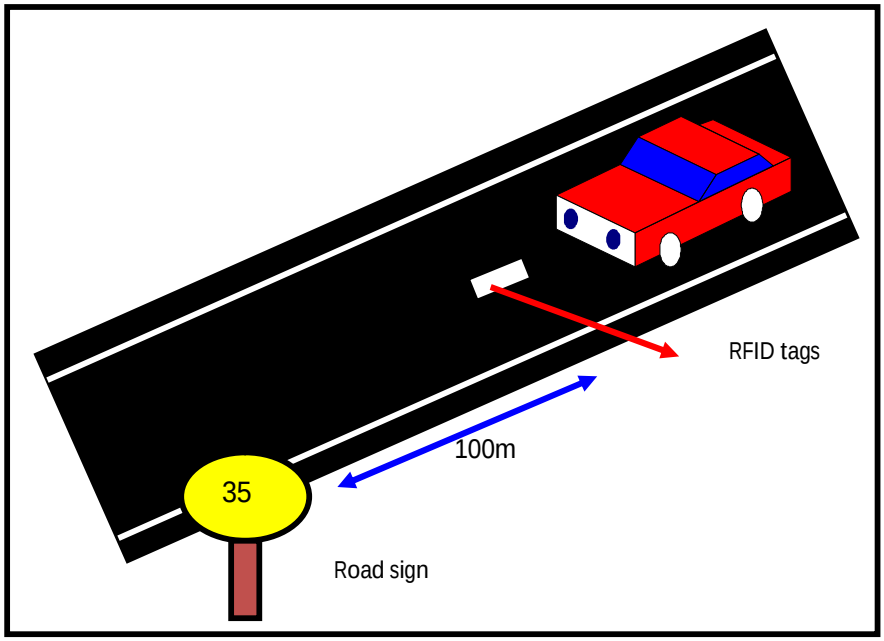


Figure 4.10: Position of tag

Figure 4.11: Project Overview

This project provides a new way of displaying the road speed sign to make it more effective than static visual information nowadays. By using the Visual Basic 6 software and RFID, this system will be able to alert the driver about the speed limit at the low speed area and capable of displaying signing on a terminal in the vehicle. In the future in-vehicle signing system can replacing the existing static traffic sign that located at the road side.

4.5 Software Results

4.5.1 Graphical User Interfaces (GUI) as Display Unit

VB6 software is used in creating a GUI to display signs traffic signals in the vehicle. GUI is the interface connecting the hardware to end users through a visual display of graphics. In producing a good result, the GUI programming is appropriate to make the simulation runs perfectly without an error. If error occurs, window will appear and the programs experiencing the error will be highlighted during the compile process conducted as in Figure 4.12

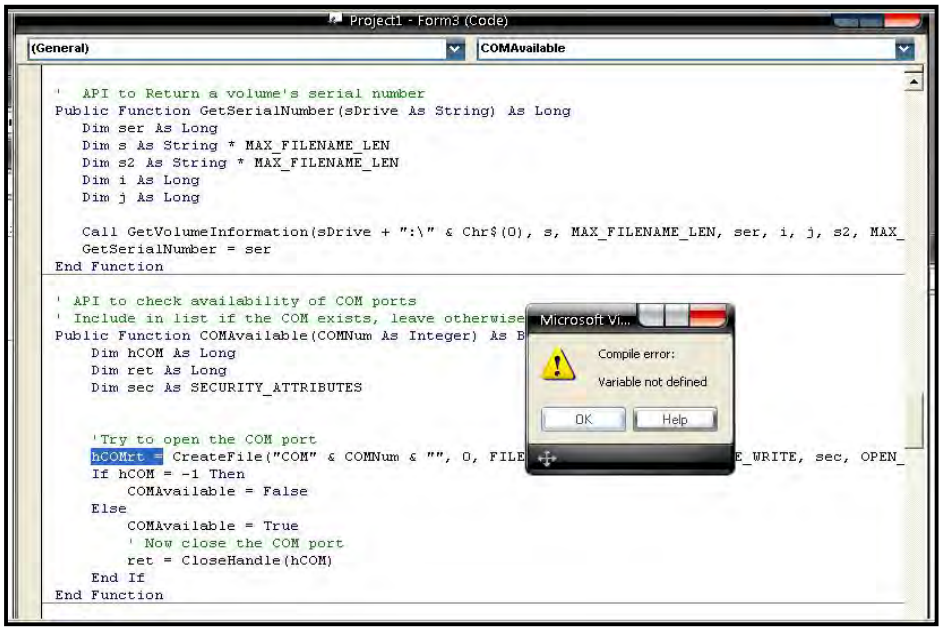


Figure 4.12: Programming In Error

Figure 4.13 show the main frame of in-vehicle signing system using RFID. This form used as introduction of the system. From this form, we can see one button that allows us to enter to next procedure. Just press ‘ENTER’ to enter this system.

Figure 4.13: Main Frame

GUI framework communication or connection frame will automatically appear when users choose to enter the system in Figure 4.13. Figure 4.14 show the Connection frame plays an important role in connecting the hardware and the GUI. Button 'OK' is designed as an interface to activate and terminate communication between the RFID systems with a GUI.

Before that, the terminal number (COM port) for communication lines should be set depending on the terminal used. Check it using device manager in computer properties. Baud rate of the RFID reader is configured according to specifications in 9600 to ensure that the ID data received by the GUI is accurate. When the 'OK' button is pressed, the RFID reader is ready to detect the tag and sends the tag ID data is received to the GUI system.

Figure 4.14: Connection Frame

When the ID tag is detected by the RFID reader matches with the ID stored in the database, the signal speed limit signs will automatically appear as illustrated in the flow of Figure 4.15. Speed limit signage is displayed is dependent on the area covered by the vehicle.

(a)

(b)

Figure 4.15 (a) and (b): Flows of In-Vehicle Signing System that will display in terminal

As can be seen, the data speed, time, date and the speed limit is also allowed to appear in the text box that was built as additional information to the driver of the vehicle. Speed limit signage will be displayed for 15 seconds before it returned to the original frame, while the system will sound an alarm within 5 seconds for drivers more cautious when they arrive in the area. The clear list button will clear list in signboard data manually. The list box is set to be clear list in 7 seconds using timer. 'EXIT' button is created to exit the system

4.5.2 Communication between RFID and GUI

RFID reader connected to the terminal on the computer through the serial port. USB to RS232 converter is used in making these connections. Communication between VB6 and serial ports can be formed by activating the Microsoft Comm equipment. MSComm equipment works like Hyper Terminal that allows communication between external devices via serial port with GUI. MS Comm is a phone icon on the toolbox as shown in Figure 4.16.

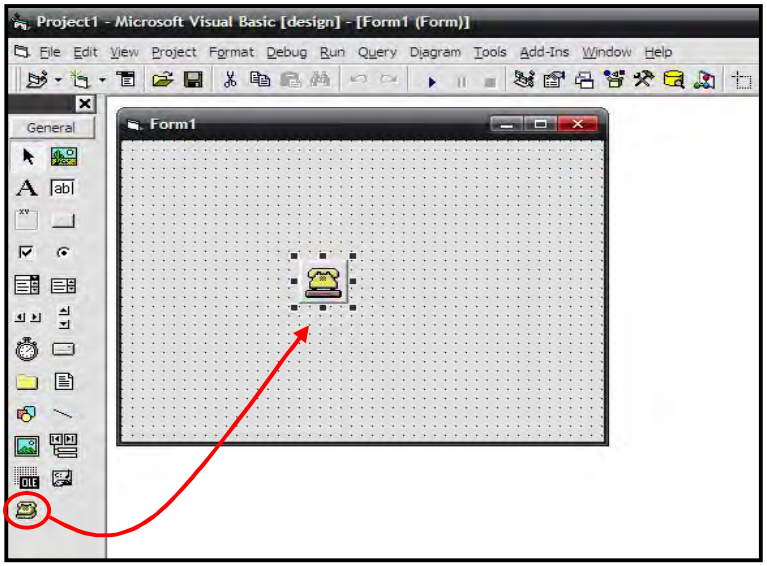


Figure 4.16: MSCOMM connection

Control line or property of MSComm be determined and identified in the process of programming in VB6. To create the communication between the terminals as shown below:

1. Property CommPort

Comm Port is used for setting the serial port and below is the programs that been used in VB.

```
MSComm1.CommPort='number of port'
```

2. Property Setting

Reception and data transmission rate is set through the following program in the MS Comm1.Settings = "Baud (rate to send or receive data), parity (N), number of bits, stop bits."

```
MSComm1.Settings="9600,N,8,1"
```

3. Property PortOpen

It is used to enable communication and power lines. To open lines of communications, command 'True' is used and the direction of 'False' used to decide the communication lines.

MSComm1.PortOpen = True

Numbers refer of the selected base used in the RFID hardware connections. Baud rate used was 9600 and this value must match the baud rate of the RFID reader. If a baud rate is different, the data transmission can not occur properly.

4.5.3 Database in MS Access

Database system designed to store data associated with signals or signs appear. Figure 4.17 show a database of the system was built. From this database can be seen that the information on traffic signals stored in the three column of the column (1)-ID, column (2)-AREA and column (3)-SPEED_AREA.

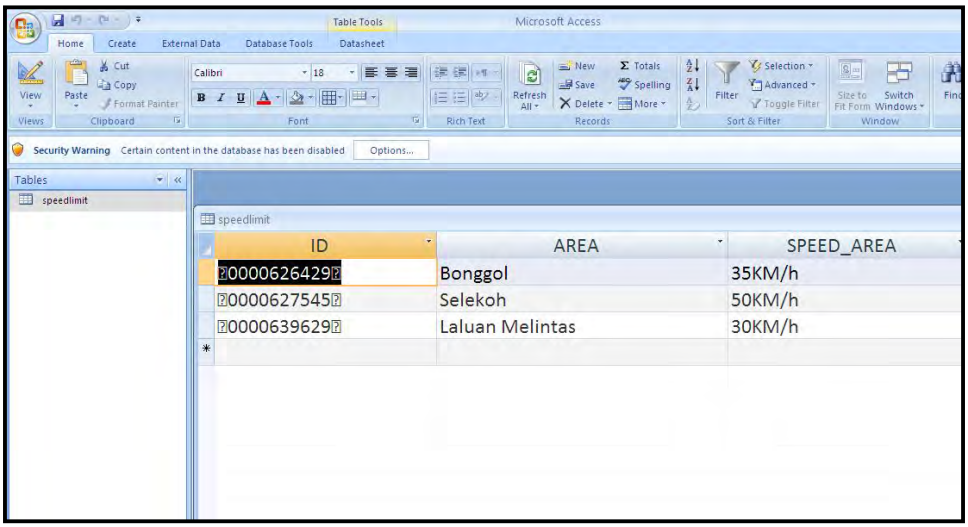


Figure 4.17: Database System

In the first column, data RFID tag ID is placed while the second column shows the low-speed data area of hump, sharp bend and crossing path. And then the last column of data to keep the speed limit allowed in the low-speed region. The database summary shown as figure 4.18.

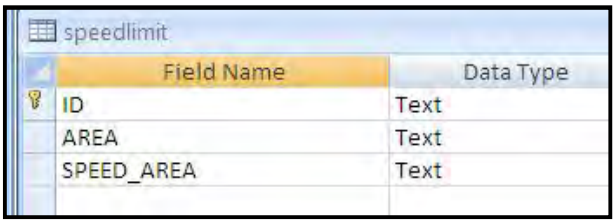


Figure 4.18: Database Summary

4.5.4 Relationship between the Visual Basic and Database

To connect the database with a GUI, Microsoft ActiveX Data Objects components (ADO) or known as Adodc in VB6 is used. ADO components are taken through the control of the frame components as shown in Figure 4.19.

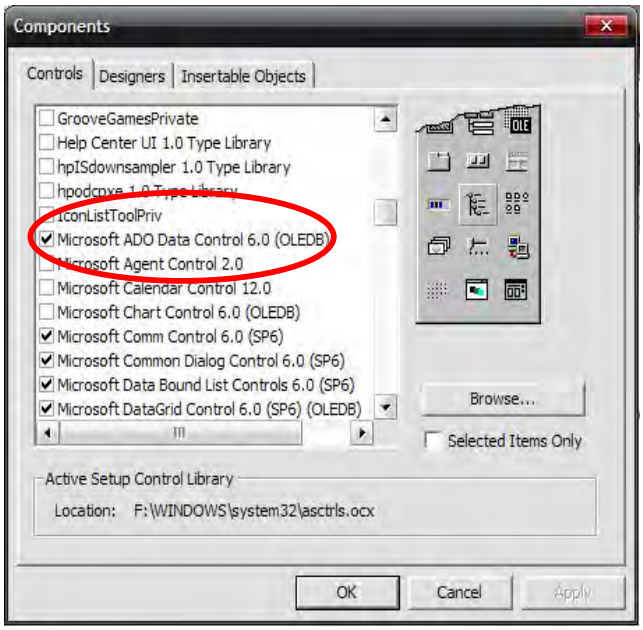


Figure 4.19: Controls in the dialog box ADO components

When the ADO components selected, Data Link Properties window will open. From this window, the file location from MS Access database designed been identified. Once the database is identified, the relationship between VB and MS Access are created. Thus, GUI is achieved and takes the traffic signing data in a database for use to display sign board.

Figure 4.20 shows the program that be designed to enable GUI access database in MS Access software. In addition to using the Data Link Properties, the location database also be identified through this program in linking databases with a GUI system

```
Private Sub Form_Load()
If CONN.State = 1 Then
CONN.Close
End If
CONN.ConnectionString =
"Provider=Microsoft.Jet.OLEDB.4.0;Data Source=" & App.Path &
"\Database\db.mdb"
CONN.Open
TXT1 = ""
TXT1 = "select distinct ID from speedlimit"
If RS.State = 1 Then
RS.Close
```

Figure 4.20: Links program for VB and database

During the process of building this system, GUI system development need more time consuming than hardware. Construction of a GUI system requires a high concentration in the resulting program to ensure the system is complete and accurate without any error. From the results and analysis be made, it concluded that the use of VB6 software is suitable for In-Vehicle Signing System. This is because the control equipment and components in VB is easier and more user-friendly. In addition, programming language used is also more straightforward and simple.

The selection of software for the MS Access database can be easily reached via the VB software. This system was intended to ensure that drivers always be vigilant in complying with the prescribed speed limit, especially in low-speed areas such as area schools, hospitals, university campuses and the sharp bend / hill. As a result, this system ensures the driver is more alert and careful when driving, especially at the lower speed. Display system alerts the vehicle is urged to use RFID to replace traffic signal in the roadside.

4.6 Hardware Result

When all component are already solder in the right place with right position in the right polarity, we can burn the program in PIC 16F877A. Before the battery (Power) is plugged in, make sure the polarity of critical component is correctly soldered to prevent any explosion. Wrong polarity of electrolytic capacitor may cause explosion. All the information based on RFID tag number that been stored or program in PIC. The RFID tag number will represent the traffic sign data of the location.

The output will display at LCD that showing only the letter without issuing an attractive graphic image. When the RFID tag is place near the RFID reader, the RFID reader read the RFID tag, further sends the tag ID to the PIC microcontroller. PIC microcontroller process the tag ID, the user name and the tag ID will be display on the LCD display. The program of PIC can be referring in appendix. The circuit designed is shows as figure 4.21.

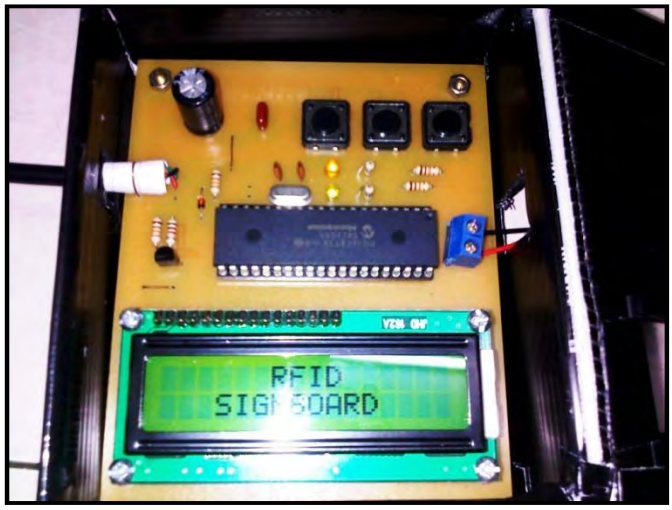


Figure 4.21: The hardware result

The vehicle signing hardware should be able to read traffic sign and signal data stored in RFID tags by vehicle RFID reader. Then finally, the detected data will be presented as digital traffic sign as well as replacing existing sign. The capabilities of displaying signing on a terminal in the vehicle are expected to provide an effective support for vehicle drivers for keeping to the lawful speed limit especially at low speed area.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.0 Conclusion

Basically, this project consists two major parts which are hardware and software. The hardware parts consist of RFID reader and RFID tag and circuit with PIC 16F877A meanwhile for the software used in this project is Visual Basic 6.0 with RFID reader and RFID tag. This project will be designed to overcome the problem about vehicle speed limit on the road. This project provides a new way of displaying the road speed sign to make it more effective than static visual information nowadays.

By using the Visual Basic 6 software and RFID, this system will be able to alert the driver about the speed limit at the low speed area and capable of displaying signing on a terminal in the vehicle. In the future in-vehicle signing system can replacing the existing static traffic sign that located at the road side.

Along with the progress of the country, many systems that apply the use of RFID are like the arrival of Intelligent Systems, toll collection systems and processing books in the library. Due to the widespread use of applications and the advantages it has, that why it becomes a choice in the design of the Vehicle Display System signals. This project provides a new approach to display the signs on the vehicle traffic is more effective than signs from the edge of the existing road. By using Visual Basic 6, the system can display the vehicle speed signals as well as to ensure the drivers more cautious when driving, especially at the lower speed.

The conclusion that can be made is that this project is very useful for use in vehicles to reduce road accidents caused by excessive speed. In addition, this project is to raise awareness driver to be more vigilant while in the lower speed limit in the appropriate pace in the area. The system is also very suitable, especially applied to the vehicle because accidents involving a car are very highest statistic in our day life.

Finally, the overall project was successful that meets and archive all the objectives, requirements and scope. In-Vehicle Signing System using RFID is recommended to replace the traffic signals are on the existing road.

5.1 Recommendation

For future work, the system suggested to be improved its efficiency by combination between hardware and software. Continue in designing in software and testing the connection between hardware. Maintenance and upgrade will be done after all the phase is done. The success of this project could be a good start and guidance in the future. In addition, it can increase the use of applications in wireless communications technology. Here are some suggestions that can be used to improve this system to be more effective in the future, namely:

i. Replacing the use of passive RFID active RFID system makes it more effective. This is because active RFID reader signal covering an area larger than the passive RFID. This system should be applied to roads in other areas and not just limited to low-speed region.

ii. Using RFID tag reader can operate in all environmental conditions and not easily distracted tag ID signal caused by changes in weather such as rain and dusty road conditions.

iii. Using the technology of other wireless systems such as GPS is more effective in controlling the speed of vehicles as they can determine more accurately the position of the vehicle. GPS has the advantage of direct communication with the satellite.

iv. Replacing an audible signal to warn of VB6 software voice signals to provide greater effectiveness to the driver of the vehicle.

v. This system also can combine with GPS system in order to give information to the driver. This system also can be upgrading by combining the system with engine car. At the same time when the system display the traffic sign, automatically will controlled the speed limit car

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APPENDIX A

H. PSM 1 - PROJECT PLANNING

List the main activities for the proposed project. State period required for each activity.

Project Activities	2010																							
	July				August				September				October				November				December			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4
Choose the project title	■								Mid Semester Break								Review Week	Final Examination			Semester Break			
Briefing PSM 1 and PSM 2		■																						
Set the objectives and scope of the project		■	■																					
Create and send a proposal to the supervisor confirmation			■	■																				
Find journals and books related to the project					■	■																		
Analyze data from the journal and books is taken							■	■																
Obtain information necessary for project development											■	■												
Set the software that will be used in the project • **Create draft interface** • **Find coding that related to the interface**											■	■	■	■										
Studying the hardware project • **Analyze data about RFID and how it function**													■	■										
Seminar PSM 1															■	■								
Submit report PSM 1															■	■								

I. PSM 2 - PROJECT PLANNING

List the main activities for the proposed project. State period required for each activity.

Project Activities	2011																							
	January				February				March				April				Mei				June			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4
Software System Development • Create an interface using VB • Install coding for interface • Create database for all data using Ms. access • Create a connection between database and interface					Mid Semester Break											Final Examination				Semester Break				
Testing and troubleshoot the Software Project																								
Hardware Project Development • Prepare a circuit for project • Test the circuit using Proteus and simulates • Etching and solder the circuit • Troubleshoot the circuit • Create the program																								
Testing and troubleshoot the circuit project • Burn program into PIC																								
Combined RFID with VB and Circuit • design the Prototype Model																								
Final Testing Project • INOTEK																								
Maintenance and Improvement for the Project																								
Complete the Thesis Report for PSM 2																								
Seminar PSM 2																								
Submit Thesis Report PSM 2																								

APPENDIX B

Program in PIC

```
//Project: RFID Message
//Programmer: HARMIDA
//PIC: PIC16F877A
//Crystal Frequency: 20MHz
//Compiler: HI-TECH ANSI C
//Last Modified: 20 MARCH 2011


#include <pic.h>
#include <htc.h>
__CONFIG(0x3F32);
#define   PB1        RA0
#define   PB2        RA1
#define   LCD_RS       RD2
#define LCD_RW      RD3
#define LCD_EN       RC4
#define LCD_DATA    PORTB
#define   LCD_PULSE() ((LCD_EN=1),(LCD_EN=0))
#define _XTAL_FREQ    20000000
#define BAUD       9600

void pic_init(void);
void uart_init(void);
void lcd_init(void);
void lcd_write(unsigned char c);
void lcd_clear(void);
void lcd_goto(unsigned char pos);
void lcd_string(const char *s);
void convert(int no, char base);
void display(char number);

char rfid[20],id[10],z,set,message;
unsigned int counter;

static void interrupt isr(void)
{
if(RCIF==1){
   counter=0;
   set=1;
   rfid[z]=RCREG;
   z++;}
if(TMR0IF==1){
```

```
  TMR0IF=0;
  if(counter<50000) counter++;
  if(counter==1000) z=0;
  if(counter==50000) message=0;}
}

main()
{
char id1[]={"0000639629"},id2[]={"0000626429"},id3[]={"0000627545"};
int i,j;
for(;;){
  switch(message){
  case 0:{
    lcd_goto(0x00);              //select first line
    lcd_string("     RFID     ");     //display string
    lcd_goto(0x40);              //select second line
    lcd_string("  SIGNBOARD   ");     //display string
  break;}
  case 1:{
    lcd_goto(0x00);              //select first line
    lcd_string(" LALUAN MELINTAS ");     //display string
    lcd_goto(0x40);              //select second line
    lcd_string("    30KM/J    ");     //display string
  break;}
  case 2:{
    lcd_goto(0x00);              //select first line
    lcd_string("   BONGGOL    ");     //display string
    lcd_goto(0x40);              //select second line
    lcd_string("    35KM/J    ");     //display string
  break;}
  case 3:{
    lcd_goto(0x00);              //select first line
    lcd_string(" SELEKOH TAJAM ");     //display string
    lcd_goto(0x40);              //select second line
    lcd_string("    50KM/J    ");     //display string
  break;}}

  if(set==1){
    set=0;
    j=0;
    for(i=0;i<=9;i++){
      if(rfid[i+1]==id1[i]) j++;}
    if(j==10) message=1;

    j=0;
    for(i=0;i<=9;i++){
```

```
      if(rfid[i+1]==id2[i]) j++;}
    if(j==10) message=2;

    j=0;
    for(i=0;i<=9;i++){
      if(rfid[i+1]==id3[i]) j++;}
    if(j==10) message=3;}
}}

void pic_init(void)
{
TRISA=0b00000011;
TRISB=0b00000000;
TRISC=0b10000000;
TRISD=0b00000000;
INTCON=0b11100000;
PIE1=0b00100000;        //Enable RX interrupt
PORTA=0b00000000;
PORTB=0b00000000;
PORTC=0b00000000;
PORTD=0b00000000;
PORTE=0b00000000;
}
void uart_init(void)
{
TXSTA=0b10100000;
RCSTA=0b10010000;
SPBRG=(int)(_XTAL_FREQ/(64.0*BAUD)-1);}

/* initialise the LCD - put into 4 bit mode */
void lcd_init(void)
{
__delay_ms(8);        //delay for LCD Power Up
lcd_write(0x38);      //function set
lcd_write(0x0C);      //display on/off control
lcd_clear();        //clear screen
lcd_write(0x06);      //entry mode set
}

/* write a byte to the LCD in 4 bit mode */
void lcd_write(unsigned char c)
{
LCD_DATA=c;
LCD_PULSE();
__delay_us(40);
}
```

```
/* clear LCD and goto home */
void lcd_clear(void)
{
LCD_RS=0;
lcd_write(0x1);
__delay_ms(2);
}

/* write a string of chars to the LCD */
void lcd_string(const char *s)
{
LCD_RS=1;           // write characters
while(*s)
lcd_write(*s++);

}

/* go to the specified position */
void lcd_goto(unsigned char pos)
{
LCD_RS=0;
lcd_write(0x80+pos);
}

void convert(int no, char base)
{char i;
for(i=0;i<=9;i++) id[i]=0;
i=0;
do{
  id[i]=no%base;
  no=no/base;
  i=i+1;}
while(no!=0);
}
```

APPENDIX C

Program in VB

```
Dim CONN As New ADODB.Connection
Dim TXT1, TXT2 As Variant
Dim RS As New ADODB.Recordset
'API constants
Dim oRS As ADODB.Recordset
Dim strT As String
Dim strI As String
Dim strData As String

Dim lvwItem As ListItem
Dim itm As ListItem
Dim BytImage() As Byte
Dim ImageSize As Long
Dim OffSet As Long
Dim TmpPic As String
Dim FF As Integer
Const conChunkSize = 100

Dim mbChangedByCode As Boolean
Dim mbEditFlag As Boolean
Dim mbAddNewFlag As Boolean
Dim mbDataChanged As Boolean
Dim Orders As New ADODB.Recordset
Private Const MAX_FILENAME_LEN = 256
Private Const FILE_SHARE_READ = &H1
Private Const FILE_SHARE_WRITE = &H2
Private Const OPEN_EXISTING = 3
Private Const FILE_ATTRIBUTE_NORMAL = &H80

'API Structures
Private Type SECURITY_ATTRIBUTES
nLength As Long
lpSecurityDescriptor As Long
bInheritHandle As Long
End Type
Private Sub cmdexit_Click()
 'Exit the project
    End
End Sub
Private Sub Command1_Click()
Call Connect
End Sub
```

```
Private Sub Connect()
Dim Mystring As String
Dim readdata As String
Dim dummy As Variant
Dim strData As String
Static strSameNumber As String
Dim strNewNumber As String

If (MSComm1.PortOpen = True) Then
MSComm1.PortOpen = False
Command1.Caption = "Connect"        ' Change button caption
Else
'Check if port is open or closed
   MSComm1.CommPort = CStr(Right(Combo1.Text, 1))
   MSComm1.settings = "9600,N,8,1"
   MSComm1.DTREnable = False
   MSComm1.EOFEnable = False
   MSComm1.Handshaking = comNone
   MSComm1.InBufferSize = 512
   MSComm1.InputLen = 24
   MSComm1.InputMode = comInputModeText
   MSComm1.NullDiscard = False
   MSComm1.OutBufferSize = 512
   MSComm1.ParityReplace = "?"
   MSComm1.RThreshold = 0
   MSComm1.RTSEnable = False
   MSComm1.SThreshold = 8
   MSComm1.PortOpen = True
   Command1.Caption = "Disconnect"
End If
again1:
Do While Checkport() = True            ' IF RFID reader is still connected
dummy = DoEvents()
Loop Until MSComm1.InBufferCount = 12   ' Then loop until  a new value is received
Mystring = CStr(MSComm1.Input)         ' Store value received in 'MyString'
Text2 = Mystring                ' Show ID
'txtFields(1) = (DATE)                  ' Show current Date
'txtFields(2) = (TIME)                 ' Show current Time
readdata = Mystring & " @ " & DATE & "=" & TIME
List1.AddItem readdata
Loop
End Sub

Static Function Checkport() As Boolean
If (MSComm1.PortOpen = True) Then
```

```
   Checkport = True
Else
   Checkport = False
End If
End Function

Private Sub Form_Load()

If CONN.State = 1 Then
   CONN.Close
End If

CONN.ConnectionString = "Provider=Microsoft.Jet.OLEDB.4.0;Data Source=" & App.Path &
"\Database\db.mdb"
CONN.Open

TXT1 = ""
TXT1 = "select distinct ID from speedlimit"

If RS.State = 1 Then
   RS.Close
End If

   Dim i As Integer
   Dim comfound As String
   Dim labelversion As String
  labelversion = "Ver 1.1"
   Label9.Caption = labelversion
' Get hard Disk Serial Number
   Text1.Text = GetSerialNumber("C")   ' Get serial number of C: drive


' Set the basic values for COM port: COM1,9600,8,N,1
   Combo2.AddItem 2400
   Combo2.AddItem 4800
   Combo2.AddItem 9600
   Combo2.AddItem 19200
   Combo2.AddItem 38400
   Combo2.AddItem 57600
   Combo2.AddItem 115200

' Check available COM ports on the system
    For i = 1 To 10              ' Check upto 16 numbers (Change this for more)
       If COMAvailable(i) Then
          comfound = "COM" & i
          Combo1.AddItem comfound
```

```
            Combo1.Text = "COM" & i
        End If
    Next

End Sub
Private Sub Form_Unload(Cancel As Integer)
    If (MSComm1.PortOpen = True) Then
        MSComm1.PortOpen = False
    End If
    End
    Unload Me
End Sub


'  API to Return a volume's serial number
Public Function GetSerialNumber(sDrive As String) As Long
   Dim ser As Long
   Dim s As String * MAX_FILENAME_LEN
   Dim s2 As String * MAX_FILENAME_LEN
   Dim i As Long
   Dim j As Long

   Call GetVolumeInformation(sDrive + ":\" & Chr$(0), s, MAX_FILENAME_LEN, ser, i, j, s2,
MAX_FILENAME_LEN)
   GetSerialNumber = ser
End Function

' API to check availability of COM ports
' Include in list if the COM exists, leave otherwise
Public Function COMAvailable(COMNum As Integer) As Boolean
    Dim hCOM As Long
    Dim ret As Long
    Dim sec As SECURITY_ATTRIBUTES


    'Try to open the COM port
    hCOM = CreateFile("COM" & COMNum & "", 0, FILE_SHARE_READ +
FILE_SHARE_WRITE, sec, OPEN_EXISTING, FILE_ATTRIBUTE_NORMAL, 0)
    If hCOM = -1 Then
        COMAvailable = False
    Else
        COMAvailable = True
        ' Now close the COM port
        ret = CloseHandle(hCOM)
    End If
End Function
```

```
' Detecting and activating a previous instance of the application
' This routine will prevent two copies of program from running at the same
' time. It consists of a Function that determines if another instance is already
' running and activates it if it is. The Sub (Form_Load()) calls this function and
' closes the program if there is another instance of the program running.

Function AnotherInstance() As Integer
   Dim AppTitle$
   If App.PrevInstance Then
      ' Hold the title of the application (title bar caption)
      AppTitle$ = App.Title
      ' Change the application title
      App.Title = "One instance running..."
      ' Let calling procedure know another instance was detected
      AnotherInstance = True
   Else
      ' Let calling procedure know another instance was NOT detected
      AnotherInstance = False
   End If
End Function

Private Sub Combo1_Click()
   Dim portnumber As String
   Dim comselect As String
   Dim i As Integer

   comselect = Combo1.Text
   If (MSComm1.PortOpen = True) Then
      MSComm1.PortOpen = False
      Command1.Caption = "Connect"        ' Change button caption
   End If
   portnumber = Right(comselect, 1)
   i = Val(portnumber)
   MSComm1.CommPort = i                   ' Set new COM port
End Sub


Private Sub Combo2_Click()
 Dim baudselect As String
   Dim commset As String

   baudselect = Combo1.Text
   If (MSComm1.PortOpen = True) Then
      MSComm1.PortOpen = False
      Command1.Caption = "Connect"        ' Change button caption
```

```
    End If
    MSComm1.settings = "9600,N,8,1"
End Sub

Private Sub Timer2_Timer()
Dim fixstring As String
    List1.Clear
    fixstring = "Card ID  @  Date = Time"
    List1.AddItem fixstring
End Sub

Private Sub Timer5_Timer(Index As Integer)
  If mstrCurrColor = "G" Then
     Label2.ForeColor = &HFF00&
     mstrCurrColor = "Y"
Else
     mstrCurrColor = "G"
     Label2.ForeColor = &HFF00FF
End If
End Sub

Private Sub Timer3_Timer()
    TIME.Caption = Format(Now, "dd/mm/yyyy")
    DATE.Caption = Format(Now, "hh:mm:ss")
End Sub

Private Sub Timer4_Timer(Index As Integer)
 If mstrCurrColor = "G" Then
     Label7.ForeColor = &H80FF&
     mstrCurrColor = "Y"
Else
     mstrCurrColor = "G"
     Label7.ForeColor = &HFFFF&
End If
End Sub
Private Sub Text2_Change()
Dim fixstring As String

If Text2 = "0000639629" Then
   Form2.Show
End If

If Text2 = "0000626429" Then
   Form4.Show
End If
```

```
If Text2 = "0000627545" Then
   Form5.Show

 End If

TXT1 = ""
TXT1 = "select * from speedlimit where ID = '" & Text2 & "'"

RS.Close
End Sub
Private Sub Command4_Click()
Dim fixstring As String
    List1.Clear
    fixstring = "Card ID  @  Date = Time"
    List1.AddItem fixstring
End Sub
```