IN-CAR ENTERTAINMENT AND MAINTENANCE SYSTEM (ICEMAN)

Concentrates on Car Maintenance System Software (CARMAN)

by

Irwan Husien B Mohamad

Dissertation submitted
in partial fulfillment of the requirement for the
Bachelor of Technology (Hons)
(Information System)

JUNE 2004

Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

IN-CAR ENTERTAINMENT AND MAINTENANCE SYSTEM (ICEMAN)

Concentrate on Car Maintenance System Software (CARMAN)

By

Irwan Husien B Mohamad

A project dissertation submitted to the
Information Technology Programme Universiti Teknologi PETRONAS
In partial fulfillment of the requirement for the
BACHELOR OF TECHNOLOGY (Hons)
(INFORMATION SYSTEM)

Approved by,

_____
(Mr. Jale B. Ahmad)

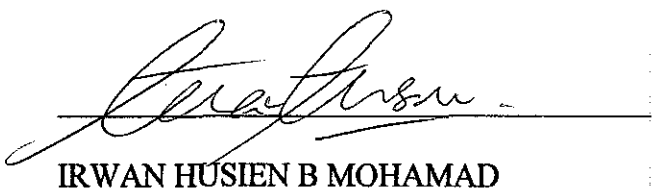
UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

JUNE 2004

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the originality of the work is my own except as specified in the references and acknowledgements, and that the original work continued herein have not been undertaken or done by unspecified sources or persons.



IRWAN HUSIEN B MOHAMAD

ABSTRACT

Computer usually used at home or in the office. In a person daily life, those are the only places where someone has to be to run their favorite songs, files or movies. Listening to vast collection of MP3s and movies even when a person is moving always being a dream. '*In-Car Entertainment And Maintenance System*' which also known as ICEMAN is a system, which make the dream comes true. ICEMAN is an integrated customized desktop with car's interior space. Existing similar system come with the concept of Carputer, only concentrates on the entertainment elements such as MP3, and movies format. Whilst, ICEMAN offers extra functions which are customized user-interface to run the entertainment programs which also known as Media Box and a Car Maintenance System which also known as CarMan system. A voice recognition system is integrated to perform the MediaBox and the CarMan functions. The car maintenance system is developed to assists the user in maintaining their car by tracking all the activities done towards the car and also able to remind the user to perform necessary activities. The system concerns about five most important elements of a car, which are car servicing, air filter, battery, brake pads and timing belt. All the car maintenance are based on the times assumptions. Each elements has it owns assumptions and decision are made based on that. CarMan was developed using the prototyping model and including research and development period, it has taken about 3 months of development time. Several limitations have been encountered as well as suggestions have been pointed out to improve the CarMan software in the future along with the ICEMAN system.

ACKNOWLEDGEMENTS

Firstly, I would like to express my gratitude to Allah, for His grace I enable to accomplish this project. I believe that His blesses and mercifulness has given me the strength and wisdom to complete this project.

I would like to extend my thank you to Universiti Teknologi PETRONAS for the opportunity given to me to accomplish my final year project. I greatly appreciate all the lessons and experiences gained throughout the period.

I would like to express my highest appreciation first of all to my parents for their full support and believe in me. I would also like to express my highest acknowledgement to my supervisor, Mr. Jale Ahmad for his commitment, comments, guidance and ideas to complete this project. Acknowledgements to Mr. Fadzil Hassan, Mrs. Rozana Kasbon, Ms. Eliza Mazmee and other lecturers who indirectly involved by guiding me throughout my project. Your knowledge, kindness and patience will always be remembered and appreciated.

I would also say my appreciations to my group mates, Ikhwan Effendi and Mohd Azridz for contributing their tremendous work, effective communication and relationship through the good and the bad times. It has been a great pleasure working with them.

Lastly, to all my friends who generously help me out with my project. Thank you Che Hasrul for lending your complete computer set for the testing, Rashid for his CPU donation, Mr. Anwar Rizman, Mr. Azmi Bahaldin and Mr. Azif Fariz from Malaysia International Shipping Corporation Berhad (MISC) for their ideas contributed towards the project. Also to those whose names are not mentioned, your help and advises are so beneficial to me for the success of this project.

TABLE OF CONTENTS

APPENDIXES

APPENDIX A

Initial ER Diagram of CARMAN

Revised ER Diagram of CARMAN

APPENDIX B

Interface Design (Main)

Interface Design (Car Service)

Interface Design (Air Filter)

Interface Design (Battery)

Interface Design (Brake Pad)

Interface Design (Timing Belt)

Interface Design (Reminder)

Interface Design (Alarm Display)

APPENDIX C

Pictures of activities throughout the development period

ABBREVIATIONS AND NOMENCLATURES

CPU – **Central Processing Unit (also used to refer the computer tower casing)**

ICEMAN – **In-Car Entertainment and Maintenance System**

CARMAN - **Car Maintenance System**

CHAPTER 1
INTRODUCTION

1.1 Introduction to Carputer

The trend of addictiveness towards computer system has become a normal issue nowadays. The high interest of the mp3 file format has become the main reason for the development of Carputer

Carputer, short-form for Car Computer, is a concept where a computer or a desktop is installed in a car and having the similar function with a normal computer available at home. This new creative concept currently has only been established in the United States of America and in Europe. The main purpose is to have the vast collection of mp3s played in the car.

Young generation users are getting sick of the CDs in the car, and keep switching between the radio channels, so the idea of having hours of hours of own preference music ready on tap is quite appealing and interesting. Perhaps current development has reached at the level of high-tech development with sophisticated design and equipments, but there was always a hard time before that. The first car computer projects found through sites sharing were both bulky (as in having a midi-tower complete with its original packing in the trunk) and technically complicated (e.g. wiring, design solutions). But as time goes by, the development of Carputer has became rapid and now, even developers could have as small, low power consumption and as much powerful as possible using proper monitor. All hardware available are basically at affordable prices.

Now, users can enjoy their music preference regardless at home or even going to somewhere. From just an mp3 playback function, a Carputer could be adding values with movies and multimedia, GPS navigation or TV, depending on ones creativity. The sky is the limit to anyone. The progress of Carputer would be increased to make the experience in the car is more than just driving.

1.2 BACKGROUND STUDY

1.2.1 Introduction to ICEMAN

ICEMAN or In Car Entertainment and Maintenance System is a concept taken from Carputer to provide more functions to user more than just for entertainment purposes. To differentiate ICEMAN from the Carputer concept, ICEMAN will be enhanced by implementing its own entertainment system, customized car maintenance program which, will be integrated with voice recognition ability. User would have the opportunity to have more wide entertainment options such as DVD, VCD, CD and MP3 and in the same time to hear the local FM and television channels as well as manage to handle the car maintenance system with the ease of voice usage to control the system. ICEMAN is divided into three main parts:

- MediaBox
- CarMan
- E-Speak

1) MEDIABOX

MediaBox is an entertainment application created by Ikhwan Effendi specifically for the use of ICEMAN. MediaBox is general name to use to represent two types of different programs, which are the MediaBox MP3 Player, and also the MediaBox Movie Player. Both of this application was developed using Visual Basic 6.0.

The functionality offered by these applications are basically similar to the existing application such as Winamp and Windows Media Player, but the unique part is that, both of the applications have been developed to suit the best size and condition for the ICEMAN. Bigger icons, fonts and display are determined to provide the ease in usage for ICEMAN users. As an extra introductory, MediaBox MP3 Player plays **mp3** files format only and MediaBox Movie Player runs files based on the format of **divx, avi, mpg, mpeg, dat, wmv and asf.**. Since these two programs are working together under one name, the design is standardized accordingly to make sure the user could use both programs easily.

2) CARMAN

CarMan is a program basically to keep track on what a particular user has done previously to the car (maintenance) and to be reminded on the next action to be done in the future. Taken from the work Car Maintenance System, CarMan is developed by the writer Irwan Husien using Visual Basic 6.0 and Microsoft Access. This software consists of two main functions, the car maintenance database and a reminder system to remind the user to service their car parts.

The car maintenance is consists of 5 major parts of a care which are **Air Filter, Brake Pad, Timing Belt, Battery and Car Servicing.** The program will store relevant information regarding those elements in the database. It would be very useful data collections for the user to refer in the future in order to track back previous activities. Furthermore, the program is able to remind user when the next

action shall be executed once the date is due based on system estimation according to the elements.

3) E-SPEAK

E-Speak is function included in ICEMAN to enable the capability of voice recognition system. The system was created by Mohd Azridz using Visual Basic 6.0. E-Speak basically consists of functions of voice activated function and voice message.

Action will be executed by using the voice-activated function. It means that, by using voice or a user speaks, the user will be able to open or close a file without involving any physical movement. Just by saying a particular keyword through a small microphone, the action will be executed.

For the voice message system, this function is basically to confirm the user about any action to be done. For instance, a user says "Open Notepad", then the system will open a notepad application with a voice reply saying, "Notepad is ready".

1.3 PROBLEM STATEMENT

In the existing Carputer, there is no maintenance system included in Carputer system. It only offers medium for entertainment. A revolution in functionality is being created here to add the benefits of developing ICEMAN.

There are not many car maintenance available customers (based on research). In fact the existing car maintenance program only being used on desktop and so far have not yet to be used mobile. That is why there exist unnecessary elements included in any existing car maintenance program which user does not even bother.

Even though the number of users is increasing day by day, but typically, normal users do not really know what car parts needed to be changed when the time is due. Also normal users do not really know when to change any car parts.

Usually, users have problems to track back all the previous action done towards his / her car. For example, they could not remember what type of engine oil used during previous service or how much was the cost to change the brake.

Existing car maintenance programs do not include any reminder to remind the users about current maintenance that should be done. They might have keyed in valuable information in the database for instance regarding the recommended timing belt change date. Delaying to change the timing belt could cause major damages to the car engine and performances.

1.4 OBJECTIVES AND SCOPE OF STUDY

1.4.1 Objectives

The aim of this research project is to learn and acquire the knowledge in developing ICEMAN and CARMAN as well as gaining experience in working as a team to accomplish the clear goals and to achieve the objectives. There are several objectives that need to be achieved in this project. First one is to develop a desktop inside a car. This project also shall gives user the enjoyment of using the PC wherever they are with the application of entertainment such as DVD, CD and MP3 and other entertainment system. Next this project shall automate car maintenance system tracking for user. The system shall include at least five car major components. This maintenance system should keep track on the activities done and also shall able to suggest a new date for the next maintenance. Lastly, this system should be able to give a reminder to user about any current car maintenance activities that need to change during a particular time.

1.4.2 Scope of Study

The scope of study of this project will be basically divided into two parts. The first part will focus on the car maintenance system program to be developed. It emphasizes on engine oil, timing belt, brake pad, air filter, reminder settings and also the interface of the program. The interface should be easily understood and require less interaction to provide most information. Learning on the language of Visual Basic program would be important.

The second part of the study about the best connectivity of computer parts with car power spacing and power system. The scope includes the study about the connectivity of computer hardware components. The integration of the Media Box applications, the car maintenance system and the voice recognition will be focused on. This is to further expand the functionality and capability of the existing Carputer.

CHAPTER 2
LITERATURE REVIEW

Regular car servicing is very important to any car. Regardless the level of quality of a car is, proper car maintenance should be reminded always again and again to avoid any unexpected, unanticipated, inconvenient, and expensive car event that might happen at anytime [David A. Cronin (2004)]. That is why CARMAN is implemented in the ICEMAN system as users guidance about the cars maintenance progress. A reminder will be included in CARMAN to remind the user what parts to be changed in that particular of time. It would be a good reminder for user to concern about the car's maintenance progress. Besides could avoid unplanned event, regular check ups could improve performance as well as fuel economy. This is by following the right schedules of servicing could prevent from damaged spark plugs, torn brakes and low transmission fluids. [Preoria Journal (2004)].

Many people agreed that keep yourself up-to-date with the car is very important to prevent any long term damage to the car as well as maintaining cost effective. Using good and right fuel and engine oil would make the car engine will always be in good shape [Vlad Samarin (1999)]. A driver should not let the car using the same engine oil even after the due to change the engine oil has passed. Using dirty and intoxicated engine will make the engine lifetime to be shorter and requires high cost of maintenance. Drivers should always keep the oil level full, change oil and oil filter on regular basis and fix any minor engine problems as soon as they can. Delaying in changing the engine oil will make the oil gets dirty. Dirty oil has a high resistance in flow where the oil finds it is hard to stick to the metal surface of the engine when the engine is off. Thus, it will cause problem to restart the engine. Dirty oil also prevents the oil to transfer the heat off from the engine, which is so dangerous. [J. Daniel Emmanuel (1997)].

Having a good braking condition is the vital elements in ensuring that a driver is safe to go at any speed while driving. When there is a sudden slowing down on the high-speed highway, the car's braking ability plays the major role to determine the driver's safety besides the driver's alertness towards the current situation. A good brake pad means that the contact surface of the pad with the crankshaft is maintain thick. Even professional drivers (F1 drivers, Rally drivers) could not stop effectively with worn brake pads. Applying the rule of ' Better too soon than too late' is important to avoid extra expenses and dangerous driving conditions. [J. Daniel Emmanuel (2003)]

Maintenance of batteries usually should be done twice a week. This is done usually by top-up the battery refill water if the water level is below the recommended level. This is because battery is being used everyday. The more usage of the battery will cause the more usage of the liquid. If the level of the battery water is low for a long period of time, it will caused the battery to be weaken and will shorten the life of the battery. Frequent check ups the battery water level shall prevent from car resource wastage. If the battery is left out drained, the battery is dead and cannot be recharged. Replacing a new battery could incur as high as RM 90 at cost. [Lawrence I. Charters (2003)]

Timing belt change policy usually last for about 80,000 kms to 100,000 kms. Failure to change within these times could cause a major disaster to both driver and the car. Engine will be damaged and huge amount of money needed to be spent to make everything back to normal. When this problem occurs, for sure it will be a bad moment for the car owner as multiple problems could occurs. [Pat Goss, (2001)]

Air filters have always played an important role, keeping harmful, dangerous dust and dirt out of the inside of the engine where it can do damage. A clean air filter is absolutely necessary to maintain the flow of air to fuel injection system. Maintaining a bad and dirty fuel distribution could cause major effects towards the engine performance and fuel consumption. [Tom Torbjornsen (2004)]

CHAPTER 3

PROCEDURE METHODOLOGY

3.1 PROCEDURE IDENTIFICATION

This project is considered as an active research and the research group is always tries to find better solutions for Carputer to make it better. Research is a fancy way of saying, "let's study what's happening at our school and decide how to make it a better place." (Emily Calhoun, 1994). Thus the group is taking the concept to develop a better Carputer and also to understand the development process and tools to build the application.

There are 5 general objectives that this research group wants to achieve - in general and more specifically about processes - may attempt to achieve:

3.1.1 description – this purpose is to describe the concept of Carputer and how would it benefit to user.

3.1.2 explanation – to learn about the hardware configuration and to get to know how could it be installed in car. Also to identify the required hardware

3.1.3 forecasting – to learn more what could be include in the ICEMAN to make it better than current Carputer.

3.1.4 modeling – to build the prototype either for the software or the hardware

:

3.2 ICEMAN HARDWARE SETUP

ICEMAN development is divided into two. First is the hardware setup and the second one is the software setup. The initial step of this project is to develop the hardware components of ICEMAN system. In order to build a successful hardware system, a model has been followed as a guideline for throughout the hardware setup development. The model is known as 'Prototyping Model'. The purpose using this model in the development of the ICEMAN is because; this type of product quite new and the best method is needed to suit with the concept and also to give the best result at the end of the development. Below is the diagram of the model

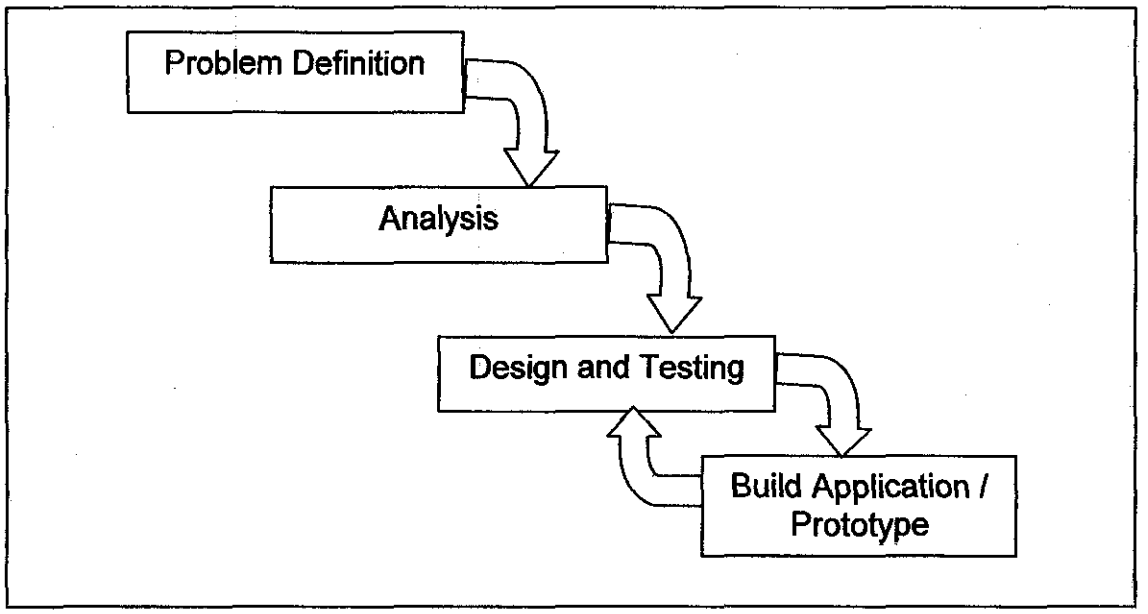


Diagram 1. Prototyping model

Problem Definition and Analysis phase is to identify current problem having by most of car users and identify the obvious consequences that would happen. As for the Design phase will be used to develop prototype interface to determine the best design with gaining the optimize database relation. Lastly, Development and Testing phase to integrate the database and interface. Iteration progress will be done until the best combination of both is reached.

Using the implementation of the methodology below, these are the progress of the project, which has been done:

3.2.1 Problem Definition

In order to design the ICEMAN requirements, there were many questions been discussed among the group members regarding the overview of the ICEMAN. The questions were:

- Are we bringing the whole bulk of CPU in the car?
- Is there any smaller monitor than the usually desktop ones?
- How does the ICEMAN power system?
- How are the wiring systems? Doesn't it going to be messy?
- What type of keyboard and mouse is feasible for the ICEMAN?
- Where is the best place to put the ICEMAN in?

At the end of the design and testing phase, these questions will be answered as a result from the preliminary stages. During the early stages of the development, many researches had been done in the Internet mostly to find out any examples that could be followed for the hardware setup and configurations. The biggest ideas contributions even until now is from a forum (www.mp3car.com) which gathers all people around the world that interested in developing concept of Carputer on their own. Many tips, ideas, suggestions and design we referred to the site as the group's guidelines and 'dictionary' whenever any problems regarding the ICEMAN cannot be solved.

3.2.2 Analysis

After determined all the ideas and concept needed to develop the system, several analyses had been done to identify all the equipments needed in order start develop the system. List below shows the required components that an ICEMAN system must have:

- Car
- DC-AC Inverter
- 12 V Battery
- 5' inch TFT Monitor
- Pre-amplifier

- Hot wires, fuse and other extensions wires.
- RCA Cables
- Gift Box
- CD-ROM
- PCI Video w/ TV out
- TV/Tuner Card
- Motherboard and processor
- Hard Disk
- RAM
- Sound Card
- Power Supply
- Microphone

For the purpose of the project, due to some limitations that cannot be avoided, the ICEMAN prototype could not used the latest computer components due to high involvement of costs. Research shows that, it is recommended to have a motherboard and processor, which is equivalent or higher to Pentium MMX which include a graphic card with TV-Out enabled. (Eg. GeForce2).

Based on the list of the hardware requirements mentioned above, Diagram 2 shows all the components to be integrated in a car.

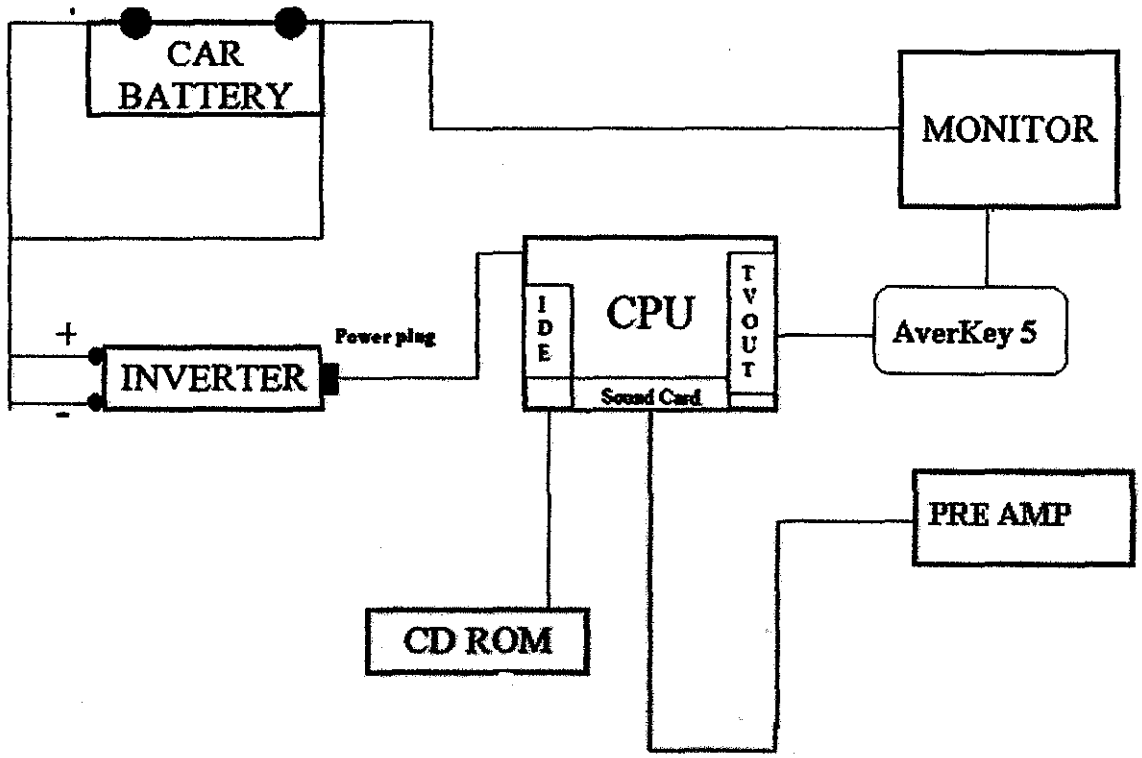


Diagram 2. Hardware connection structure

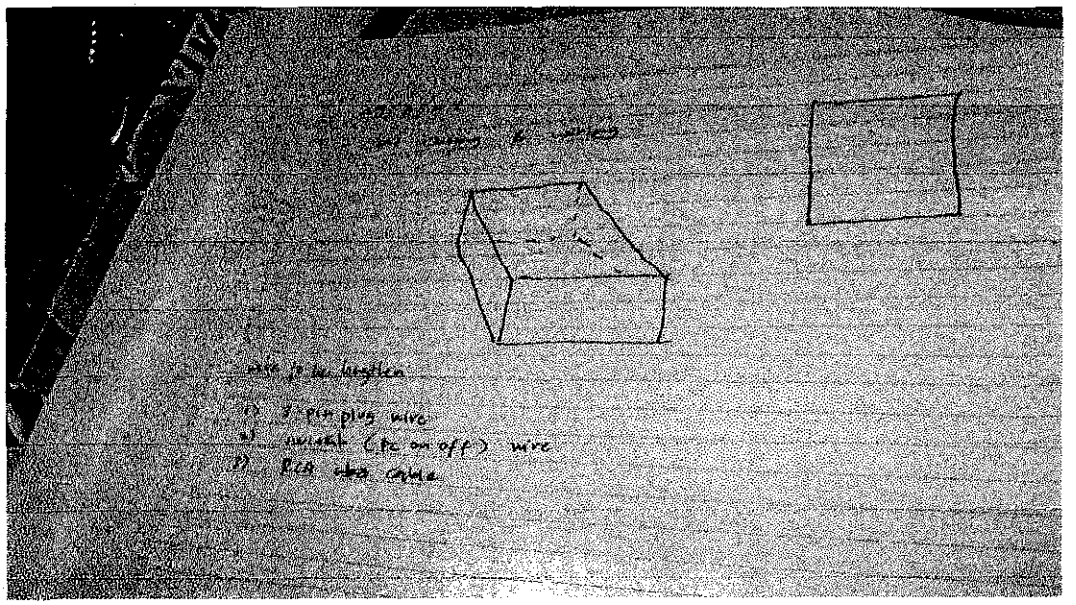
From the structure of Diagram 2, CPU is the center of all the connection involved in the architecture. From the CPU, the direct connections to the CDROM drive for the cd usage. While for the sound of the CPU, it will be handled by the pre-amplifier installed in the car previously. The amplifier would be attached to the speaker available in the car. Furthermore, since the owner particular system does not have the available slot on the board for the TV-Out card, AverKey5 product has been used to replace the graphic TV-Out card. AverKey5's function is more as a computer-to-TV converter, which carries out the similar function as a normal graphic card as TV-Out. Next, monitor is connected to the AverKey 5 as well as to the car battery. The battery is supplying power to the monitor. The battery is also supplying the power to overall system through the inverter located at the back of the car. The inverter is connected to the battery through the match of positive and negative side. Then the inverter in connected to the CPU by power cable.

Besides determining the possible structure for ICEMAN, some analyses had been done to develop and customize ICEMAN according to the car interior size. The height of the below of the driver / passenger seats needed to be measure whether does it possible to locate the new compressed CPU at the place. This is to know the height between the new CPU and compare it with the space the available below the seats or maybe to locate it in the car boot. The length of required wiring also needed to be considered.

Besides that, some analyses had been done on ensuring the low temperature in the CPU could be gained. This is to know how many fans that are needed to low down the temperature when running the system.

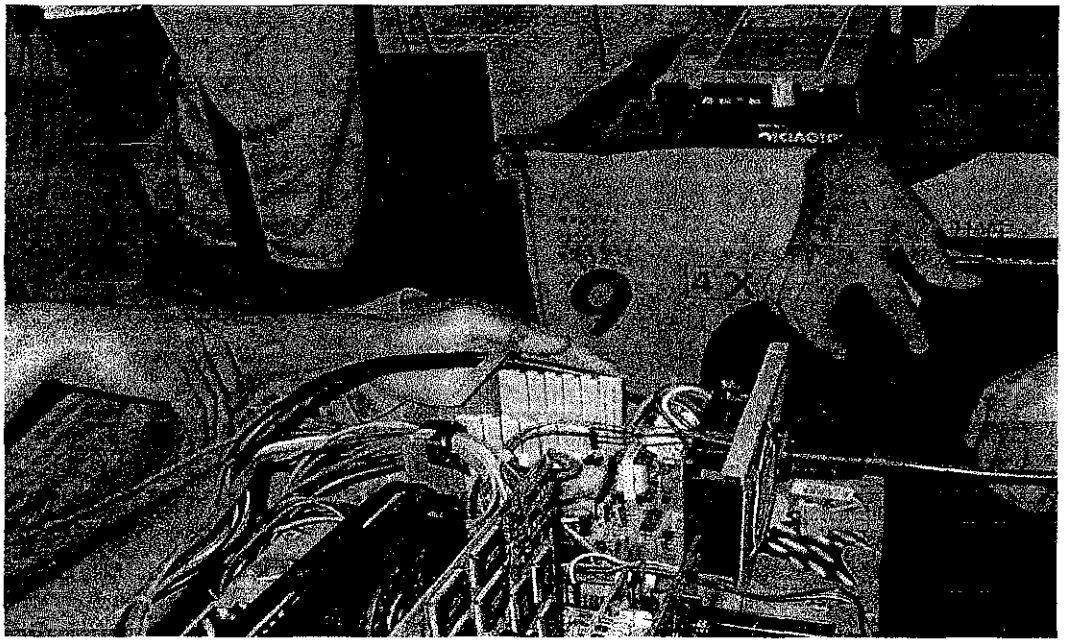
3.2.3 Design and Testing

The design phase started off with identifying the best place to allocate (to secure) the position of the motherboard and the rest (hard-disk, power supply, etc). A medium size gift box has been chosen as the new casing of the computer system Based on Picture 1, the size of the box (Length x Width x Height) is 36 X 29 X16 in cm.

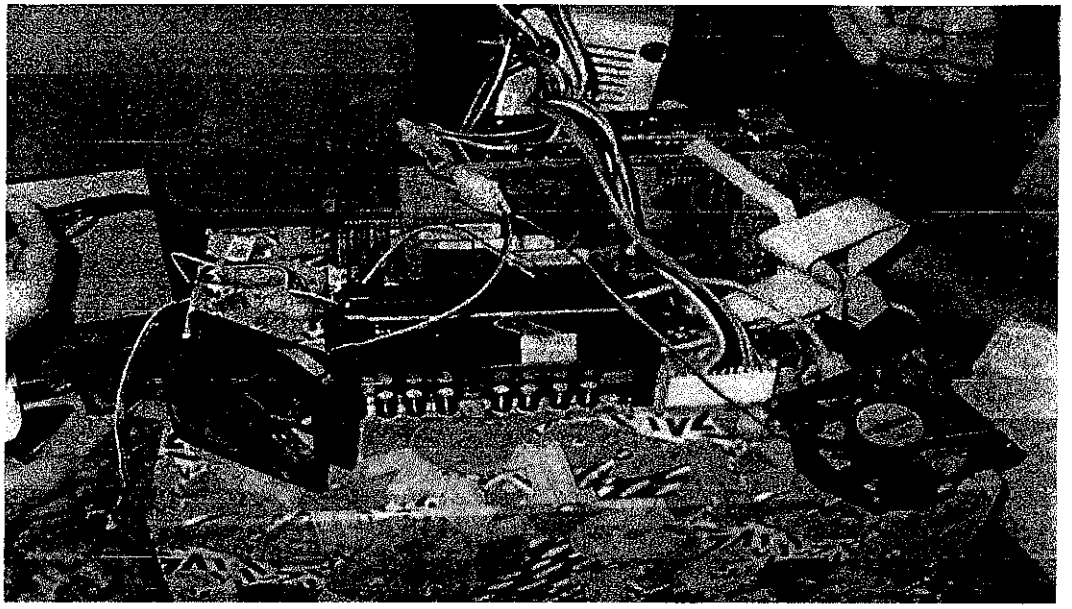


Picture 1. (Step 1) -The design planning to determine which part to cut

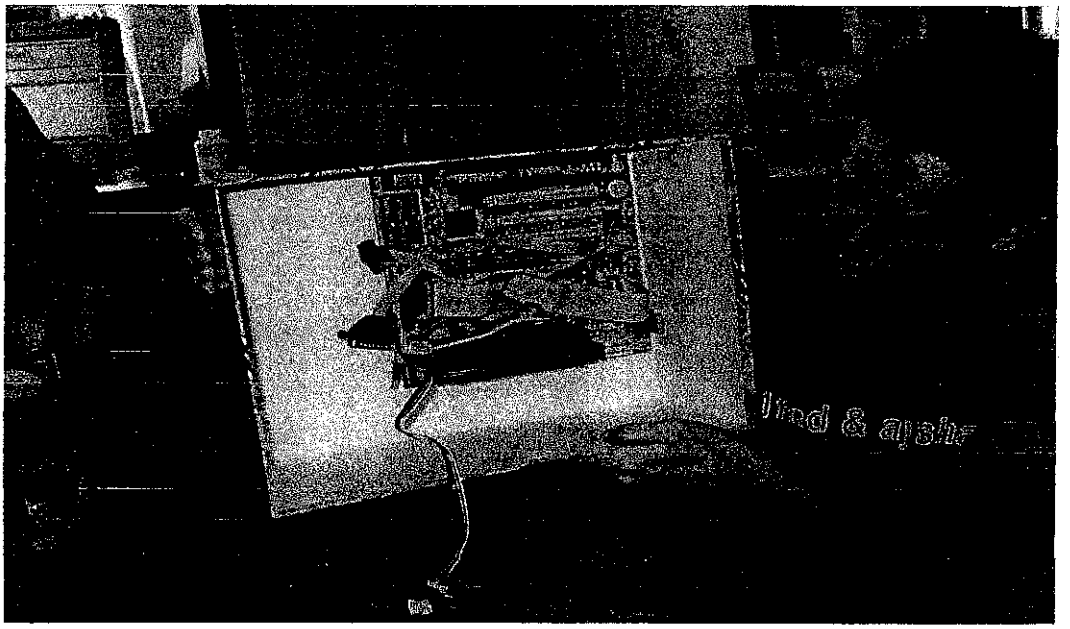
Before cutting the box, the arrangement inside the box had been determined thoroughly to ensure the good balance of the equipments, tidiness and to minimize the complexity of the crossing-wires within the box. Then, started to draw the possible position to cut to give space for given hardware. Upon customizing the box into a useful one, the hard disk has been fully formatted and configured and reinstalled with Windows XP Lite. Below are the pictures showing the step-by-step procedures, which have done to setup the ICEMAN hardware system.



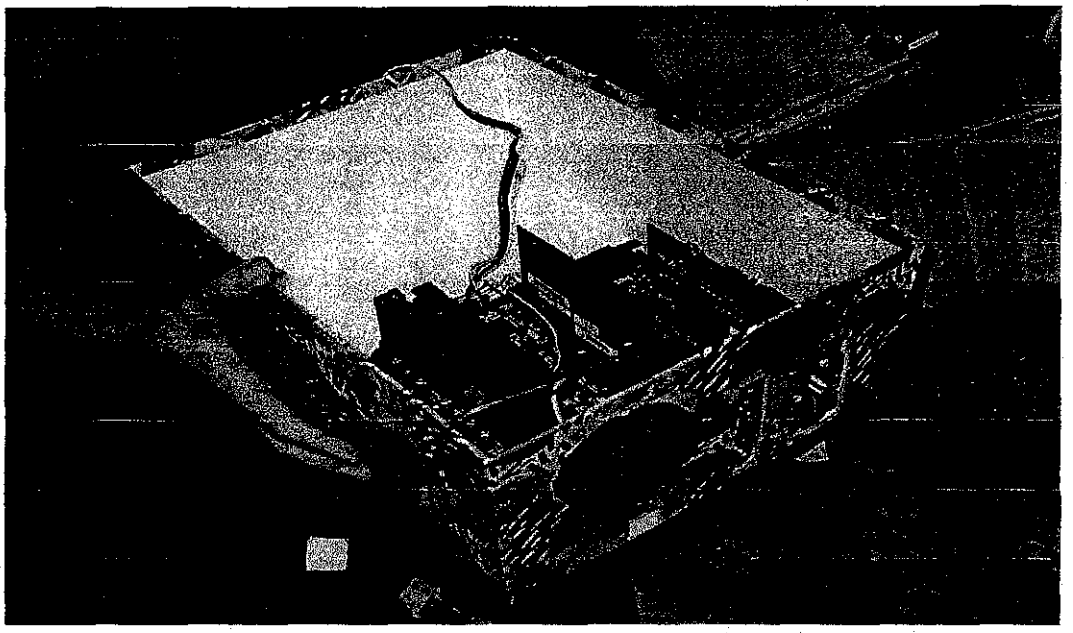
Picture 2. (Step 2) - The size of the motherboard is determined to decide the best position within the box



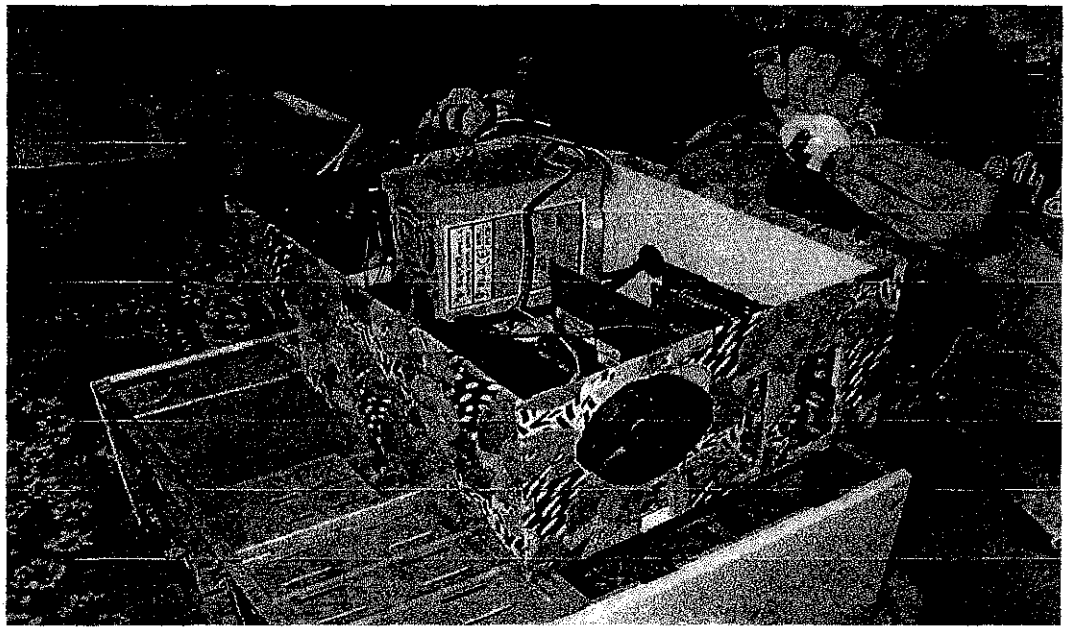
Picture 3. (Step 3) - All dismantled - components being tested to ensure all are working well before putting it the box



Picture 4. (Step 4) - Ikhwan showing the motherboard is attached perfectly to the box



Picture 5. (Step 5) - Space for all the cards and the fan are successfully made

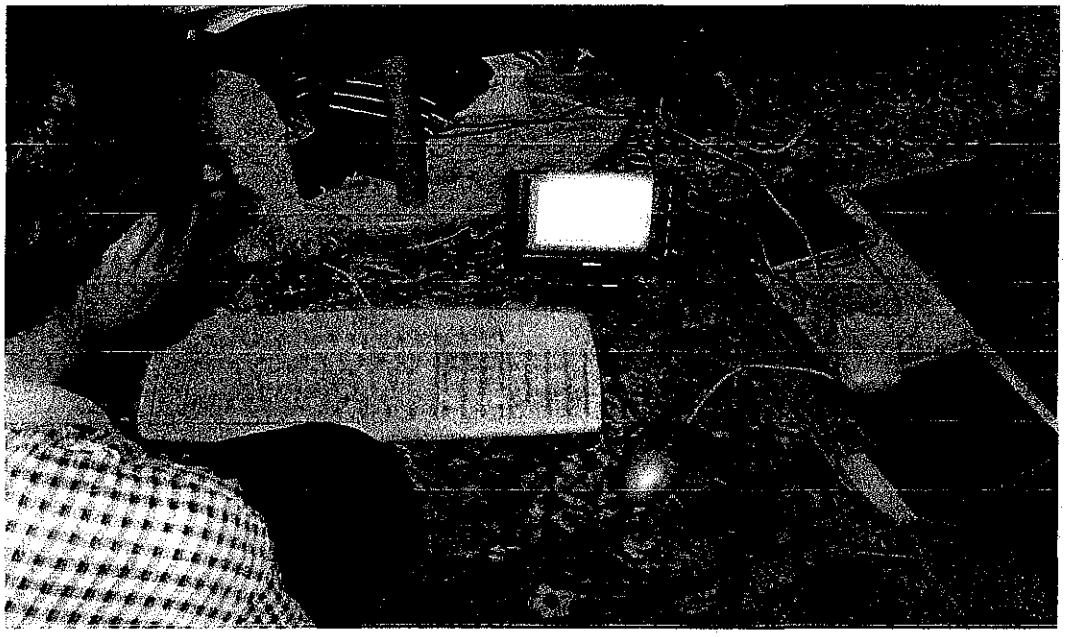


Picture 6. (Step 6) -The condition after all the components have been compiled together.

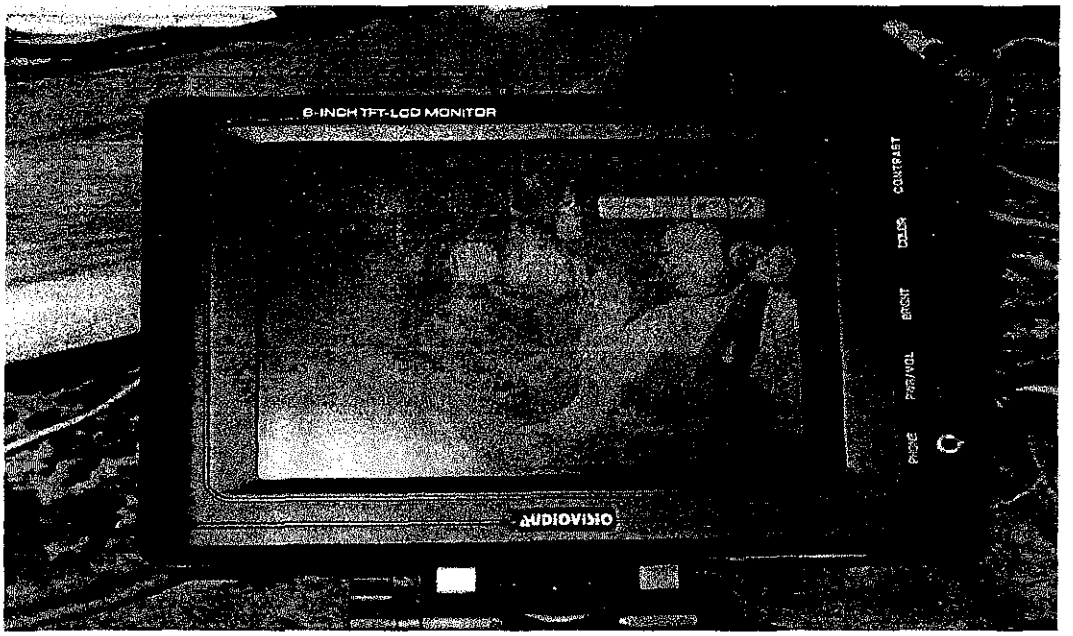
In Picture 6, it shows the compiling of all the hardware inside the box has been successful. The decision of buying the box is well paid off because it fits according without leaving any unnecessary spaces.

Next is to show the testing hardware result. Picture 7 below shows the testing progresses integrate with other hardware as well as the monitor for display.

Picture 7. (Step 7) - Neat and tidy, this is the customized CPU for ICEMAN

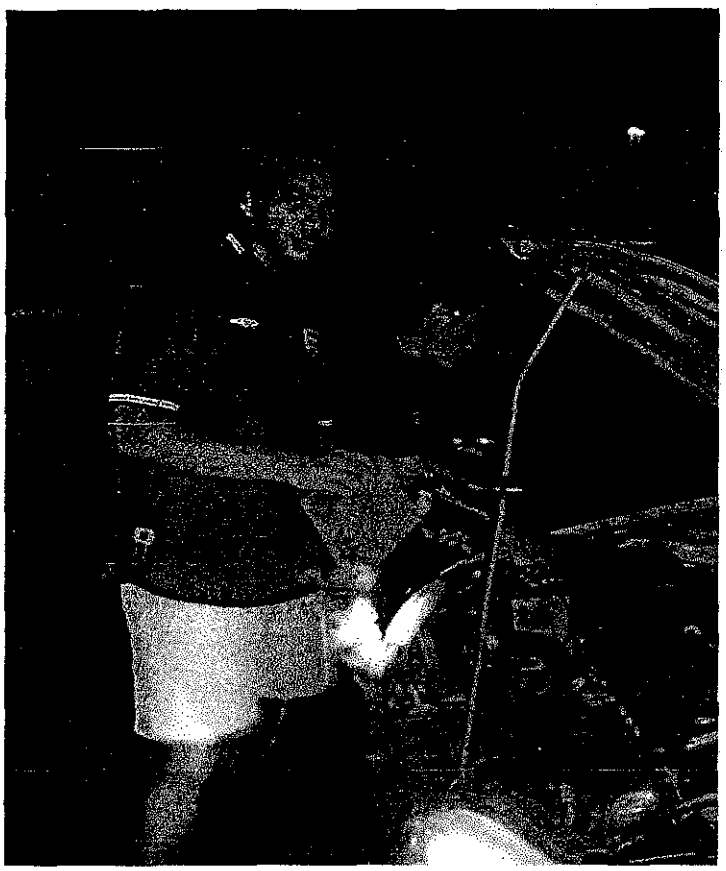


Picture 8. (Step 8) - Azridz lead the monitor testing with ICEMAN

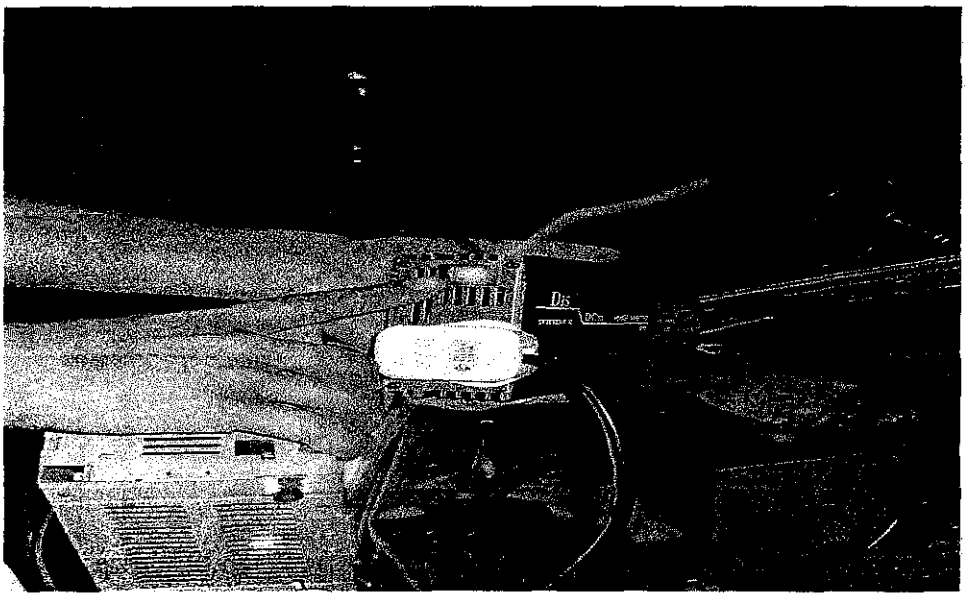


Picture 9. (Step 9) - Close view of the 6' inch monitor with such a great display

Lastly for the design and testing phase, the progress was to test the functionality of the inverter when it is attached to the car battery. Inverter is the equipment, which connected between a battery and the CPU. The main function of the inverter is to ensure the power from the battery to the CPU is maintain regardless whether the car is moving or not. General knowledge confirms that when a car moves, more power being distributed to the car system to support the usage requirement. So the power rate may vary. Without inverter, CPU may be in danger as it could create overpowered or below powered which could harm the CPU as it contains a sensitive computer chips especially towards power distribution.



Picture 10. (Step 10) - Testing the inverter using the car battery



Picture 11. (Step 11) - The inverter is working perfectly

At this point, the design and testing level has completed for the ICEMAN hardware, the CPU now is ready to be install in the car. Proper wiring and connections are very much needed to avoid any flaw in running the system. Next section will further explain the Build Application / Prototype step. From the design process, there are still a lot to learn to determine the best design that can be used to develop the CPU. The later version of motherboard and processor would gives the smaller and compact size which is so beneficial especially in terms of better advantage in space limitation.

Referring back to the questions at the beginning of the analysis section, not the whole bulk of CPU will be brought into the car, but the components of the CPU will be dismantled and recompiled in a different casing. ICEMAN will be using a monitor as small as 5' inch in size to be located on the car dashboard. Based on the Diagram 2, the resources to power up the ICEMAN are taken directly from the car battery through the inverter. The monitor also receives power directly from the car battery. The wiring system is not going to be messy. Only a few lengthy wires is used which are easily to be handled. For the keyboard, a small size keyboard will be used and for the mouse, a corded-trackball or a radio-frequency trackball are the potential options to be used. The best place to locate the ICEMAN system is in the car trunk as it has larger space to support the width and the height requirements for the CPU.

3.2.4 Build Application / Prototype

After the hardware setup and configuration, this last phase deals with the installation of the ICEMAN in the car. This is another complicated part that needed to be done as it is the last phase before the ICEMAN system to run.

Diagram 3 below shows the system installation

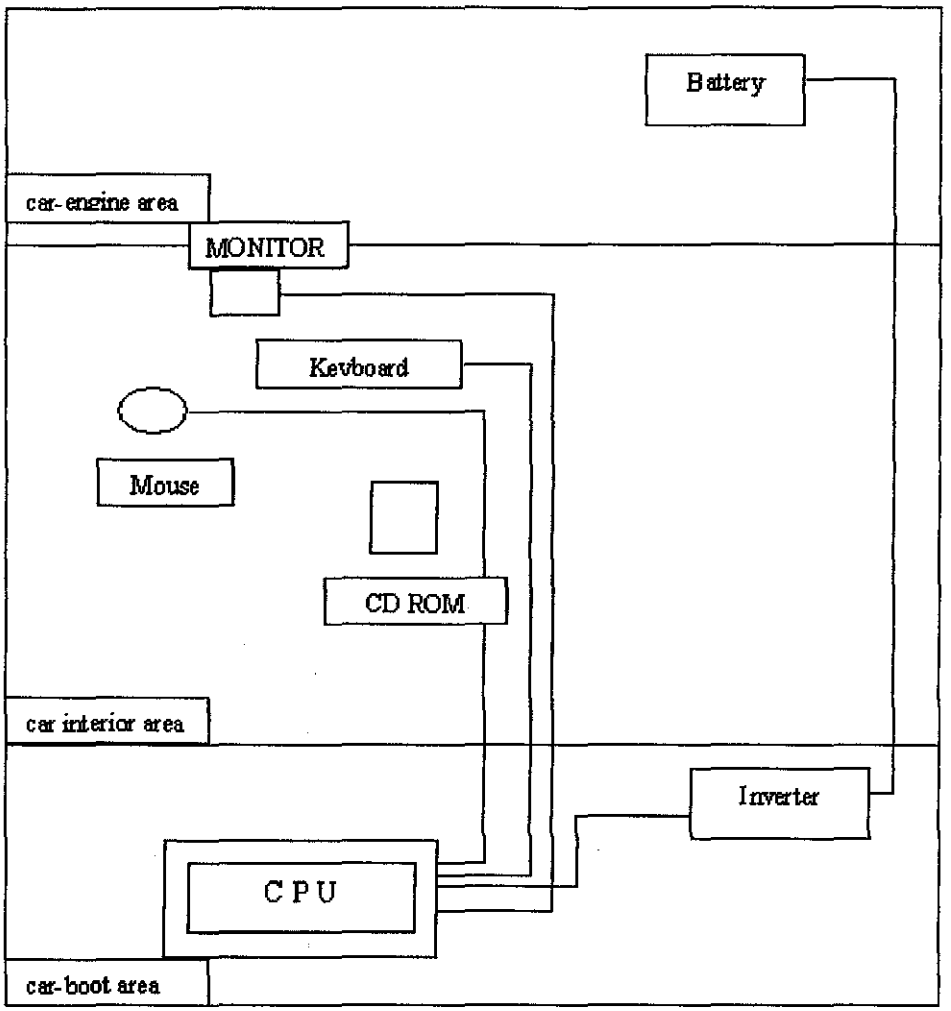
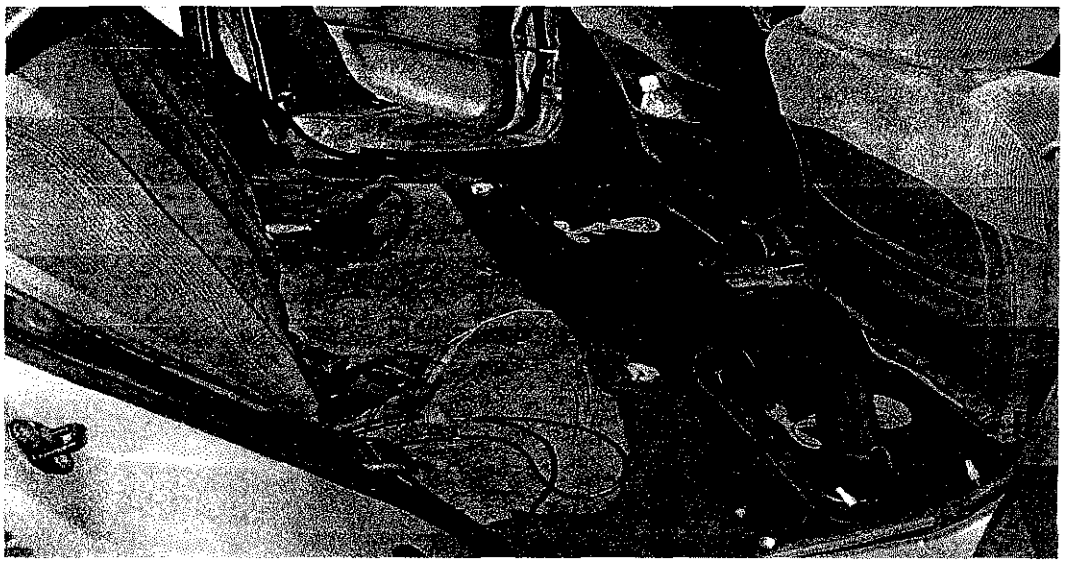


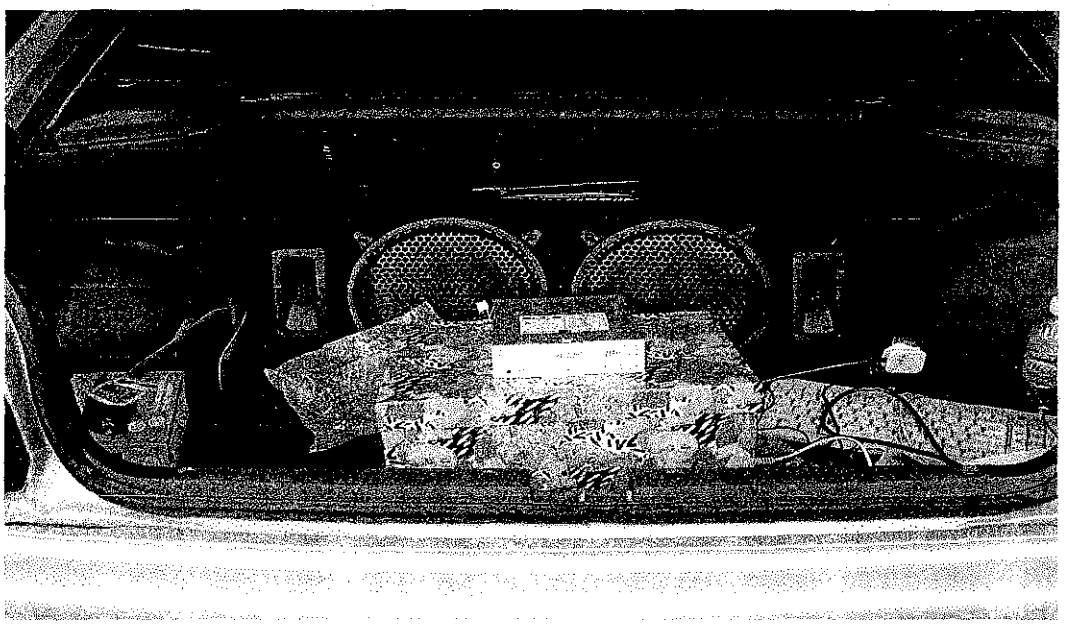
Diagram 3. ICEMAN installation diagram

The customized CPU is located at the back of the car as well as the inverter. The power cable from the CPU is connected to the inverter, which is directly connected to the car battery. Thus, the power that is pulled from the battery will be constant as it reaches the CPU because of the inverter. The rest of the hardware is connected normally, its just that the length is longer than normal. The monitor is connected through the TV-Out card placed at the CPU and the monitor is also attached to the battery for the power. The monitor is connected to the CPU by using RCA cable. For the sound, from the sound card is connecting to the car cassette player using amplifier (not in the picture), which will connect to the pre

amplifier and then lastly connect to the car radio. So, the computer audio control can be done through the pre amplifier. Below are the pictures of the installation progress.



Picture 12. (Step 12) - The back seat was taken out to ease the wiring connections



Picture 13. The ICEMAN installation has been completed

Picture 13. The monitor displaying the Windows XP interface

3.3 ICEMAN SOFTWARE SETUP (CARMAN)

3.3.1 Problem Definition

In developing a car maintenance system program, since so far there are only a few applications available, there are some questions that needed to look into consideration when designing the system. The questions are:

- What are the 5 most important elements that users shall look into more?
- How easy would the user be in adding information?
- Would the program make the analyzing better?
- What is the function that can alert user due to the car matter?

As a matter of fact, current existing applications usually contain unnecessary elements where users have the tendency to ignore it later in the future. These questions would be answered at the end of the design and testing phase.

3.3.2 Analysis

Basically, the main function of the CARMAN application is to help the normal users to take care of their car accordingly. The system functions are to keep track on the recent action / activities done to any of the 5 basics elements of a car and allow user to easily recall it by display accumulation of the each data. Elements that are included are:

1) Car Servicing records (engine oil + oil filter)
2) Car Battery
3) Car Air filter
4) Car Timing Belt
5) Car Brake Pad

Regular car servicing is very important to any car users because it is the only way to ensure the car always in good running condition. The service incurs activities of changing the engine oil as well as the oil filter. A driver who would not spend around RM 40-RM 60 for this service on a regular basis later may get nailed for an engine repair that would cost between RM 3000-RM 6000.

The battery is the only power source that a car could get from. With no sufficient battery power, the engine would not starts, the light dim and the car performance will be weaken. Ignoring the care could cause user to spend his/her time all night at the side of a road, which other uncertainties could possibly happens.

Air filters have always played an important role, keeping harmful, abrasive dust and dirt out of the inside of the engine where it can do damage. A clean air filter is absolutely necessary to maintain the delicate balance of air-to-fuel ratio in a fuel injection system. Dirty air filter into the engine system would create haywire in maintaining vehicle's performance balance.

Timing belt is the element to make sure the engine's mechanical parts are running. Without the timing belt, the engine is impossible to move the camshafts and the pistons. When a timing belt breaks, it usually does when the engine is running. This kind of operational breakage could incur results in very expensive engine damage, due to fast-moving pistons in the engine.

In the case of braking, it's essential that drivers maintain optimum friction of brake pad depth to insure maximum performance of the braking system. Nothing is more important than giving the car ability to stop when a driver wants it to stop.

To make the system more useful, the system is expected to recommend the user when approximately the next action should be taken for each element. Then a reminder will pop up to remind the user on the day the next action suppose to be taken. The reminder date could be set automatically by system or customized by the user.

3.3.3 Design / Testing

Before starting to determine the relationships, all the tables and fields must be identified and be normalized it and grouped it together. After the final review, this program is going to have 6 tables, which are Car Information table, Car Service table, Brake Pad table, Battery table, Air Filter table, Timing Belt table, Diagram 4 below is the diagram showing the relationships between all the tables designed.

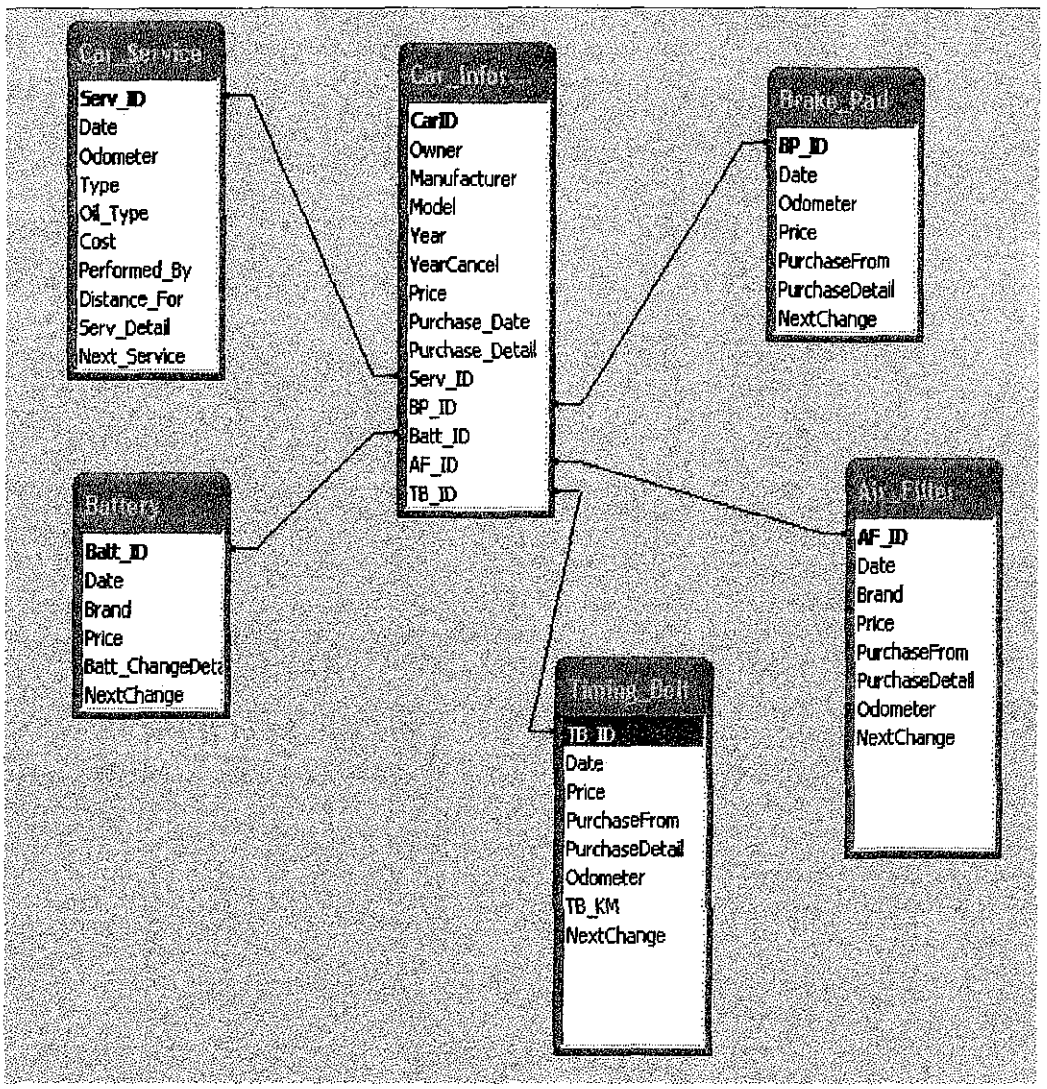


Diagram 4. The finalized database relation tables

These are the relation between the tables in the database. Car_Information table is the main table for this whole application, which the primary key is CarID. The connection of one-to-many with the table Car_Service is connected by having Serv_ID of Car_Service as a foreign key in Car_Information table.

Next, the Car_Information table has one-to-many relationship with the Battery table. The connection is connected by having the Batt_ID of Battery as a foreign key in Car_Information table.

Next, the Car_Information table has one-to-many relationship with the Timing_Belt table. The connection is connected by having the TB_ID of Timing_Belt as a foreign key in Car_Information table

Next, the Car_Information table has one-to-many relationship with the Air_Filter table. The connection is connected by having the AF_ID of Air_Filter as a foreign key in Car_Information table.

Lastly, the Car_Information table has one-to-many relationship with the Brake_Pad table. The connection is connected by having the BP_ID of Brake_Pad as a foreign key in Car_Information table.

Then, the structure of the whole system is designed to determine the flow of the system. Diagram 5 below is the diagram showing the structure design

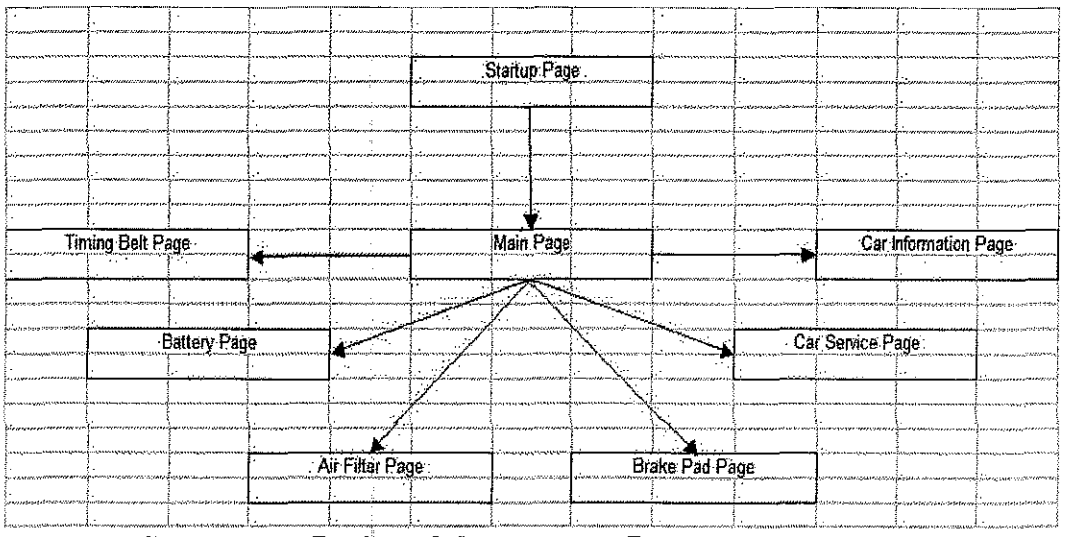


Diagram 5. Design of the program flow structure.

When the user clicks the icon of CARMAN at the main interface of ICEMAN, it will directly open the main page of CARMAN. At the main page, all the information would be able to be viewed rather than to open to each element page and look for information there. When a user wants to add data on Car Servicing, he / she could do that by clicking to Car Service icon on the main page and the

system will bring the user to the Car Service Information. From there user would be able to add/delete/view data regarding the car service information. The rest of the pages would be following the same method as mentioned for the Car Service page.

The next step was to start the design phase of the application. Design for the main page was the first thing to do. It contains spaces for all the elements to display the information as a quick reference for the user once they open the application. From there, user may able to add new data through a button, which will lead the user to open the specific page. Different car elements will have a different key-in-data page. Diagram 6 below showing the design for the main page and also for the car service page.

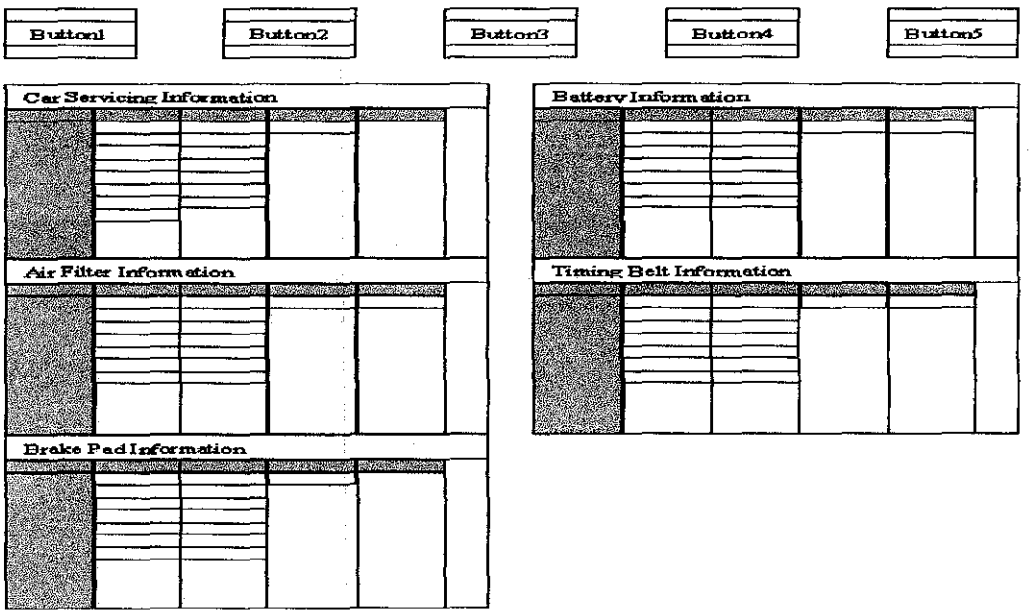


Diagram 6. Design of the Main Page.

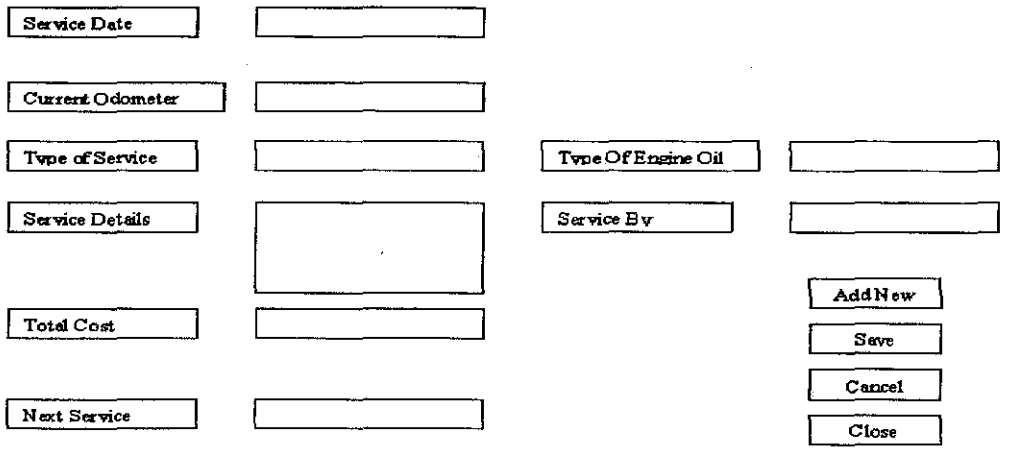


Diagram 7. Design of the Car Service form. The design for other forms is quite similar with the Car Service.

For the rest of the pages, even though the data contain in the page is not the same, but the page concept would be the same to all pages.

3.3.4 Build Application / Prototype

This is the last phase of the CARMAN development progress. The application started of with the development of the database using Microsoft Access. Below will be the list of fields containing in each table.

Car_Information (CarID, Owner, Manufacturer, Model, Year, Price, PurchaseDate, Purchase_Detail)

Car_Service (ServID, Date Of Service Odometer, Type, Cost, Performed_By, Distance_For, Serv_Detail, Next_Service)

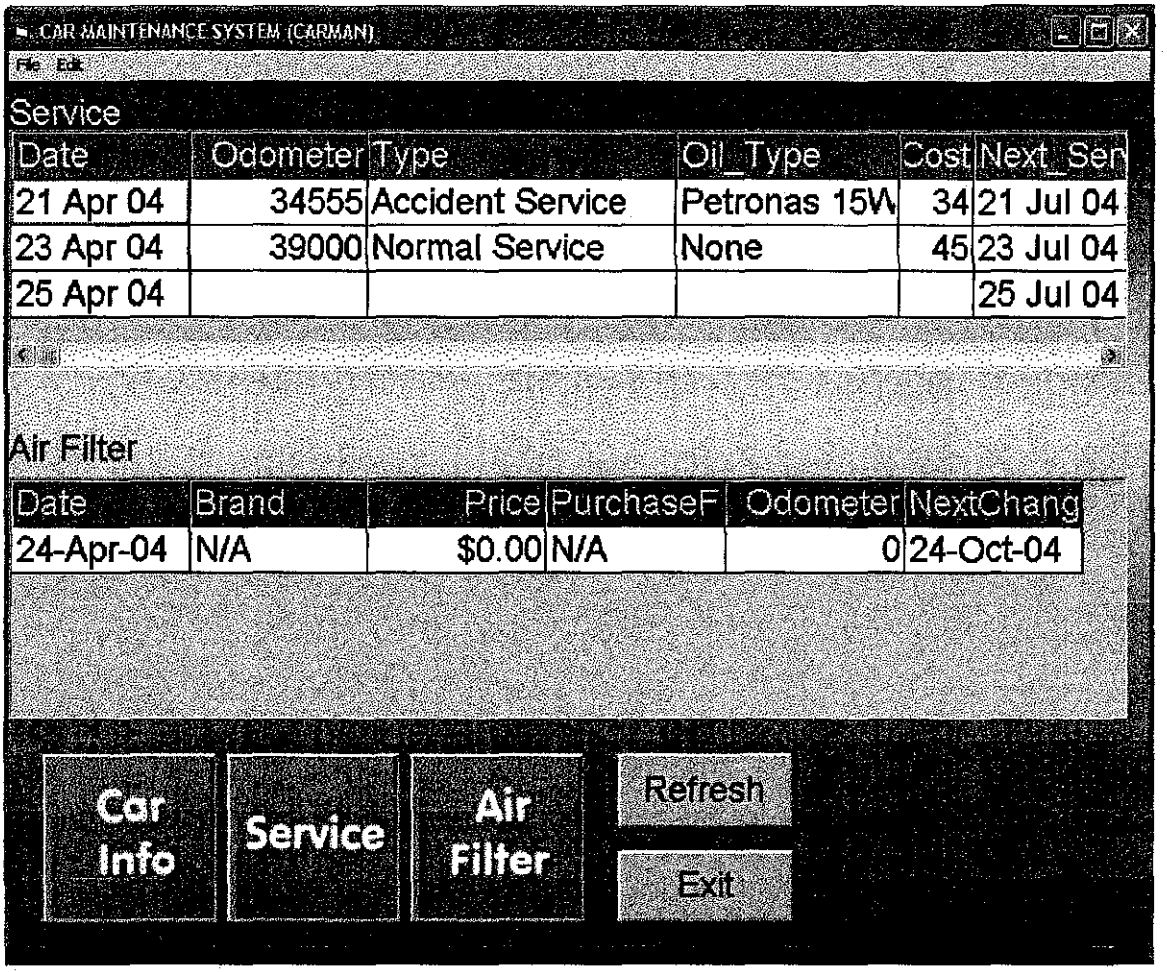
Timing_Belt (TB_ID, Date, Price, PurchaseFrom, PurchaseDetail, Odometer,TB_KM, Next_Change)

Air_Filter (AF_ID, Date, Brand, Price, PurchaseFrom, PurchaseDetail, Next_Change)

Battery (Batt_ID, Date, Brand, Price, Batt_ChangeDetail, NextChange)

Brake_Pad (BP_ID, Date, Odometer, Price, PurchaseFrom, PurchaseDetail, NextChange)

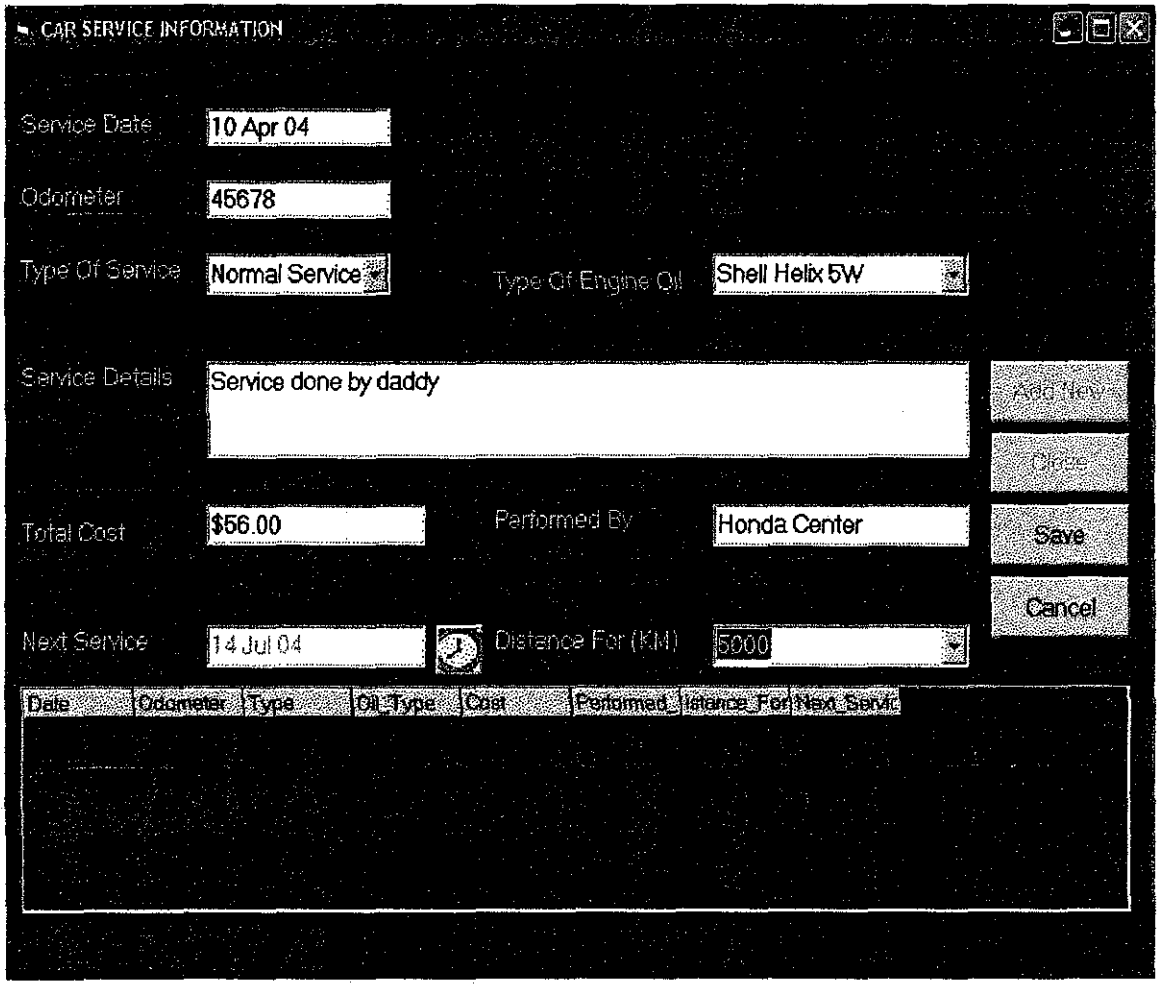
For the development, the Main Page was the first page to be developed. According to the main page design showed earlier, that is how the real application looks like.



Picture 14. The main page of CARMAN system

In this page, the FlexGrid has been used to display information as soon as the form is load. Different type of elements have different colour. This is to make the user to recognize easily later on in the future.

Same concept has been used to retrieve other tables information. The six icons above showing the navigation to go to specific car elements. Refresh button is to update any current changes to any FlexGrid to display the latest information and Exit button to quit from the program. To navigate to the next form, assume that a user has chosen the Service elements to be updated.

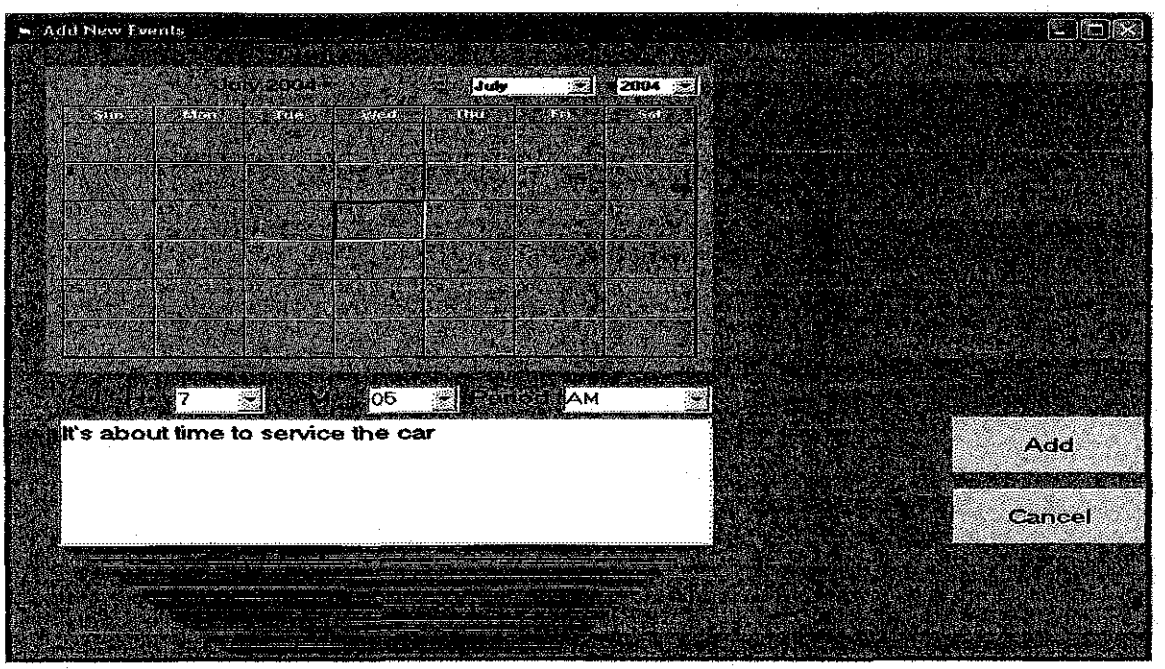


Picture 15. The Service Information page

In this page, all the data to be key in are according to the fields of the Car Service table. Data such as Service Date and Next Service are auto generate by the system. Data such as

Odometer, Service Details and Cost are required to be typed by user. The answer would be vary so there is no way to provide fixed answer. While the rest are Type of Service, Type of Oil and Distance are in combo which user could just choose the exact data for it. In this page, user has been given a choice whether he/she wants to set Reminder for the information. This is by clicking the red button above the grid layer. Further explanation would be given later in this section. Meanwhile, after done with data entry, User shall press the button Save and Close the form. The flexgrid is available also in this section because is shows the detail information to the user specifically regarding service information without having to go back to the main page.

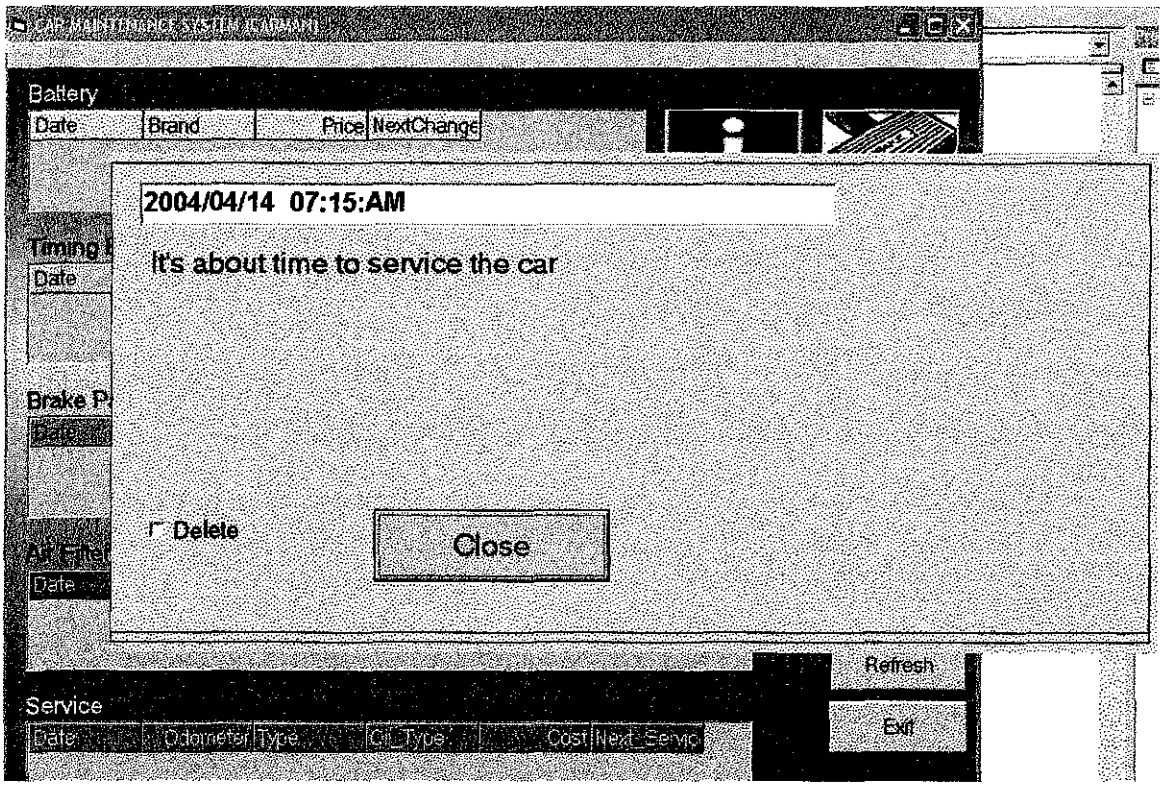
Different car elements have different estimation from the others. All other sections using the same method by according to each change requirements. When clicking the Reminder button (small red button), this page will appear at the screen. (Picture 16)



Picture 16. The Service Reminder page

In this page, the date is set according to what has been recommended by the system. Also a default message is provided to the user. User only has to click the Add button to activate the alarm. Else, clicking the Cancel button would bring back to the previous

page. User could set his/her own reminder time and also exactly and what hours, minutes and period AM/PM. Lastly, when the reminder time has comes, this is what will appear to the users.



Picture 17. The Alarm page displayed when time has comes.

The message will always appear to remind the user until the user themselves delete this message. It does not require a database for this because later on will create a massive data storage. The data is kept in a notepad, which could be added and deleted easily.

User should always make sure that the CARMAN application is running in order for the reminder to be working. There is a small red icon at the system tray, which is at the bottom right side of the Windows. When the icon appears, it shows that the CARMAN application is running. The other remaining of the car elements has a similar functions and procedures as what has been mentioned. The prototype currently is running smoothly according to the plan, but it still need some improvements especially in HCI design and some user-friendliness elements.

3.4 Tools and Equipments Required

For all the activities done throughout the period, tools can be divided into two (2) categories, hardware and software

3.4.1 Software

- Operating System : Windows 98/ME/XP
- DBMS : Microsoft Access
- Application : Visual Basic, Microsoft Paint, Adobe Photoshop 7.0

3.4.2 Hardware

- Car
- DC-AC Inverter
- 12 V Battery
- 5' inch TFT Monitor
- Pre-amplifier
- Hot wires, fuse and other extensions wires.
- RCA Cables
- Gift Box
- CD-ROM
- PCI Video w/ TV out
- TV/Tuner Card
- Motherboard and processor
- Hard Disk
- RAM
- Sound Card
- Power Supply
- Microphone

CHAPTER 4
RESULTS AND DISCUSSION

4.1 INTRODUCTION

This project aims to find out how ICEMAN can further enhance the concept of Carputer and also to find out how ICEMAN could bring a new trend in technology world, which could be produced at home It is very important to learn the overall review on the ICEMAN specifications, requirements, pros and cons and also to create a positive perception towards the creation of this product. More and more research and findings need to be done to make ICEMAN to have better feature and function.

4.2 RESULTS AND DISCUSSIONS

4.2.1 ICEMAN Hardware Development

The development of ICEMAN made using various types of electronic components such as TFT monitor, DC-AC power inverter, CPU and using the power from the car battery. The connection between the CPU and the inverter are directly connected to the car battery. The battery is connected to the monitor as well. The target to install each prototype in every member's car has achieved. Upon the completion, there are several matters resulting from the ICEMAN development.

To run the system, user has to make sure that ignition is either at the ON or START. There is a switch underneath the dashboard as the CPU ON and OFF button. Provided the keyboard and mouse are at near the user and also the monitor is already located at the holder, the user only needs to switch ON and ICEMAN will starts. Having the switch at the dashboard area currently is the best solution. Initially, users need to make sure that the inverter in ON (inverter is located at the trunk) manually and then only users can switch on the CPU. Similar steps when switching OFF the ICEMAN, users need to turn OFF the CPU and then need to turn OFF the inverter. This will create so much trouble. But, with the current

solution, that problem has been eliminated. Having a switch that combines the function between the inverter and the power supply make the process to use the ICEMAN easier.

To develop the ICEMAN is not an easy task for the group members. Massive design and testing phases needed to go through before the system could be installed in the car. This problem is resulting from using the old computer components. The best method that best described the type of work is 'TRY AND ERROR". There is no specific guideline that the group could follow in order to build the system. Sometimes the testing meeting could be up late until 4 o'clock in the morning.

In order to run the ICEMAN smoothly, the mouse, keyboard and CDROM need to be extended the length so that it could reach the user easily. The benchmark user is refers to the driver. ICEMAN could not have a mouse, keyboard and CDROM in the trunk. This will make the system much less troublesome and useless. Extra wires needed to joint and make those elements longer. As for the CDROM, to bring the player to the front, the IDE cable and also the power plug need to be lengthened. An advise from a computer supplier mentioned that the IDE cable should not be more than one meter to guarantee it is working. There are many more considerations that needed to be figured out. Making the mouse or anything is not an easy task, as these activities need to be done manually.

While running the system in the car, the settings have to set the interface size according to the size of monitor. In other words, size of the interface needs to be two or three times larger than the normal size. If to use the normal size using the small monitor, the condition would be like a normal CPU view, which has been made smaller in scale. Small fonts and icons and application will be appear which could cause trouble to read. With having a bigger size, even though would create some disruption in terms of display, but most of it would be able to be displayed, to be read for user to use.

For the customized CPU casing, user need to give the CPU as much flowing air as possible. Located in the car trunk which is already hot at noon time would make CPU hotter when using it. To handle the heat, the user is recommended to provide as least two-structured fan attached to the box. Structured here means that there is a flow of air in and out. The more structured fan would make the CPU cooler than ever.

One of the major problems of the hardware upon installation was the noise resulting from the connection from CPU to the amplifier. This occurs when the audio cable from CPU to the amplifier is side-by-side with the video cable connected to the monitor. Both cable produce electromagnetic power and when both are intersected, it affects the audio cable and resulting the noise. The noise can be heard clearly when the pre-amplifier is switch ON. Similar to the video producing noise. It can be seen from the display where the monitor showing some moving lines which could be annoying.

Lastly, there is a need of proper wiring architecture to install the system in the car. The process done as neat as possible as there are also in need of complete resources. The inverter function is one of the important elements in ensuring that ICEMAN is running smooth as possible. This is included with a fuse, which located at the engine area. The purpose of the fuse is to protect the CPU from any destruction if there is any problem with the battery. Without the fuse, for instance if the battery produce sparks or short circuits, the effect would directly goes to the inverter and blows it up as well as the CPU. These are some security features that need to have when installing the wiring elements in the car.

While driving from Tronoh to Kuala Lumpur, since the beginning of the journey until reaching the destination, ICEMAN was in the process of endurance test throughout the journey of 232 kilometers for about three hours. As a result, the system had incurred no problem at all. The system was still running good without any freeze (computer hang) or any error due. From this test, it is convinced that

vibration and heat are not a major threat to the system to run in car. ICEMAN also is feasible to be used in car.

4.2.2 CARMAN Program Development

After referring to many examples of existing programs, extract and combine the functions between the programs, finally the CARMAN application is running well according the requirements and functionality.

The program function is basically to keep track on user activities towards maintaining the car in terms of servicing, battery, air filter, timing belt, and brake pad. The reason why only these elements been taken is because these are the most important part that any driver should know which always been neglected. The program also provides a reminder function, which intends to be as the alarm system for the user regarding the car maintenance.

The components inside the application is believed has been mentioned earlier. Upon developing the application, there were many findings that managed to achieve. First is the issue regarding the size to be designed for the icons, fonts and background. The exact size to be determined was the hard part because too many TRY AND ERROR method needs to apply. As been mentioned, there are no specific guidelines that can be followed to design the application. Even some of the HCI guidelines procedures were taken for granted in designing CARMAN. So what can only be done was to design and run and test repeatedly until the best design appears according to the suitability with the screen.

Secondly, the alarm system message will appear once the program is running. The user does not have to open for any extra page or application to be reminded for an activity. To set the reminder, after finish fill the data; there is a button, which will bring the user to the calendar page. When the calendar display, it will default set the date as the recommended date by the system. However, user is still allowed to change the reminder date and time respectively. After agree with the reminder

time, user should press the ADD button and the system will bring the user back to the previous page. Later, when the date and time is due for the system, a yellow message will appear and show the display message to the user. The same reminder message will keep appearing to the user until the user hit the delete function for the particular message. The reason why the message would not be saved inside the database is because, to avoid from any wasted space in memory. The messages would not be using as a log by the user, so it should not be saved permanently.

The main page information display is one of the important functions that the system could offer best to the user. With just one click (to open the program), a person would be able to check the overall maintaining progress towards his/her car all in one page. User does not have to check each element page by page to know what is the current status and to know when is the next action date.

It is also quite important to have standardization in the program. In terms of size, all the elements in the programs (forms, text boxes, label, buttons, fonts, etc) must be in the same size according to it type. Also need is standardization in the type of fonts in all pages. The font used is ARIAL at 12 pts in size. The position of all the text boxes, labels and others in each form also shall be the same or similar. Different in design could cause confusion to the user when accessing more than one page.

The colour for each element is set to different color instead of the same. This is to create a differentiation and identity for each element. As in the CARMAN, the colour of yellow to represent the Battery, light blue for the Timing Belt, dark blue for the Brake Pad, green for the Air Filter and red for the Service record.
At the main page also, the position of the information display is organized according to the most frequent ones to the less frequent ones. The top information starts from Car Service information, Air Filter, Brake Pad, Battery and Timing Belt.

These details are really important in running the CARMAN application. It is hope to give maximum benefits to users at the easiest way of usage. Room for improvement is still available for CARMAN to improve in the future development.

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

This project aims to find out how ICEMAN can further enhance the concept of Carputer and also to find out how ICEMAN could bring a new trend in technology world, which could be produced at home It is very important to learn the overall review on the ICEMAN specifications, requirements, pros and cons and also to create a positive perception towards the creation of this product.

This project consists of two sections; building the physical system of the computer (ICEMAN) and also to develop car maintenance system program (CARMAN). ICEMAN is taken from the name if In-Car Entertainment and Maintenance System and CARMAN is taken from the name Car Maintenance System.

The development of ICEMAN was initialized from the idea of having huge number of Mp3 music file format in a car. The idea was extended until it reached the climax to idea develop and install a computer in a car.
The process started from listing down all the required components, design the CPU according to the space in the car, setup the computer and integrates with necessary hardware, design the electricity connections in the car and lastly to install and run the system in the car.

As for the CARMAN, the idea was initialized from the attitude of current users nowadays who actually know nothing about the maintenance of the car. The process to develop the system started from gathers information on the basic important elements of car that anyone should know. From the knowledge gathered, database relationship has been developed to make the connection clearer and better.

With thorough research and findings, CARMAN system is believed could provide the best car tracking maintenance system for users, as it will determine the most important and vital parts of a car.

From the objectives stated above, clearly indicates that this project managed to satisfy all the project aims. The project managed to develop a desktop inside a car. Referring to Picture 35 (page 57), ICEMAN system has been installed inside a Proton Wira car. The ICEMAN includes an automated car maintenance system, which is called as CarMan as part of its applications. CarMan has five major elements of a car, which are the car service information, air filter information, battery information, timing belt information and brake pads information. The CarMan system able to keep track on the all these car elements information (refer to the Picture 14 page 31). This system also able to suggest the user on the new maintenance date right after user trying to key in information in the system. Lastly, the CarMan system able to give a pop-up reminder to user indicating the time to do car maintenance.

Although there are still a lot to learn, but ICEMAN is hoped to create more options on human needs especially in this rapid compu-tech era. Now people can really signify the term of " Computer anytime and anywhere". ICEMAN in the future is expected to be more advanced with greater improvements in terms of functionality and also to improve the user-friendly and human computer interaction level provided in the system.

5.2 RECOMMENDATIONS

For greater improvements of the ICEMAN, here are some suggestions and ideas on what possibly could be added into the system in the future.

5.2.1 Digital Mileage

In CARMAN, the recommended next action is based on the assumption on date. With digital mileage, the mileage reading from the engine to be converted in digital format and directly read into the program. With this, the recommended next action would be precise as the system is running and mileage is always

running and updated. This of course will provide better solution than the current based.

5.2.2 Networking

The idea to sharing songs among other ICEMAN community could be pick as one of the future advancements. The latest trend of Wi-Fi can be used to implement this idea. The benefits are, when two cars that have ICEMAN system are parked side by side, they would able to share and transfer files among each other. Also, whenever the car is at the Hot Spot area (TM Net), the car is available with Internet connection

5.2.3 GPS

GPS feature will allow user to find out route, map or exact location of a place. Even though so far there is no GIS map of Malaysia that is available, integration with another project emphasize on GIS of Malaysia, which would be such a tremendous idea. This would enable personal car to be similar in technology advancement as available in Western countries

5.2.4 Internet Access

The Internet connection can be done with using a GSM modem or GSM handphone such as login to the Internet using laptop when someone is away from home. With that, the ICEMAN will be able to dial into any Internet Service Provider and log onto the Internet.

5.2.5 SMS to Service Center

Specifically this is for CARMAN program advancement. An SMS will be sent to the Service Center if the user wants to book a place in the Service Center for car servicing via SMS besides displaying the reminder.

5.2.6 Reverse Sensor

A small camera is located at the car back bumper. So whenever a driver is doing reverse parking, the system enables the driver to have extra view to avoid any accident while parking.

REFERENCES

Journals

- (David Cronin 2000), Psychic Experience and Car Maintenance.
- (Preoria Journal ,2004), How To Save Gas
- (J. Daniel Emmanuel, 1997), Importance of Oil and Filter Services.
- (Scott Memmer, 2003), Change Your Brake Pads.
- (Tom Torbjornsen, 2004), The Importance of Proper Filter Maintenance
- (Lawrence.I. Charters, 2003), Blackout:What To Do After The Light
- Come Back On. Washington Apple Pi Journal
- (Pat Goss,2001), The New Timing Belt Requirements
- (Tim Dant and David Bowles), Dealing With Dirt: Servicing and Repairing Cars

Internet sources

- http://theserviceadvisor.com/oil.htm
- http://www.adquest3d.com/content.cfm?BRD=418&PAG=31
- http://www.arcpress.com/tips/subject.htm
- http://www.digitalfriedchicken.com/sscc.html
  http://www.carcaresoftware.com/top_scrn.htm
- http://www.samarins.com/maintenance/simple.html
  http://www.newagecities.com/communities/inspirations/content/davids_car.asp
- http://www.lonewolf-software.com/automotivewolf.htm
- www.mp3car.com
- www.lazydaysoftware.com/MCT.html
- www.carcaresoftware.com
- www.trustmymechanic.com/maint_schedule1.html)
- http://www.cs.jcu.edu.au/Subjects/cp1500/1998/Lecture_Notes/relational_model/sql.html
- www.planet-source-code.com/
- http://www.control.com
- http://www.rentacoder.com/RentACoder/misc/BidRequests/ShowBidRequest.asp?lngBidRequestId=100286
- http://www.otal.umd.edu/SHORE98/vb.html
- http://msdn.microsoft.com/vbasic/
- http://www.coe.fau.edu/sfcel/define.htm
- http://www.womanmotorist.com/index.php/news/main/841/event=view
- http://www.patgosscarworld.com/new%20timing%20belt%20requirements.htm
- http://www.edmunds.com/ownership/parts/articles/43787/article.html

APPENDIXES

APPENDIX A

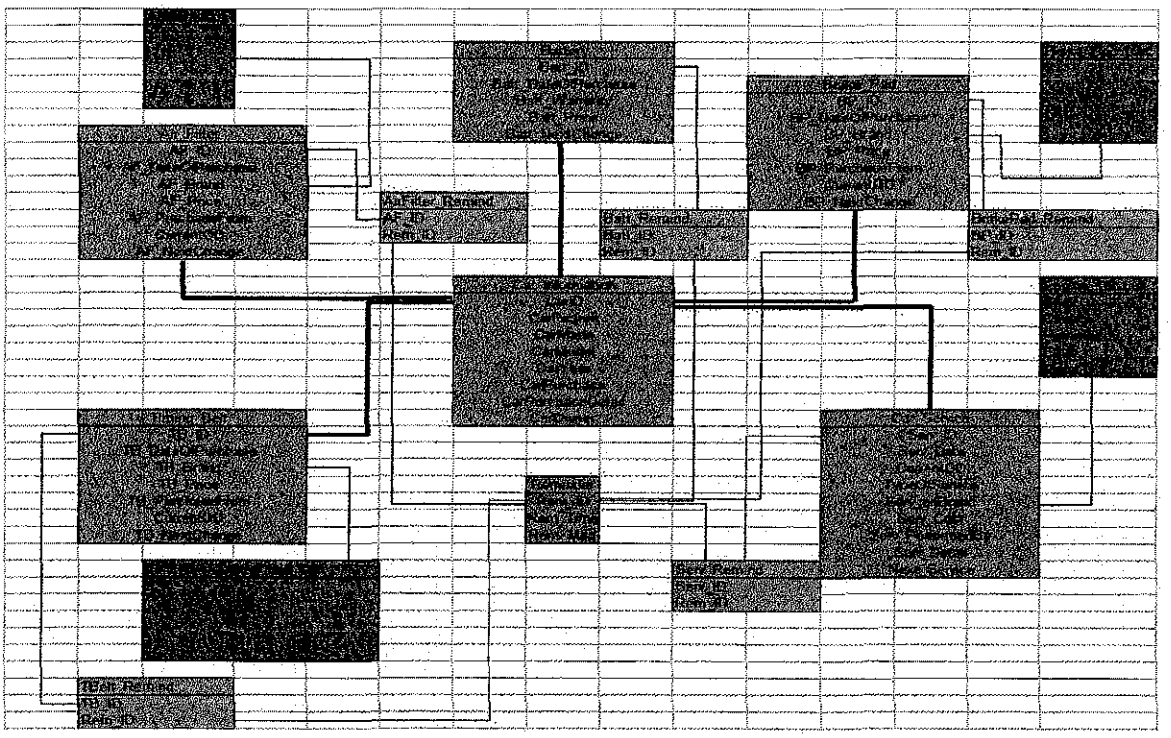


Diagram 8. Initial ER-Diagram for CARMAN

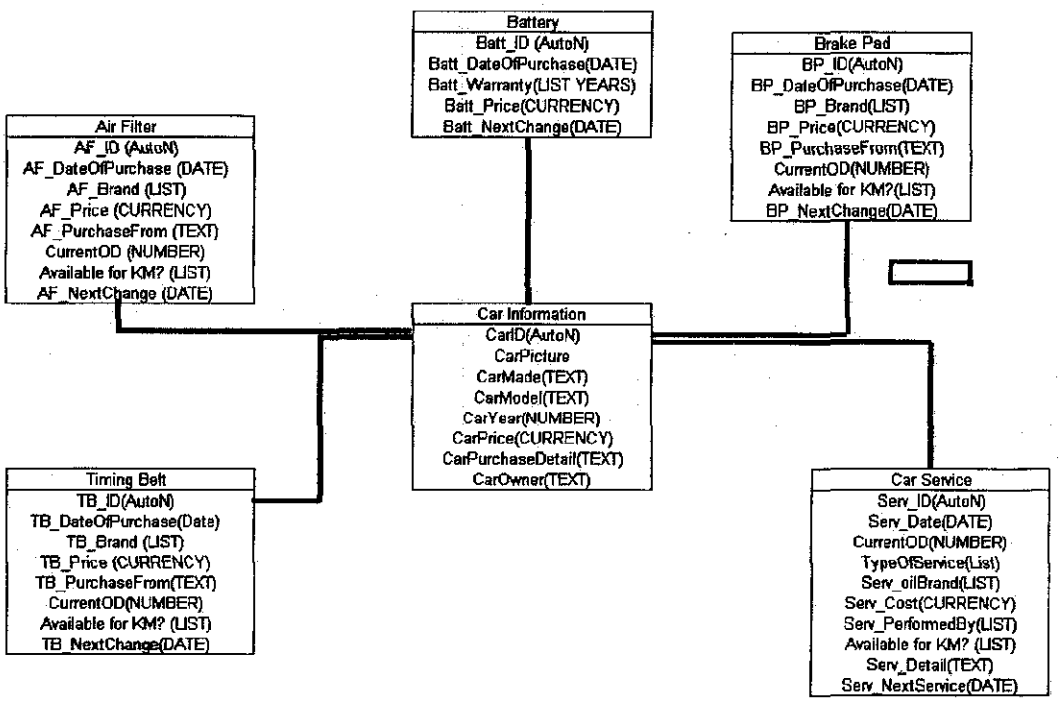
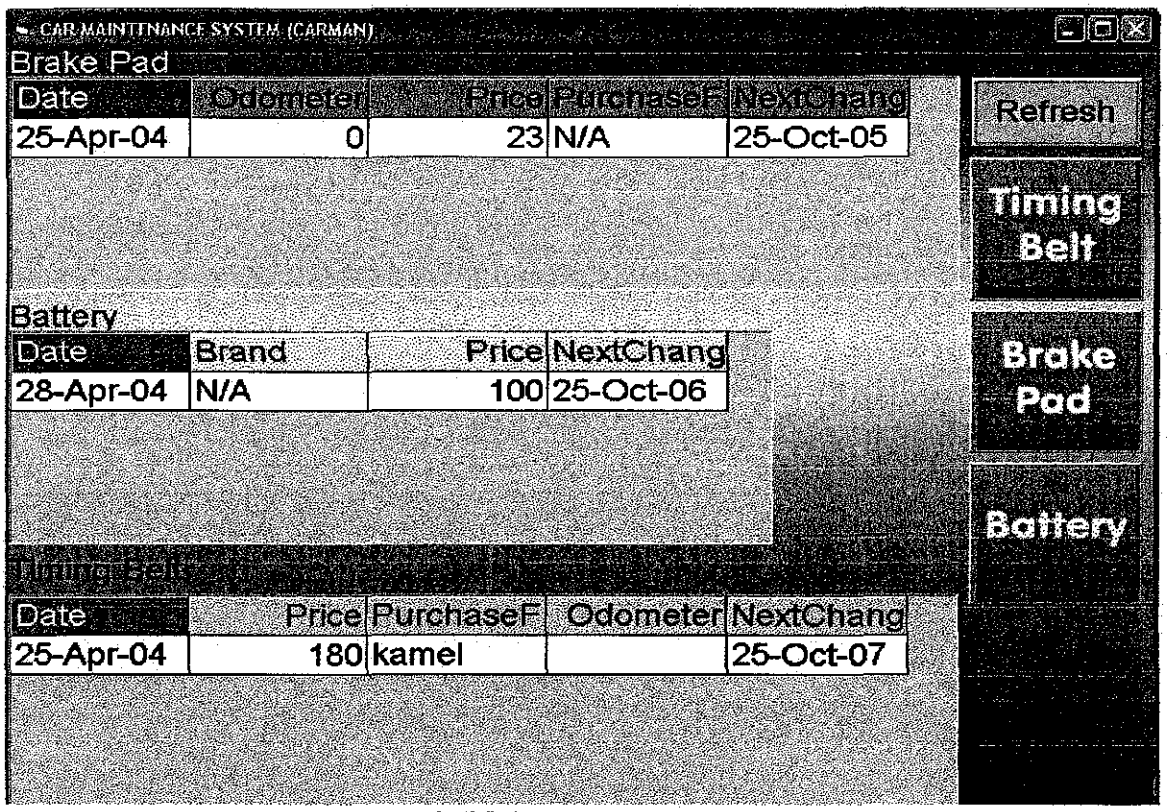
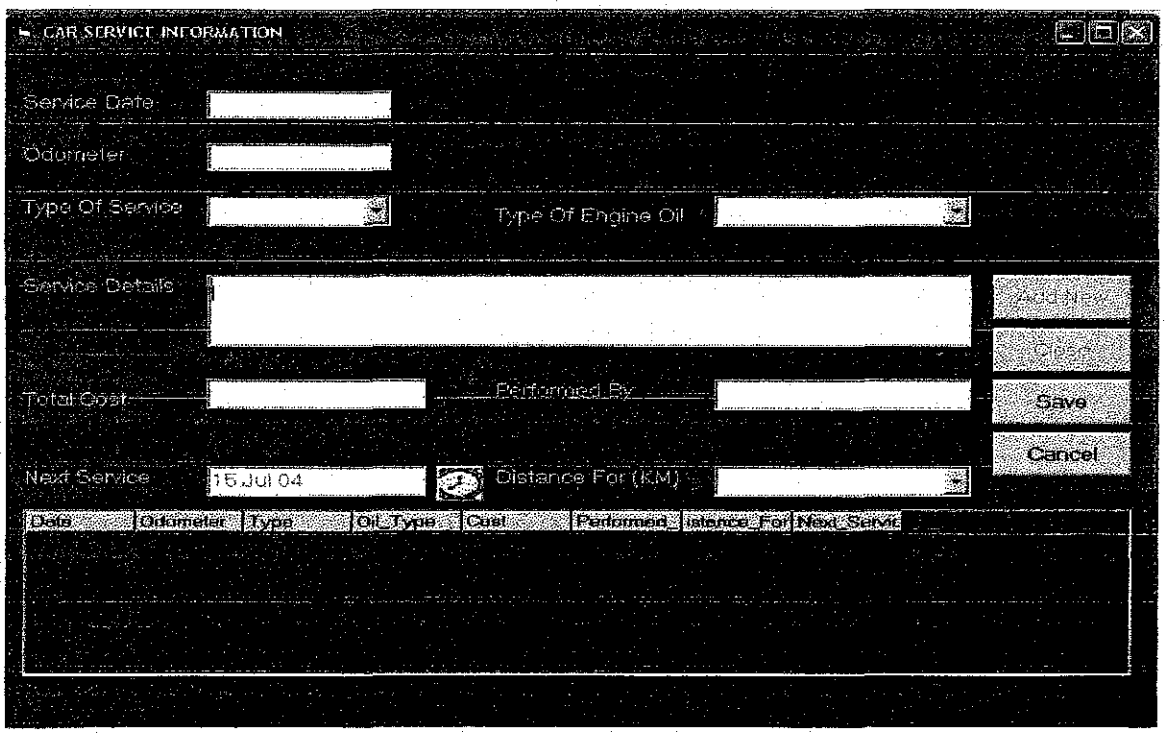


Diagram 9. Revised ER-Diagram for CARMAIN

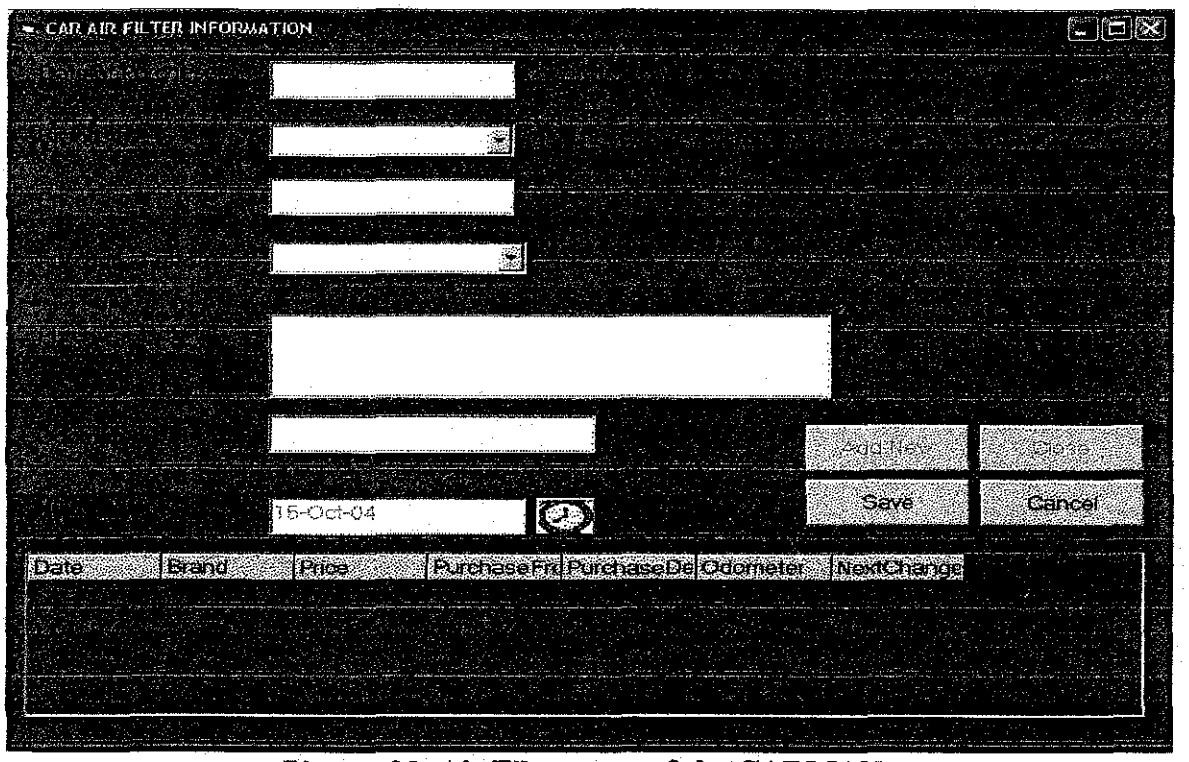
APPENDIX B



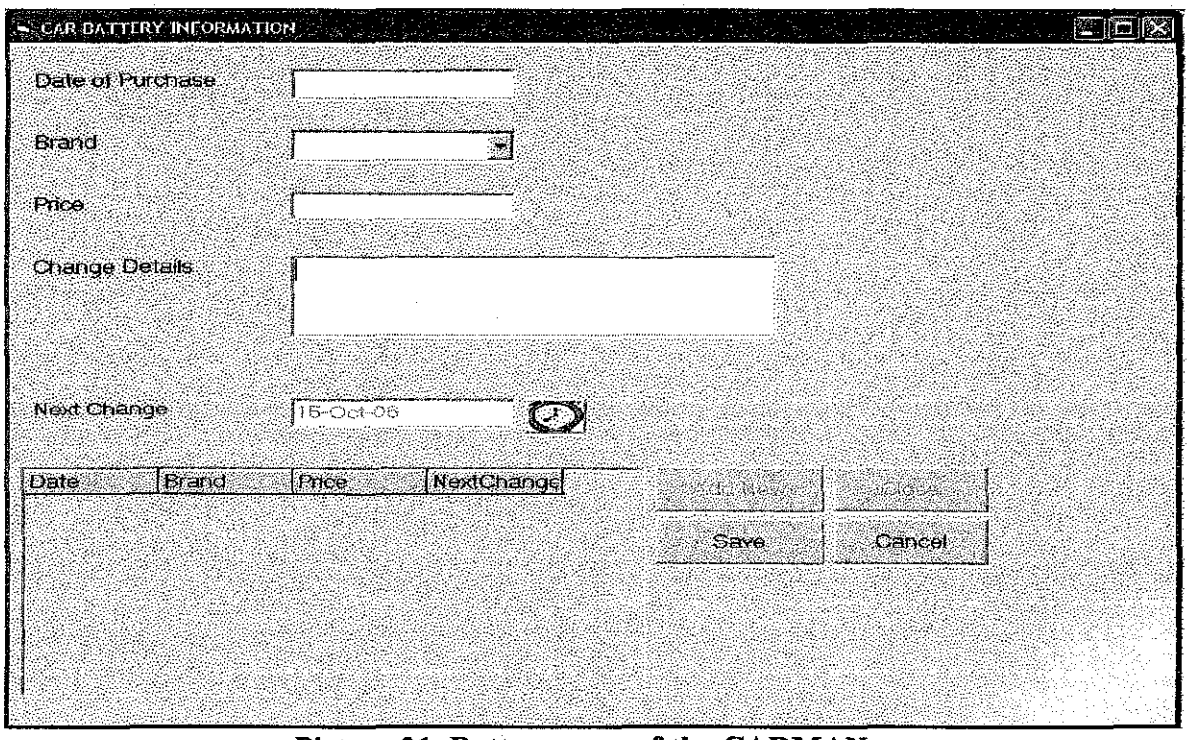
Picture 18. Main page of the CARMAN



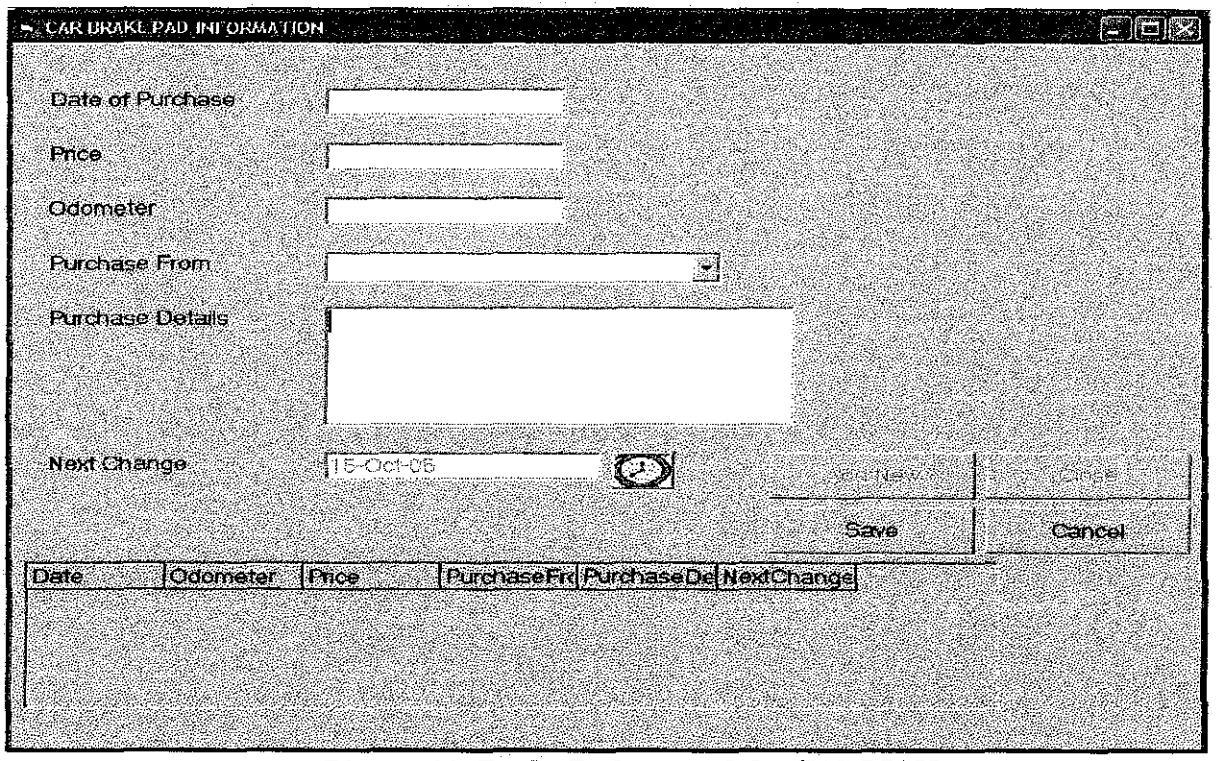
Picture 19. Car Service page of the CARMAN



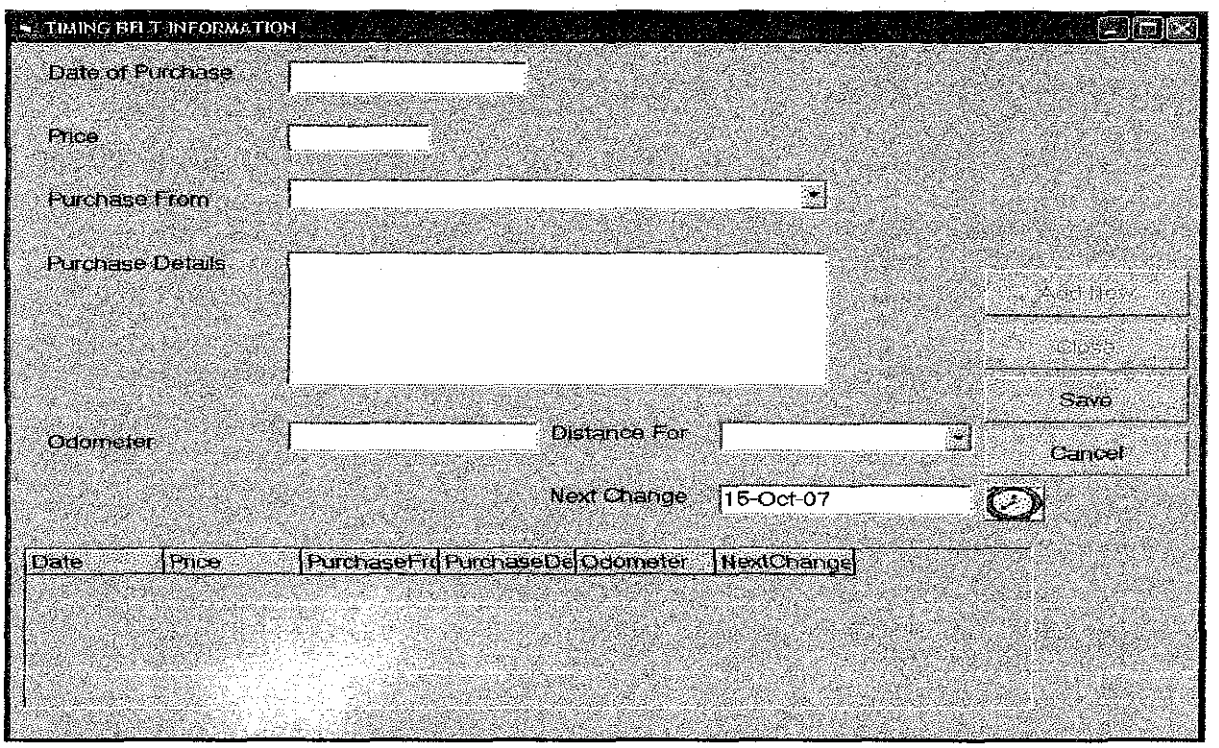
Picture 20. Air Filter page of the CARMAN



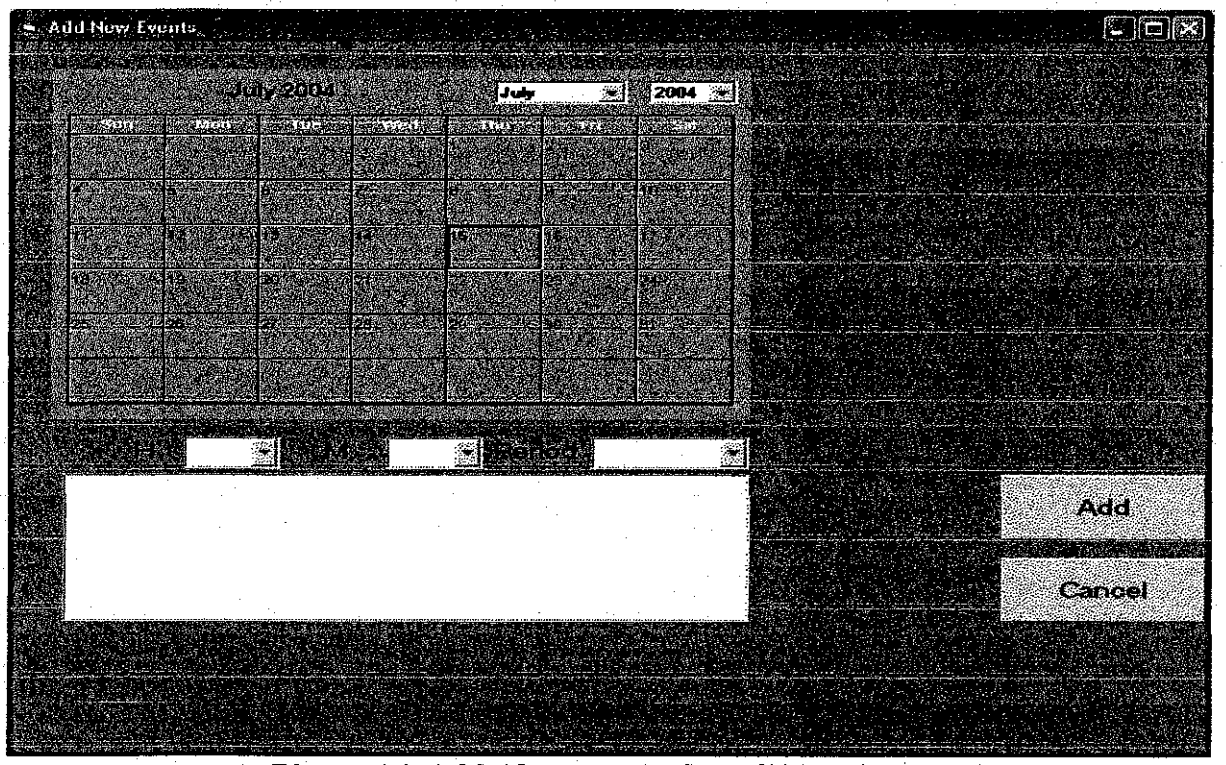
Picture 21. Battery page of the CARMAN



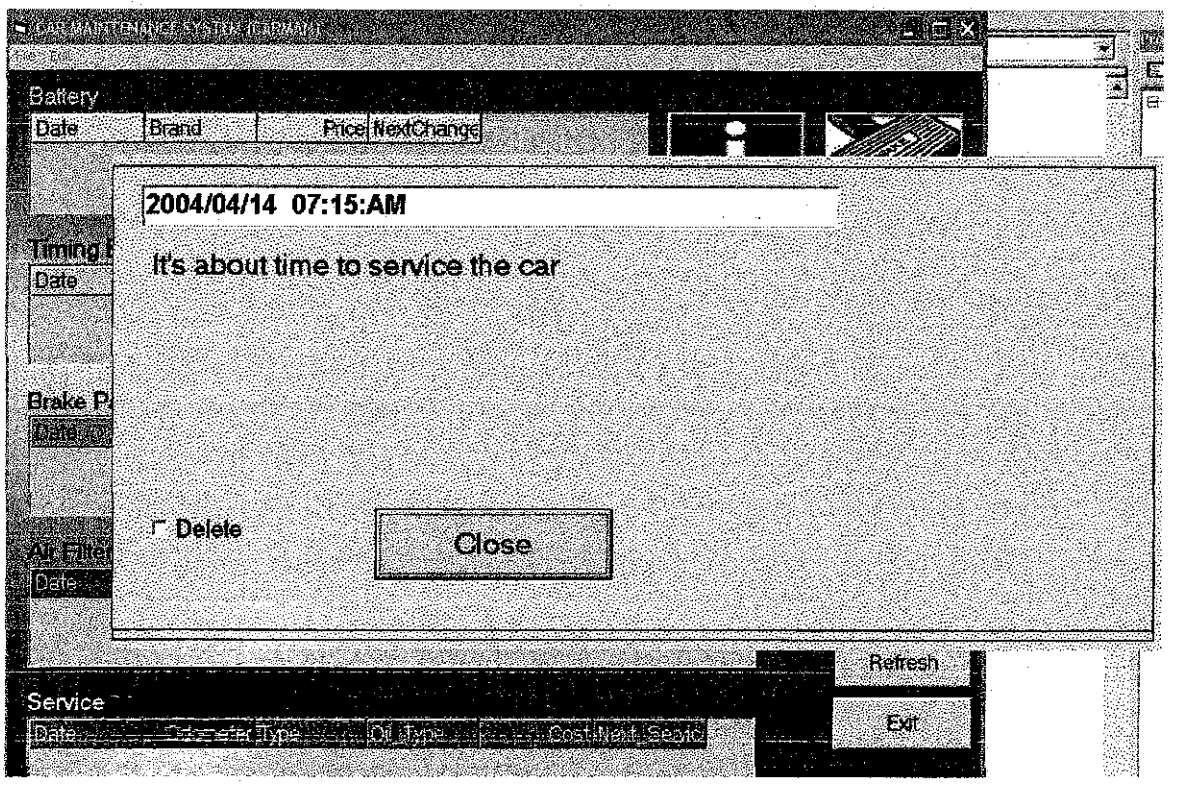
Picture 22. Brake Pad page of the CARMAN



Picture 23. Timing Belt page of the CARMAN



Picture 24. Add Alarm page of the CARMAN



Picture 25. Alarm Display page of the CARMAN

APPENDIX C

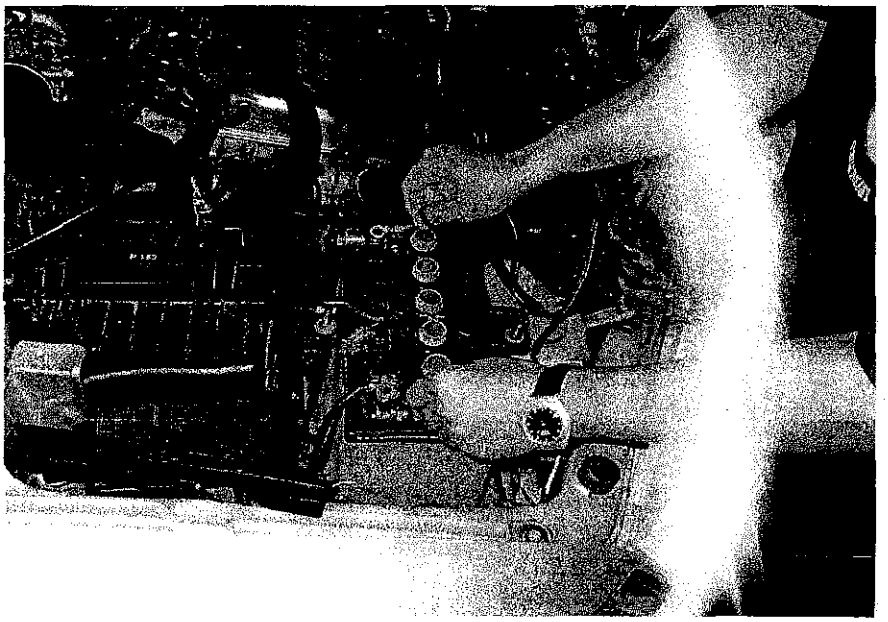
Picture 26. Mechanic to install the complicated wiring part into the car

Picture 27. Early development stage where trying to dismantle a CPU into parts

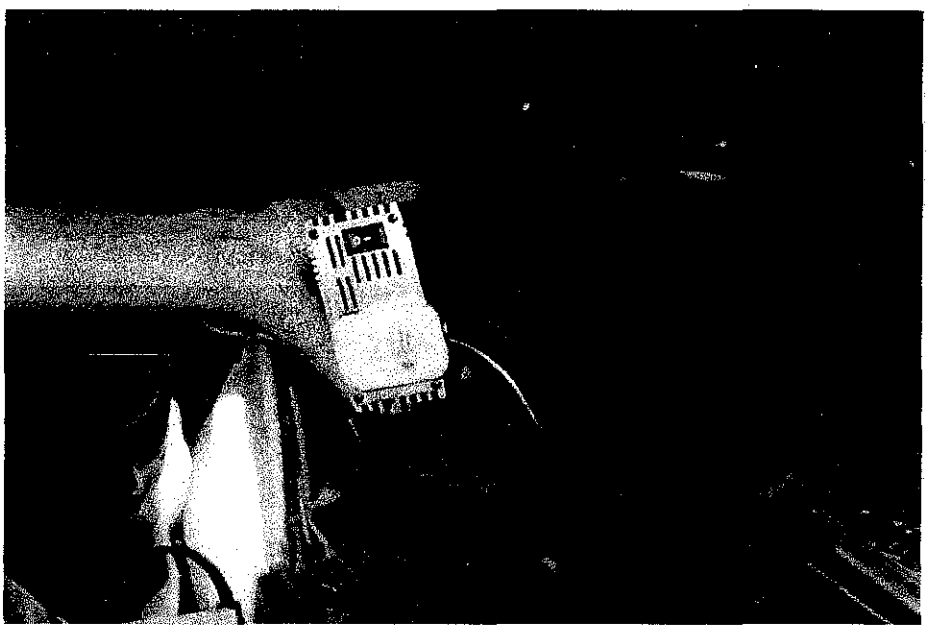
Picture 28. Try and Error phase in finding the right material for new casing

Picture 29. Finalized casing selection by choosing hard type gift box material.

Picture 30. Testing the functionality of the monitor

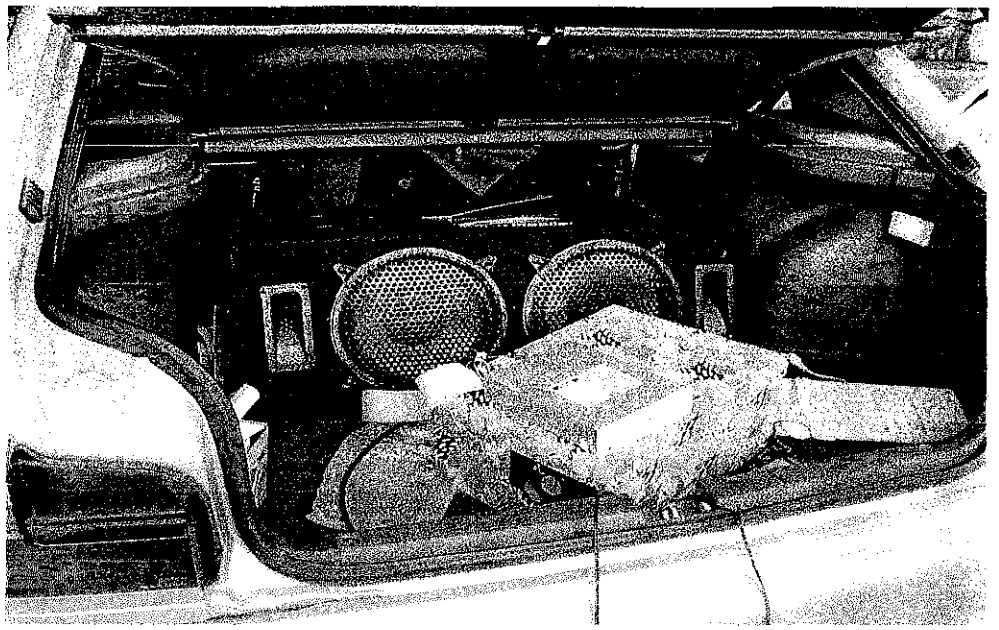


Picture 31. Testing the functionality of the inverter by using the battery

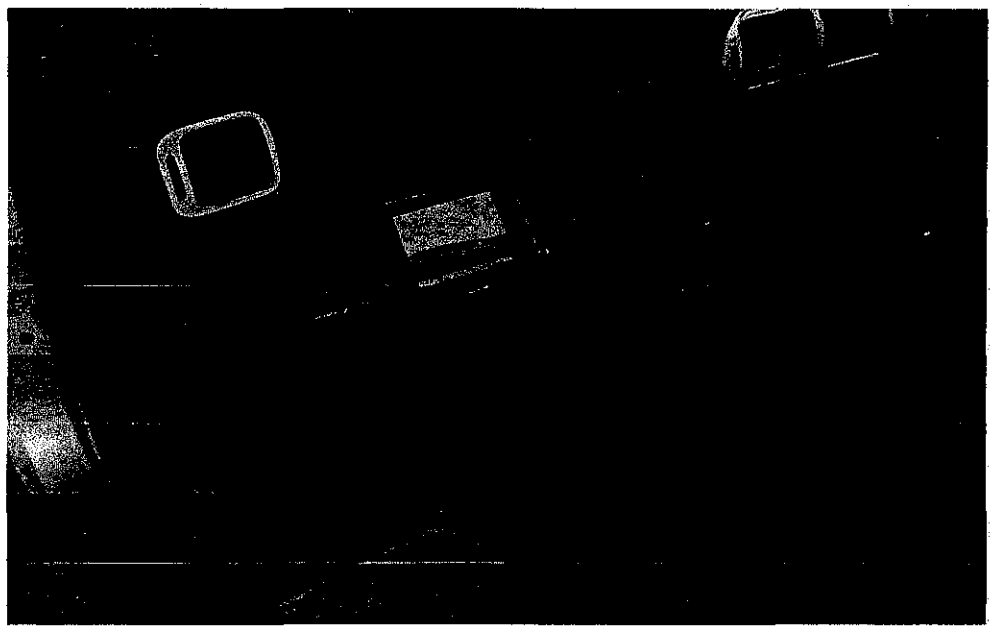


Picture 32. Testing the functionality of the inverter by using the battery

Picture 33. Product simulation in the room



Picture 34. Implementation in the car



Picture 35. ICEMAN is ready to run