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CAR PARKING MANAGEMENT SYSTEM USING RFID

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report **"CAR PARKING MANAGEMENT SYSTEM USING RFID"** is the bonafide work of **"R.S ARUN, V.HARIHARAN and B.PREMKUMAR"** who carried out the project work under my supervision.

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27/4/09
INTERNAL EXAMINER

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DECLARATION

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hereby declare that the project entitled **"CAR PARKING MANAGEMENT SYSTEM USING RFID"**, submitted in partial fulfillment to Anna University as the project work of Bachelor of Technology (Information Technology) degree, is a record of original work done by us under the supervision and guidance of Department of Information Technology, Kumaraguru College of Technology, Coimbatore.

Place: Coimbatore

Date: 27.4.09

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ABSTRACT

In today's electronic world, the product information is to be accessed quickly. The previous technology namely 'Bar Code System', was used to scan the information about the product from its tag. But the industries faced difficulties in tracking the product in its environment. Recently RFID technology is being used to solve the problem.

RFID technology constitutes of main functionalities which supports to collect data from the RFID tags in an efficient manner. In the RFID technology, the reader will track the products at regular intervals under its coverage area. The collected information will then be updated in the database, which will be used in generating reports.

There are many applications which have implemented all the functionalities and are working efficiently. The application that we have chosen is '**Car Parking Management System using RFID**'. This project helps to read the vehicle information from the RFID tags using RFID reader and the vehicle information is stored in the database. A conventional parking system is developed using RFID to provide maximum automation of car parking reducing human intervention.

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INTRODUCTION

1. INTRODUCTION

1.1 RFID:

Radio frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders and RFID readers. RFID tag is an object that can be attached to or incorporated into a product, animal or the person for the purpose of identification using radio waves. RFID reader consists of a transceiver and a decoder that read and writes data to the tag. RFID is more advantageous than the existing Bar Code System. It is the advanced technology used in many areas for the identification of products.

Table 1.1 Benefits of RFID technology over the commonly used Bar code technology

		RFID	**Barcode Technology**
1	Visibility	Works in any direction, does not require line of sight.	Directional, requires line of sight
2	Read range	Between 4 and 80cm using passive tags, up to 100 meters using active tags	Typically 15-30cm(6-12 inches)

3	Read rate	Up to 200 tags per second	Limited to rate at which objects can be physically located in front of scanner
4	Automation	No human intervention required	Often requires human intervention to ensure correct orientation
5	Data storage	Up to 4 KB using passive tags and 32 KB using active tags.	None
6	Durability	Withstands harsh environments(snow, rain, sunlight)	Prone to scratching and tearing
7	Flexibility	Tags can be packaged for a wide variety of applications	Must be located on outside of package, on a relatively flat surface
8	Environment	Low frequency technology can read tags located underground	Cannot read without the line of sight.
9	Security	Near impossible to	Simple to replicate

		replicate	
10	Maintenance	Can operate for extended periods of time with no maintenance	Lenses must be cleaned periodically

A basic RFID system consists of two components:

- RFID reader
- RFID tags

1.1.1 RFID readers

The RFID reader consists of two main components

- An antenna or coil
- A transceiver

Antenna or coil:

The antenna emits radio signals to activate the tag and read and write data to it. Antennas are the conduits between the tag and the transceiver, which controls the system's data acquisition and communication. Antennas

are available in a variety of shapes and sizes; they can be built into a door frame to receive tag data from persons or things passing through the door. The electromagnetic field produced by an antenna can be constantly present when multiple tags are expected simultaneously. If constant interrogation is not required, the field can be activated by a sensor device.

Transceiver:

The transceivers are used to decode the data that are passed by the antenna. It is used to regulate the frequency between the antenna and the circuit. While transmitting data, it oscillates the data to correct transmitting frequency of the antenna using an LC circuit. It decodes the information and passes the information to a microprocessor or microcontroller for processing the data. The reader emits radio waves in ranges pf anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used.

The interrogator, an antenna packaged with a transceiver and decoder, emits a signal activating the RFID tag so it can read and write data to it. When an RFID tag passes through the electromagnetic zone, it can detect the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit and data is passed to the host computer. The application software on the host processes the data and may perform various filtering operations to reduce the numerous often redundant reads of the sane tag to a smaller and more useful data set.

1.1.2 RFID tags

The tag contains a transponder with a digital memory chip that is given a unique electronic product code. RFID tags come in a wide variety shapes and sizes. Tags can be screw-shaped to identify trees or credit cards for use in access applications. The anti-theft hard plastic tags attached to merchandise in stores are RFID tags. In addition
Heavy duty 5-by 4-by 2inch rectangular transponders used to track container trucks and railroad cars for maintenance.

Active RFID tags:

Active RFID tags are powered by an internal battery and are typically read/write. An active tags memory size varies according to application requirements. In a typical read/write RFID work in process system, a tag might give a machine a set of instructions and the machine would then report its performance to the tag. This encoded data would then become part of the tagged part's history. The battery supplied power of an active tag generally gives it a longer read range. The trade off is greater size, greater cost and a limited operational life.

Passive RFID tags:

Passive RFID tags operate without a external power source and obtain operating power generated from the reader. Passive tags are

consequently much lighter than active tags, less expensive and offer a virtually unlimited operational lifetime. The trade-off is that they have short read ranges than active tags and require a high powered reader. Read-only tags are typically passive and programmed with a unique set of data.

Developments in RFID technology continue to yield large memory capacities, wide reading ranges and faster processing. It is highly unlikely that the technology will ultimately replace barcode even with the inevitable reduction in raw materials couple with economies of scale; the integrated circuit in an RF tag will never be as cost-effective as a barcode label. However, RFID will continue to grow in its established niches where barcode or other optical technologies are not effective.

1.1.3 Communication between Tag and Reader:

The Tag-it transponder is half- duplex, the fundamental operation being a transaction which consists of:

- A request sent by the reader to the transponder

- A response sent back by the transponder to the reader

Both the request and the response contain certain Command Code which specifies the operation to be performed by the transponder. The transponder never initiates a response without having been instructed to do so by the reader. The request must have been fully understood by the transponder

before it can respond. He presence of the 13.56 MHz carrier frequency will power up the transponder but does not generate a spontaneous emission (response) of any kind by the transponder.

Each Tag-it transponder has a unique address which is factory-programmed and 32 bits long, thus allowing an address range of more than 4 billion individual addresses.

If several transponders are expected to be present in the read area, the first step is to inventory them. This is done by the Simultaneous Identification (SID) mechanism which results in the reader storing in its memory the addresses of each transponder present within its range. At this point, the reader may pass them on to the application processor.

A transaction is carried out with a single transponder, which is identified by its address.

1.2Problem definition :

This system aims at developing an access control and parking system using the concept of Radio Frequency Identification (RFID). It aims at minimizing the manual intervention at all possible levels and providing complete automation of the parking process. The system makes use of RFID tags and readers.

The users are given an option of sending a request message to the provided mobile number, to know the availability of free slots in the parking area. The SMS query is processed by the savant. The number of available free slots which is obtained from the database is sent as a response message back to the same number.

The RFID tags are placed on the incoming vehicles containing the vehicle information. The vehicle information includes owner's name, vehicle ID, vehicle type and vehicle model. The RFID reader is placed at the entry and exit points of the parking lot. The RFID reader reads the information from the RFID tag and stores it in the database. The toll gate is activated once the reading process is complete and the vehicle enters the parking slot. The parking slots are fixed with IR sensors which are used to find out whether the particular slot is free or occupied.

When the vehicle exits, the RFID reader at the exit point reads the vehicle ID from the RFID tag and calculates the toll for that vehicle. Then the sensor at the exit point activates the toll gate.

1.3 Problems of the existing manual car parking system:

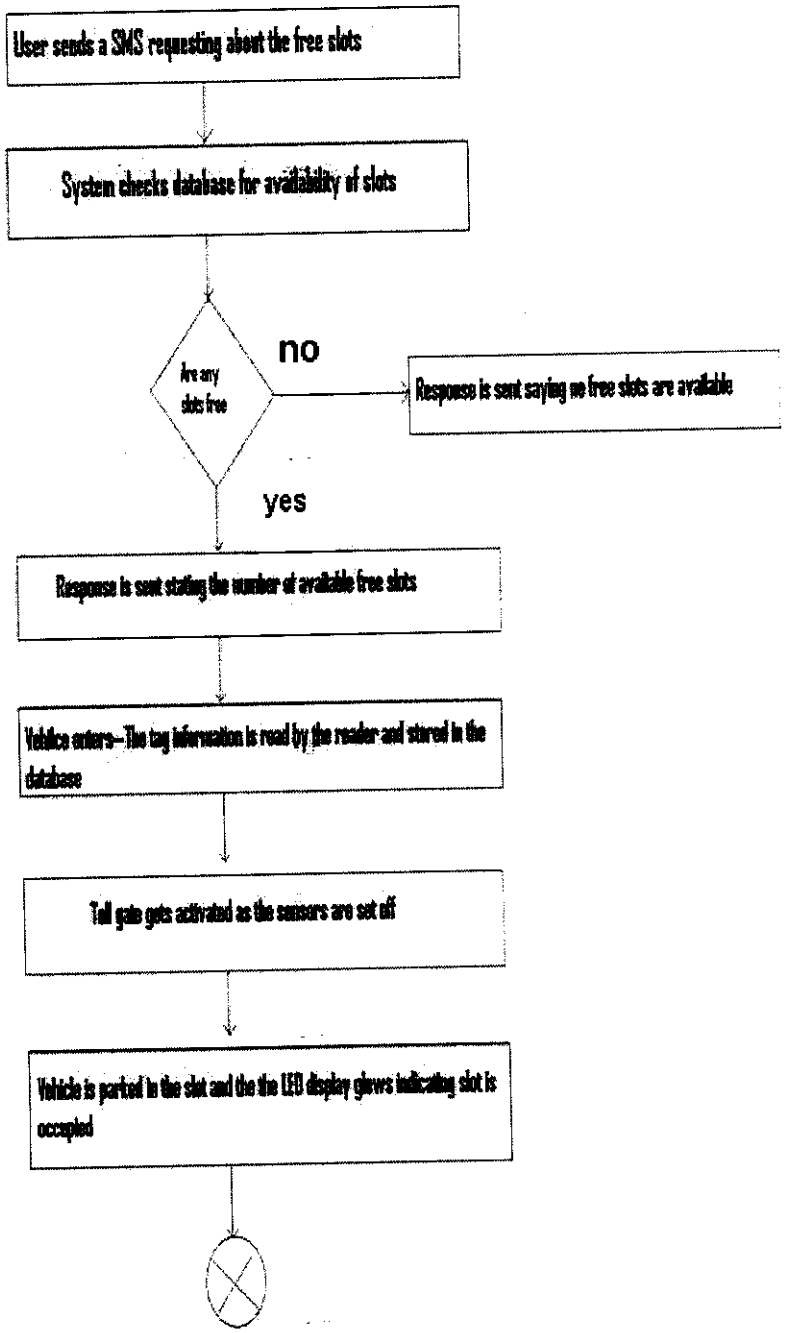
The current system that is in use requires manual intervention at all levels. The human work is required to make registry of the incoming vehicle, finding out whether there is any slot available for parking a vehicle and for even calculating the toll to be paid by the vehicle. Since there is so much human work involved it introduces the possibility of human error which reduces the robustness of the system.

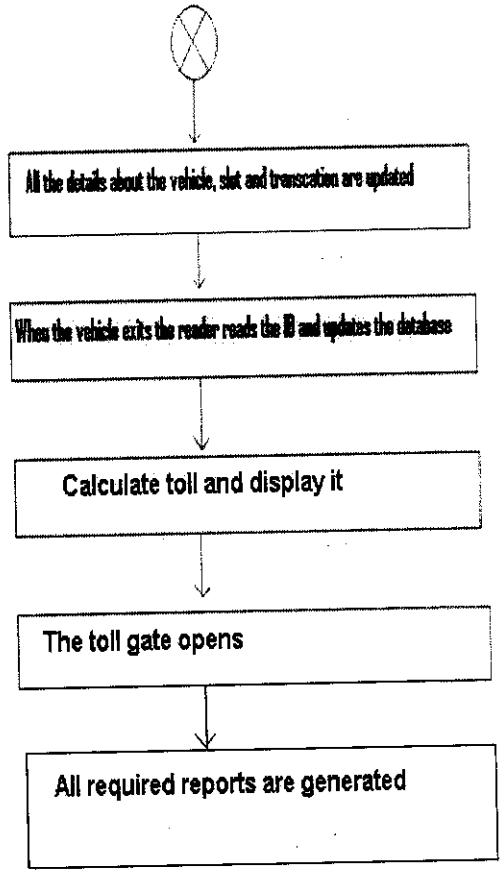
The time taken for the entire parking process in the existing system is more. Maintaining the registry is a complex process and identifying the status of a parked vehicle is difficult. The free slots cannot be identified easily. So knowing the availability of free slots in advance is not possible.

1.4 Advantages of the proposed system:

- Information on the availability of free slots can be obtained.
- Free pool management is done efficiently.
- Vehicle registry is made easier using RFID.
- Time taken to park a vehicle is minimized.
- Human intervention is reduced to the maximum possible extent, thus providing complete automation.

1.5 SYSTEM FLOW:




All the details about the vehicle, slot and transcation are updated
When the vehicle exits the reader reads the ID and updates the database
Calculate toll and display it
The toll gate opens
All required reports are generated

DETAILS OF METHODOLOGY ADOPTED

2 DETAILS OF METHODOLOGY ADOPTED:

2.1 Mobile communication

2.2 Vehicle entry

2.3 Toll gate

2.4 Parking sensors

2.5 Vehicle exit

2.6 Toll calculation

2.7 Database design

2.1 Mobile communication:

The communication between the system and mobile device attached to it takes place with the help of the SMSlibx software. The main communication that takes place is the reading of an SMS received by the GSM device by the system and the second is the sending of any SMS by the system using the GSM device.

The SMSlibx reads the SMS received by the GSM device using the AT_READ command which displays all the messages received by the device which is connected to the system using the USB port. The system only extracts the mobile number of the sender from the SMS read by the SMSlibx software using the inter-process communication. The system sends the number of free slots to the intended receiver by using the number extracted from the SMS and by setting the number of free slots to be sent as the message text.

The inter-process communication takes place with the help of window handles which can be used to access and read and retrieve and also set the data from a text box in the window it handles. For the mobile communication the GUI uses the handle of the text box of the SMSlibx software which displays the contents of the received SMS and extracts the number of the sender from the whole received data.

For sending a reply SMS the GUI sets the number it extracted from the SMS as the recipient number and information to be sent as the message text in the appropriate text boxes in the SMSlibx software by using their handles and the command to set the text.

2.2 Vehicle entry:

When the reader detects a tag attached to a incoming vehicle, it reads the data stored in the tag which include the owner name, vehicle ID, vehicle type and vehicle model and it passes these data to the GUI using the inter process communication. The GUI on receiving the data and records them on to the database after displaying all the details to the user.

The main purpose of this program for reading the data from the tag is to decrypt the data received from the tag into the user required form. The reader on receiving the data from the tag in form radiations will convert into any encrypted form based on any RF protocol. The encrypted data is to be converted to the required form and passes on to the GUI.

The reader must be instructed to check the identity of the tag in the first place then is to be instructed to read the data by following any commands like start bit stop bit etc., Then on successfully reading the data which is in the encrypted form the program converts the data into user required form and then it is displayed in the WINXTALK window from which it is passed to the GUI using proper inter-process communication.

The program for reading the data from the tag reads the encrypted data and decrypts it and displays it in the text box of the WINXTALK window. The GUI uses the handle to this textbox and reads and retrieves all the data from the WINXTALK window by using the command to get the text of a text box. This data is then displayed to the user and stored in the database.

2.3 Toll gate:

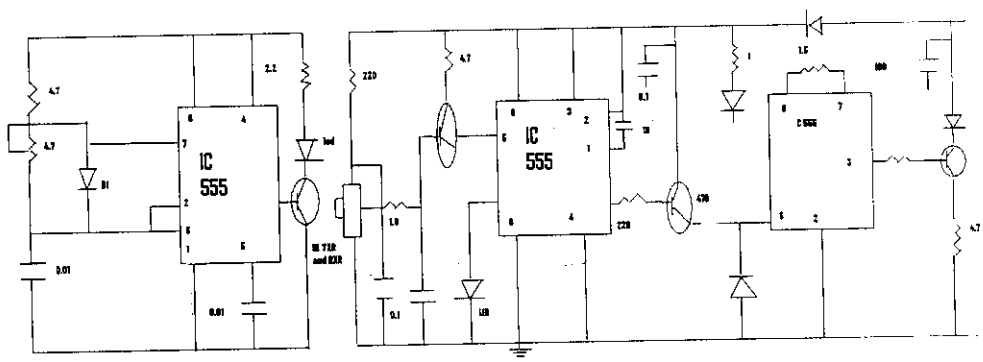
The toll is an external hardware circuit which is used to allow entry and exit to the parking lot. The toll gate is an automated one which detects the arrival of a vehicle and allows it to enter the parking lot. Detecting an arriving vehicle is performed using an IR sensor. AN IR transmitter and receiver are placed facing each other. When any vehicle arrives near the toll gate it blocks the IR radiations from the transmitter to the receiver.

The transmitter circuit consists of a NE555 timer which provides the delay for the transmitting diode so as to make it transmit radiations in a fixed interval of time (say 5 micro seconds). The transmitter is given a 9 volt power supply.

The receiver circuit is also given a clock frequency which matches with frequency provided to the transmitter by a NE555 timer. The receiver circuit remains closed until it receives the radiations from the transmitter. Once the radiations are blocked by any object (vehicle) the circuit is opened and it passes a voltage (12V) to the DC motor attached to it. The motor in turn runs a clamp which opens the toll gate in every odd cycle and closes it in every even cycle. So when a vehicle nears a toll gate it blocks the radiations from the transmitter and receiver circuit runs the motor which drives the clamp to make it open the toll gate and when the vehicle crosses the gate the even cycle takes place and the toll gate is closed.

2.4 Parking sensors:

The parking sensors are similar to the sensors of the toll gate. They are also IR sensors with a transmitter and a receiver. The transmitter has a NE555 timer which provides the clock frequency for the transmitting diode. The transmitting diode continues to transmit radiations to the receiver. When any obstacle blocks the receiving diode from receiving the radiations, the receiver circuit opens and passes a voltage to an indication diode. The transmitter circuit is given a power supply of 12 volts and the receiver circuit is given a clock frequency which matches the frequency of the transmitter by a NE555 timer.



2.5 Vehicle exit:

When the reader detects a tag attached to a vehicle near the exit, it reads the vehicle ID of the vehicle and passes the data to the GUI which displays it to the user and records the exit of the vehicle and makes the changes in the number of free slots available and also the status of the vehicle in the database.

2.6 Toll calculation:

When a vehicle exit operation is performed the GUI calculates the parking fee using the formula

Toll= Parking time * Tariff

The tariff for the parking slot varies depending on the time. There is increased tariff during the peak hours. After calculating the toll, it is displayed to the user and also the time of stay is also displayed.

2.7 Database design:

A database is designed to register the incoming vehicle information. Microsoft access serves as the back-end and supports the creation of various fields in the database. Three tables are maintained in the database namely vehicle details, slot details and transaction details. Based on the information stored in the database required reports are generated. The tables that are used are as follows

2.7.1 Vehicle table:

This table is used to store all the vehicle information obtained at the entry point. The fields included in this table are vehicle ID (primary key), owner name, vehicle type and vehicle model and the date of entry.

Vehicle ID	Owner Name	Vehicle Type	Vehicle Model	Date
TN42C0006	R.S.Arun	Car	Honda City	23/4/2009
TN37AK9990	Hari.V	Car	Optra	24/4/2009
TN43AC0955	Prem.B	Car	Nano	24/4/2009

2.7.2 Slot table:

This table is used to store all the information about the slots including the entry time of the vehicle, exit time of the vehicle, vehicle ID being parked and date of entry.

Vehicle ID	Entry time	Exit time	Date
TN42C0006	15:04	17:34	23/4/2009
TN37AK9990	14:45	16:23	24/4/2009
TN43AC0955	15:23	18:55	24/4/2009

2.7.3 Transaction table:

All the information about the vehicle transactions is contained in this table. Vehicle ID, Time of stay, toll paid and date are the fields contained in the table.

Vehicle ID	Time of stay	Toll paid	Date
TN42C0006	2:08	40	23/4/2009
TN37AK9990	1:20	30	24/4/2009
TN43AC0955	3:30	70	24/4/2009

Reports:

The GUI also generates a number of reports when requested for analysis purposes. All the reports are generated based on the data in the database. The reports generated include

- Customer details
- Total number of entries in any particular day
- Number of free slots available at any time
- Real time total of receipts at any time

Customer details:

On entering the vehicle ID the entire customer details are displayed. This helps in easy identification of a particular vehicle.

Total number of entries in a particular day:

It displays the total number of vehicles entered and exited in a particular day on entering the date.

Number of free slots available at any time:

The actual number of total slots, number of free slots and occupied slots are obtained from this report.

Real time total of receipts:

On entering the present date the total toll collected up to the present time is displayed.

CONCLUSION

3. CONCLUSION:

The RFID car parking system is successfully designed and implemented with all the functionalities. The RFID tags are fixed in the incoming vehicle. The user obtains the information on available free slots in prior by sending a message through his mobile. The reader at the entry point reads the vehicle information and stores it in the database. After the vehicle registration the sensor activates the toll gate to open.

The free slots are identified by the incoming vehicle based on the output of LED connected to the parking slot. The vehicle is parked in the identified free slot. At the exit point the vehicle ID is read by the reader and the time of stay of that vehicle is obtained from the database. Based on the parking time the toll is calculated.

The calculated toll is displayed on the screen and the sensor activates the toll gate after the toll collection. Users generate following reports based on requirements.

- Customer details
- Total no of entries
- Free pool management
- Real time total of receipts

FUTURE ENHANCEMENTS

4. FUTURE ENHANCEMENTS:

The RFID car parking model created can be used to provide authenticity thereby increasing the security measures. Slot numbers can be provided in the parking slot for easy identification of a vehicle.

The enhancements that can be further added to the project are,

- Web cameras can be installed to monitor the parking slots increasing security.
- Reservation of parking slots can be done through mobile.
- A website can be created where online parking reservation can be done.
- RFID readers can be installed in each parking lane enabling the users to park in the correct lane.

APPENDIX-1 SOURCE CODE

APPENDIX-1 SOURCE CODE:

Code to read information from tag:

```
#include "rfid.h"
#include <C:\Program Files\PICC\Drivers\em4095.c>
#include <C:\Program Files\PICC\Drivers\em4102.c>
#include <C:\Program Files\PICC\Drivers\rs485.c>

int8 msg[32];
#include "utilities.c"
unsigned int occupancy=0;

unsigned int parking[10];
unsigned char a;
unsigned int i;
void delay()
{
unsigned int i,j;
for(i=0;i<0xff;i++)
for(j=0;j<0xff;j++);
}
void main()
{
   int8  customerCode;
   int32 tagNum;
```

```
rf_init();
rf_powerUp();
rs485_init();
output_high(GREEN_LED);  //blinking of led if a
                           tag is detected
output_high(RED_LED);
output_high(YELLOW_LED);


RS485send(msg);          //reading the data from tag

for(i=0;i<10;i++)
parking[i]=0;


for(; ;)
{
   if(read_4102(msg))
      {                          //identifying the
                                   tag and
                                   displaying its
                                   details

      customerCode = msg[0];

tagNum=make32(msg[1],msg[2],msg[3],msg[4]);
```

```
        if(tagNum ==1074191882 )
        {
        sprintf(msg, "HARI.VTN37AK9990CAR  OPTRA
");
        parking[1] = 1;
        RS485send(msg);
        output_low(RED_LED);
        delay();
        delay();
        output_high(RED_LED);

        }

        else if(tagNum ==1220137535 )
        {
        sprintf(msg, "JANA.ATN43AC0955CAR  NANO
");
        parking[2] = 1;
        RS485send(msg);
        output_low(RED_LED);
        delay();
        delay();
        output_high(RED_LED);

        }
```

```
            delay();
            delay();
            delay();


    }
}
}
```

Graphic User Interface:

Vehicle entry:

```
Dim a, b, c, d, e As Integer
Private Declare Function SendMessage Lib "user32" Alias "SendMessageA"
(ByVal hwnd As Long, ByVal wMsg As Long, ByVal wParam As Long,
lParam As Any) As Long
Private Sub Command1_Click()
Data1.Refresh
Data1.Recordset.AddNew                    //registering the car into the
                                            database
Data1.Recordset.Fields(0).Value = Text1.Text
Data1.Recordset.Fields(1).Value = Text3.Text
Data1.Recordset.Fields(2).Value = Text10.Text
Data1.Recordset.Fields(5).Value = Text4.Text
```

```
Data1.Recordset.Update
Data2.Refresh
Data2.Recordset.AddNew
Data2.Recordset.Fields(0).Value = Text1.Text
Data2.Recordset.Fields(1).Value = Text2.Text
Data2.Recordset.Fields(2).Value = Text6.Text
Data2.Recordset.Fields(3).Value = Text7.Text
Data2.Recordset.Fields(4).Value = Text4.Text
Data2.Recordset.Update
Data3.Refresh
Data3.Recordset.AddNew
Data3.Recordset.Fields(0).Value = Text1.Text
Data3.Recordset.Fields(4).Value = Text4.Text
Data3.Recordset.Fields(3).Value = 1000
Data3.Recordset.Update
Data4.Refresh
Data4.Recordset.MoveFirst
Data4.Recordset.Edit
Data4.Recordset.Fields(1).Value = (Data4.Recordset.Fields(1).Value) + 1
Data4.Recordset.Fields(2).Value = (Data4.Recordset.Fields(2).Value) - 1
Data4.Recordset.Update
Unload Me
Form2.Show
End Sub
Private Sub Command2_Click()
Unload Me
Form2.Show
```

```
End Sub
Private Sub Command3_Click()
 Dim s As String                          //using the handle to get the text
                                           from the text box
Dim i As Long
Dim l As Long
Dim sa As String
 i = SendMessage(133660, &HE, 0&, 0&)
 s = Space$(i + 1)
 Call SendMessage(133660, &HD, ByVal i + 1, ByVal s)
 'MsgBox s
 Text2 = Mid(s, 1, 6)
 Text1 = Mid(s, 7, 10)
 Text6 = Mid(s, 17, 5)
 Text7 = Mid(s, 22, 8)
 sa = ""
 l = SendMessage(133660, &HC, 0, ByVal sa)
End Sub
Private Sub Form_Load()
Text1.Text = ""
Text2.Text = ""
Text3.Text = ""
Text6.Text = ""
Text7.Text = ""
Text10.Text = ""
End Sub
```

```
Private Sub Timer1_Timer()
 Text3 = Hour(Now)
 Text10 = Minute(Now)
 Text4 = Day(Now) & "/" & Month(Now) & "/" & Year(Now)
End Sub
```

Vehicle exit:

```
Dim a, b, d, e, f As Integer
Dim c As Double
Private Declare Function SendMessage Lib "user32" Alias "SendMessageA"
(ByVal hwnd As Long, ByVal wMsg As Long, ByVal wParam As Long,
lParam As Any) As Long
Private Sub Command1_Click()
a = 0
b = 0
c = 0
d = 0
e = 0
Data1.Refresh
Data2.Refresh
Data1.Recordset.MoveFirst
Data2.Recordset.MoveFirst
While (Not Data1.Recordset.EOF) And d = 0          //updating database
                                                    about vehicle exit
If (Data1.Recordset.Fields(0).Value = Text1.Text) Then
Data1.Recordset.Edit
```

```
d = 1
Data1.Recordset.Fields(3).Value = Text2.Text
Data1.Recordset.Fields(4).Value = Text3.Text
Data1.Recordset.Update
Else
Data1.Recordset.MoveNext
End If
Wend
While (Not Data2.Recordset.EOF) And e = 0
If (Data2.Recordset.Fields(0).Value = Text1.Text) Then
Data2.Recordset.Edit
e = 1
a = (Val(Text2.Text) * 60) + Val(Text3.Text)
b = (Data1.Recordset.Fields(1).Value * 60) +
Data1.Recordset.Fields(2).Value
f = a - b
a = f / 60
b = f Mod 60
Data2.Recordset.Fields(1).Value = a
Data2.Recordset.Fields(2).Value = b
If (Data1.Recordset.Fields(1).Value < 10) Then
c = (f) / 8
Else
c = (f) / 6
End If
Data2.Recordset.Fields(3).Value = c
Data2.Recordset.Update
```

```
Else
Data2.Recordset.MoveNext
End If
Wend
Data1.Refresh
Data2.Refresh
Data3.Refresh
Data3.Recordset.MoveFirst
Data3.Recordset.Edit
Data3.Recordset.Fields(1).Value = (Data3.Recordset.Fields(1).Value) - 1
Data3.Recordset.Fields(2).Value = (Data3.Recordset.Fields(2).Value) + 1
Data3.Recordset.Update
If (d = 0) Then
MsgBox ("Vehicle not found")
End If
Unload Me
Form2.Show
End Sub
Private Sub Command2_Click()
 Dim sa As String                          //using handle to get the text of the
                                           textbox
Dim l As Long
 sa = ""
 l = SendMessage(133660, &HC, 0, ByVal sa)
Unload Me
Form2.Show
End Sub
```

```
Private Sub Form_Load()
Text1.Text = ""
Text2.Text = ""
Text3.Text = ""
End Sub
Private Sub Timer1_Timer()
 Text2 = Hour(Now)
 Text3 = Minute(Now)
Dim s As String
 Dim i As Long
 i = SendMessage(133660, &HE, 0&, 0&)
 s = Space$(i + 1)
 Call SendMessage(133660, &HD, ByVal i + 1, ByVal s)
' MsgBox s
Text1 = Mid(s, 7, 10)
End Sub
```

Toll calculation:

```
Dim d As Integer
Private Declare Function SendMessage Lib "user32" Alias "SendMessageA"
(ByVal hwnd As Long, ByVal wMsg As Long, ByVal wParam As Long,
lParam As Any) As Long
Private Sub Command1_Click()
Data1.Refresh
Data1.Recordset.MoveFirst
d = 0                                          //displaying the toll
```

```
While (Not (Data1.Recordset.EOF) And d = 0)
If (Data1.Recordset.Fields(0).Value = Text1.Text) Then
If (Data1.Recordset.Fields(3).Value = 1000) Then
MsgBox ("Vehicle is still parked")
Else
MsgBox (Data1.Recordset.Fields(3).Value)
End If
d = 1
Else
Data1.Recordset.MoveNext
End If
Wend
If (d = 0) Then
MsgBox "vehicle not found"
End If                                          //getting the string from the
                                                textbox using a handle

 Dim sa As String
Dim l As Long
 sa = ""
 l = SendMessage(133660, &HC, 0, ByVal sa)
Unload Me
Form2.Show
End Sub
Private Sub Command2_Click()
 Dim sa As String
Dim l As Long
 sa = ""
```

```
l = SendMessage(133660, &HC, 0, ByVal sa)
Unload Me
Form2.Show
End Sub
Private Sub Form_Load()
Text1.Text = ""
End Sub
Private Sub Timer1_Timer()
Dim s As String
 Dim i As Long
  i = SendMessage(133660, &HE, 0&, 0&)
 s = Space$(i + 1)
 Call SendMessage(133660, &HD, ByVal i + 1, ByVal s)
' MsgBox s
 Text1 = Mid(s, 7, 10)
 End Sub
```

Mobile communication:

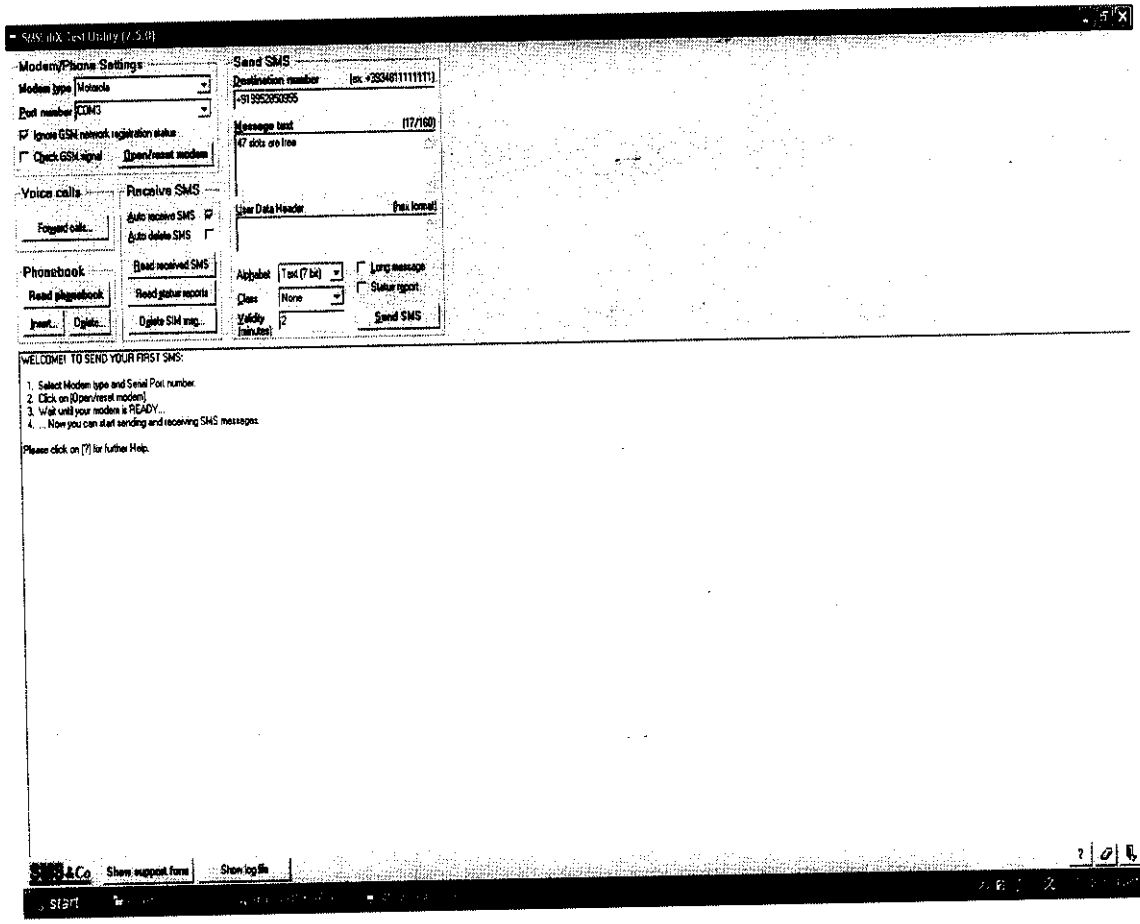
```
Dim s As String, t As String, g As String
Dim l As Long
Private Declare Function SendMessage Lib "user32" Alias "SendMessageA"
(ByVal hwnd As Long, ByVal wMsg As Long, ByVal wParam As Long,
lParam As Any) As Long
Private Sub Command1_Click()
Dim sa As String
Dim il As Long
```

```
il = SendMessage(67434, &HE, 0&, 0&)
MsgBox il
sa = Space$(il + 1)
Call SendMessage(67434, &HD, ByVal il + 1, ByVal sa)
g = Mid(sa, 41885, 13)
MsgBox g
Data1.Refresh
Data1.Recordset.MoveFirst
t = Data1.Recordset.Fields(2).Value
Data1.Recordset.Close
s = t + " slots are free "
l = SendMessage(132884, &HC, 0, ByVal s)
l = SendMessage(132882, &HC, 0, ByVal g)
End Sub
```

APPENDIX-2 SNAPSHOTS

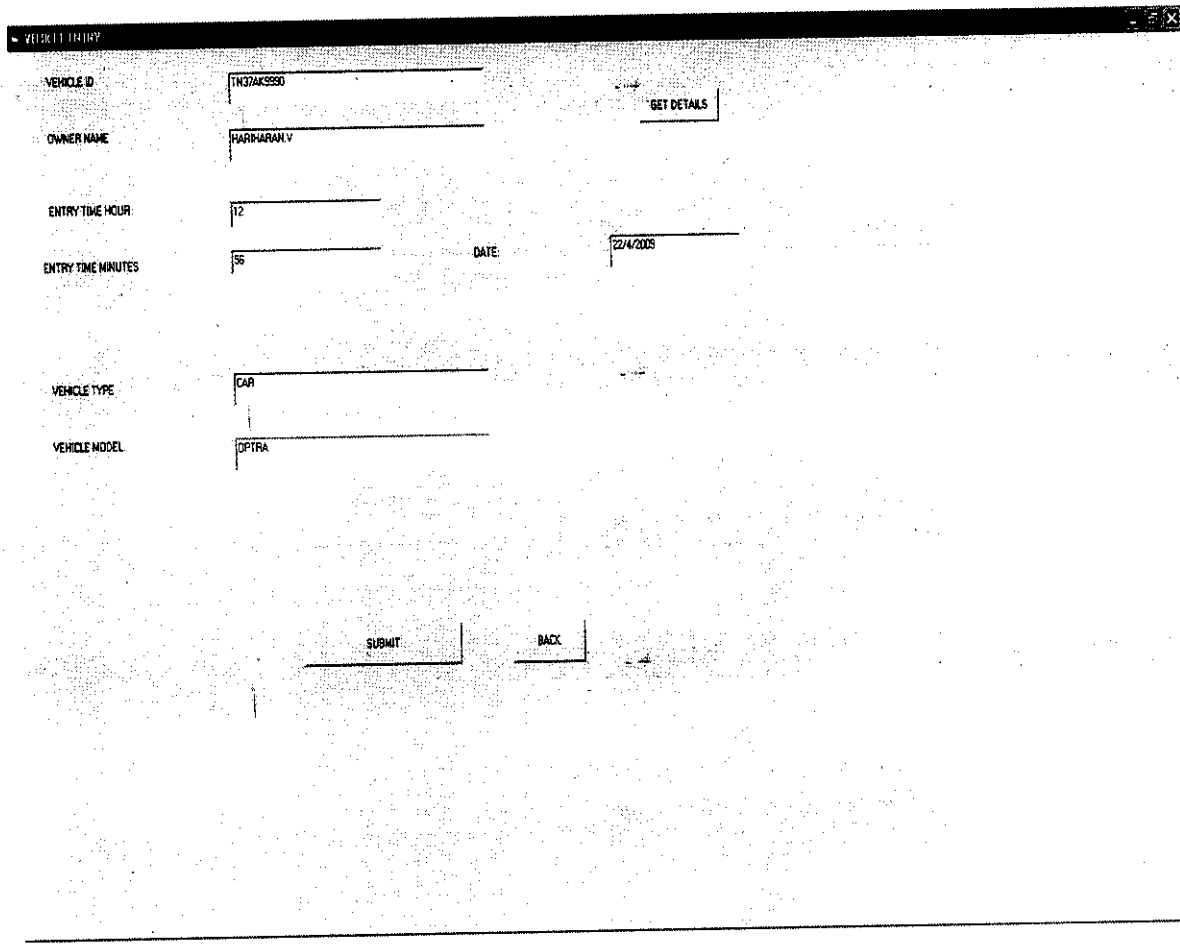
APPENDIX-2 SNAPSHOTS:

Mobile Communication:

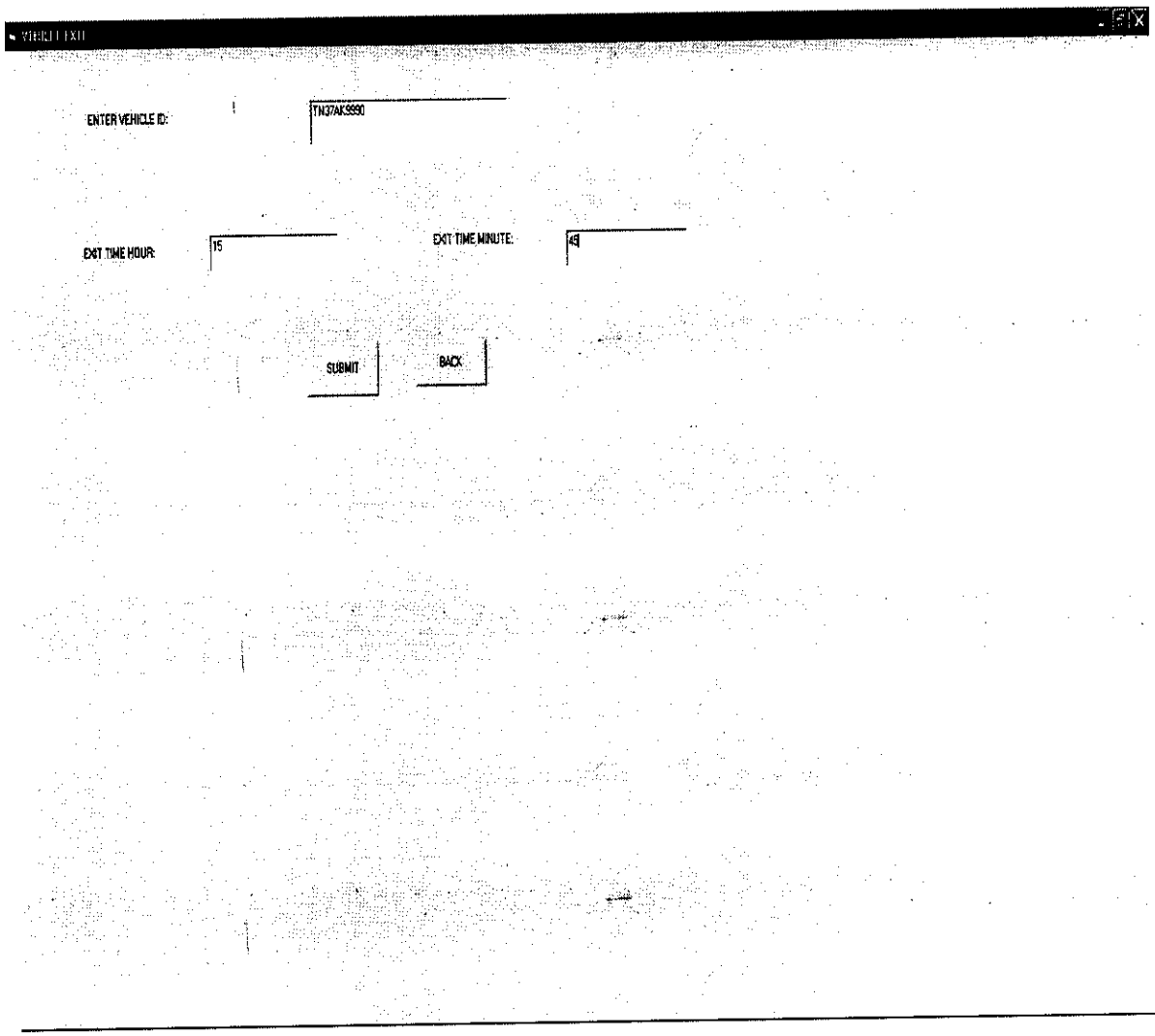


GRAPHICAL USER INTERFACE:

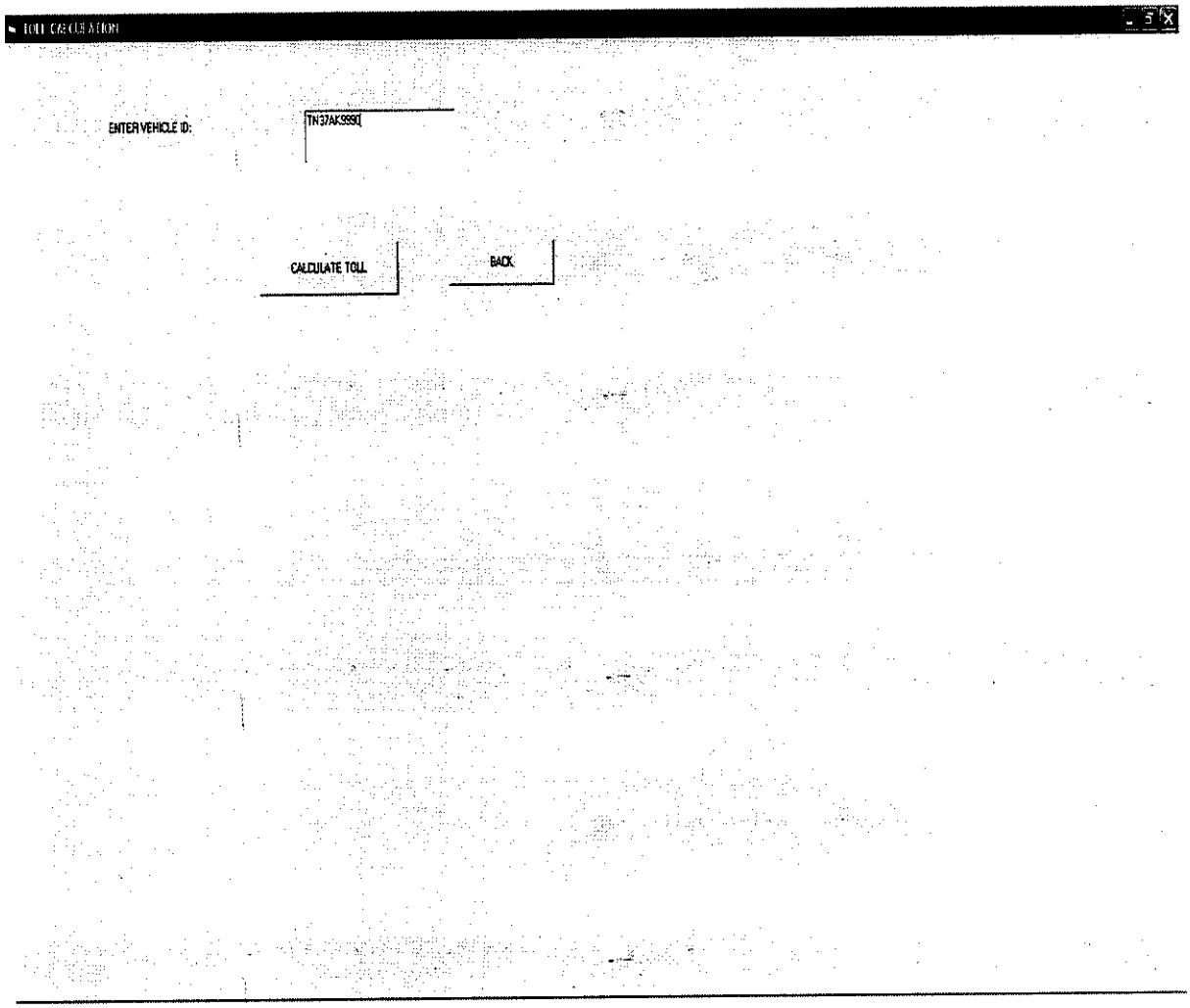
1. Vehicle Entry:



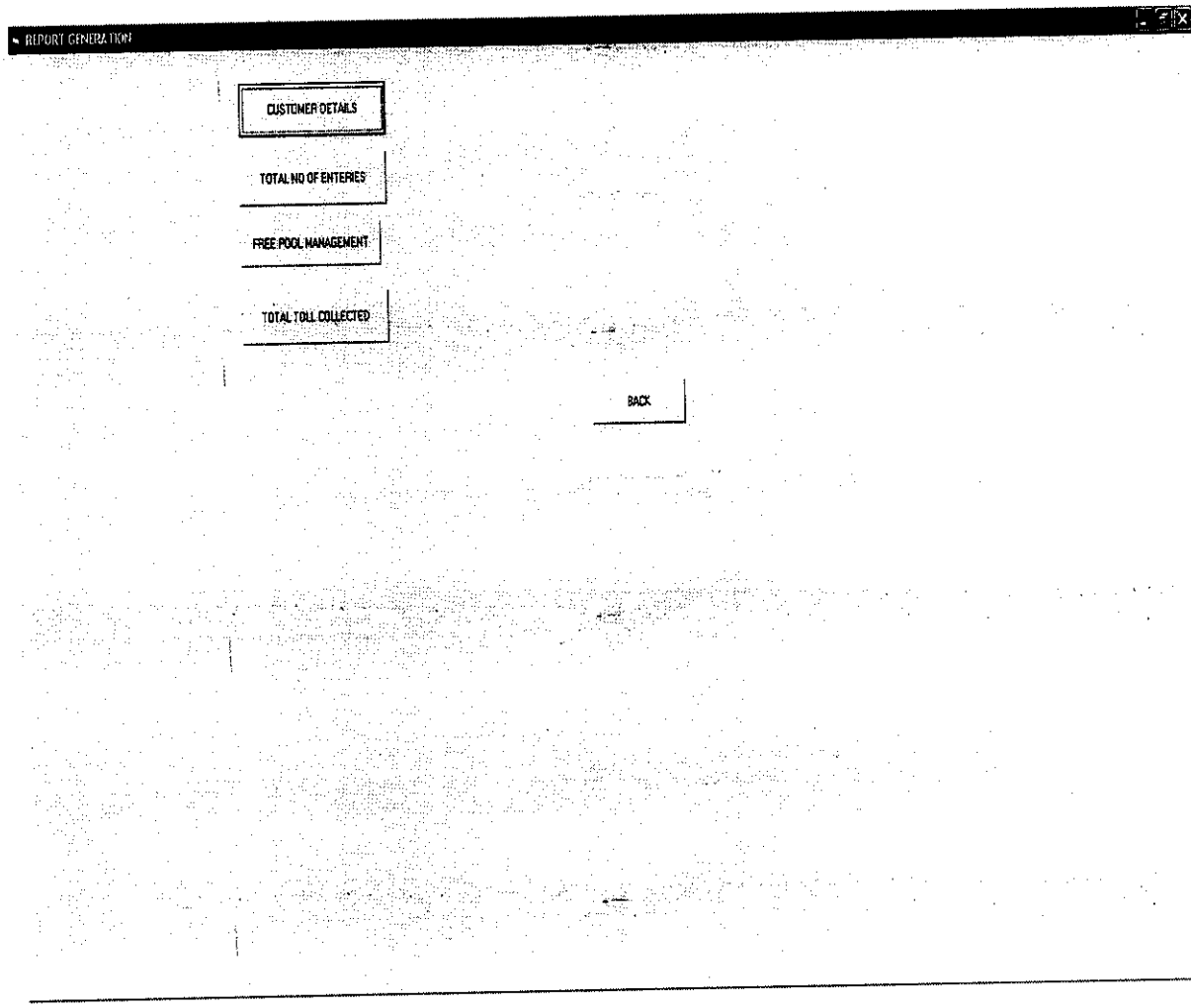
2. Vehicle Exit :



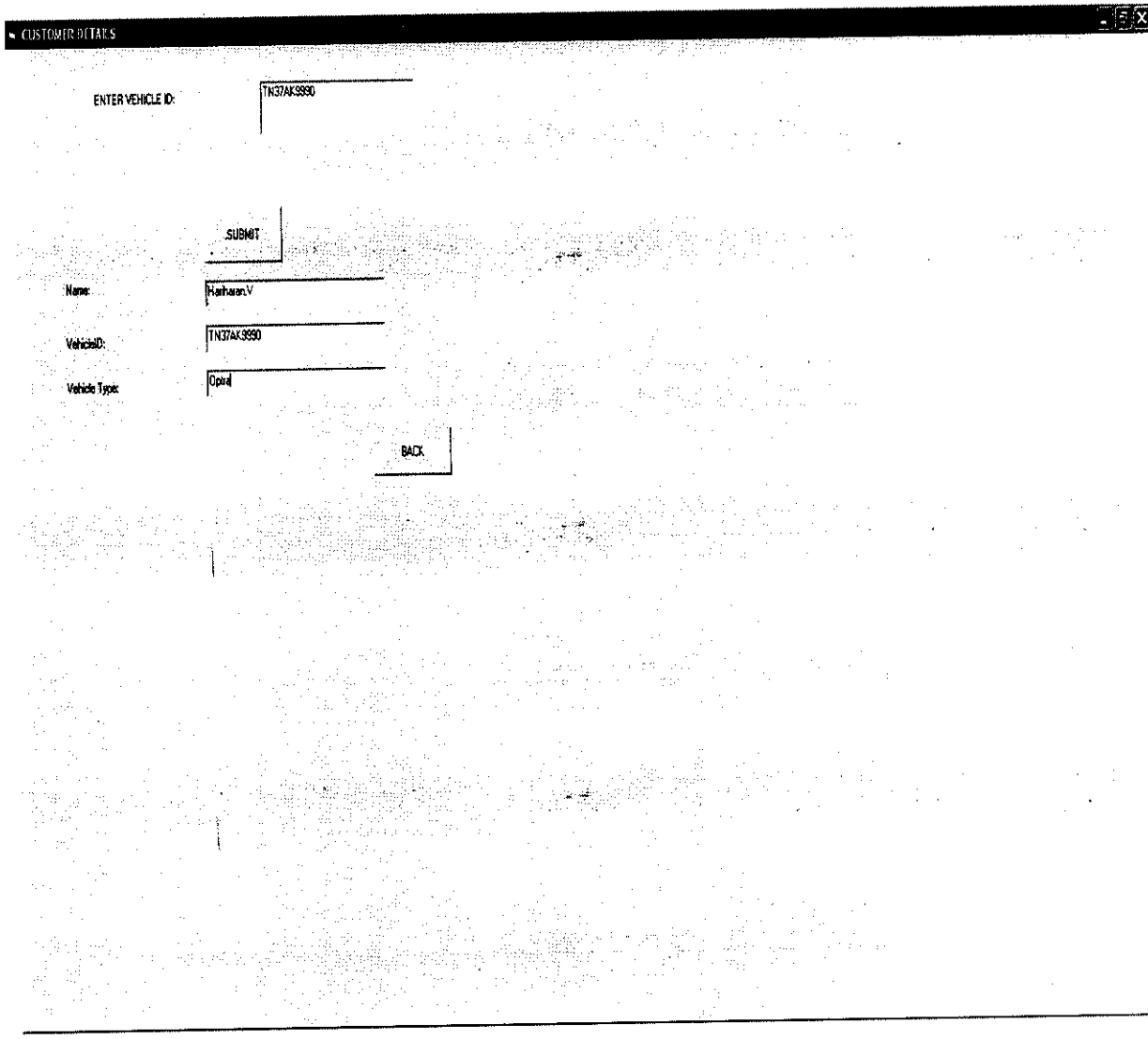
3. Toll Calculation:



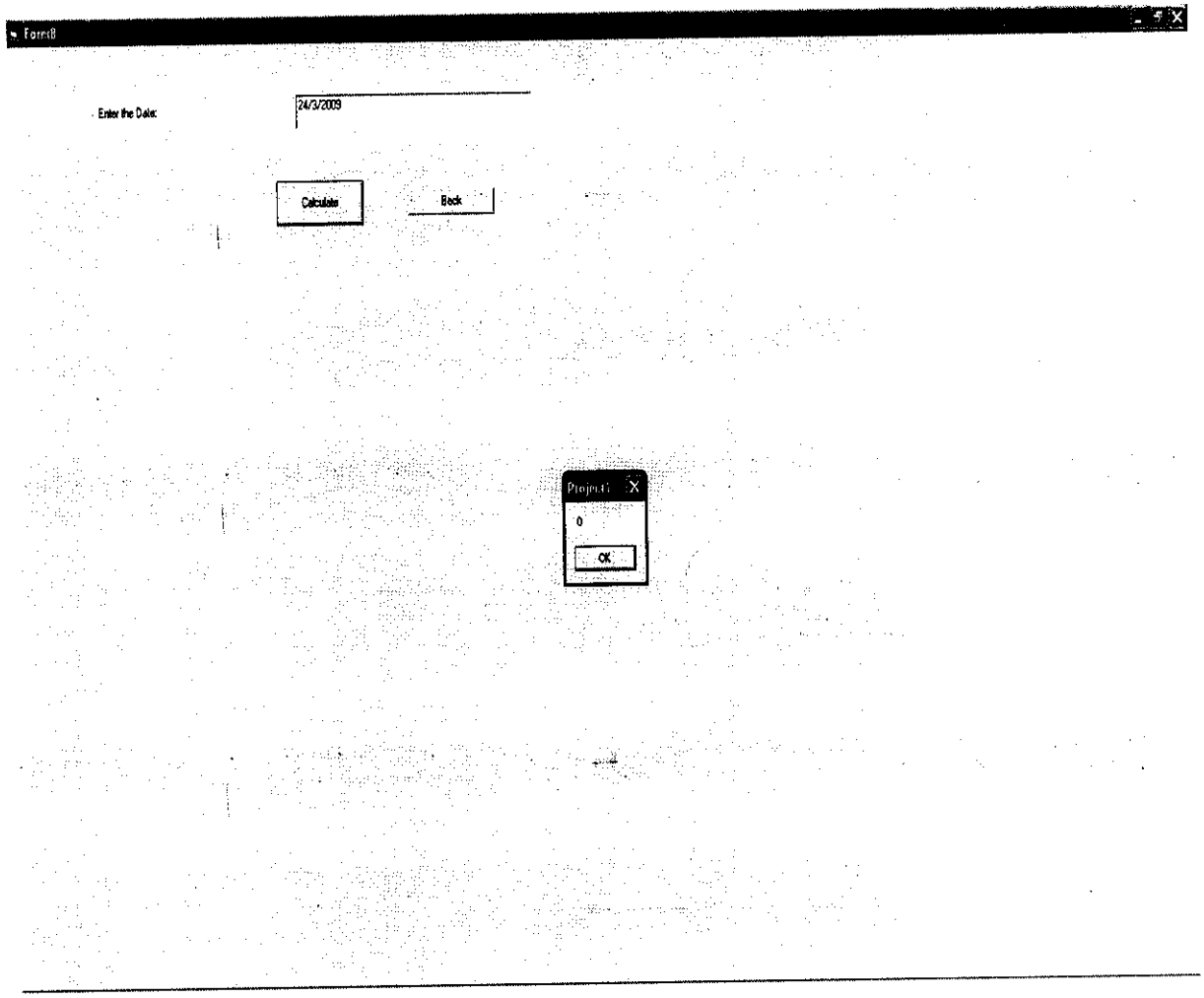
4. Report Generation:



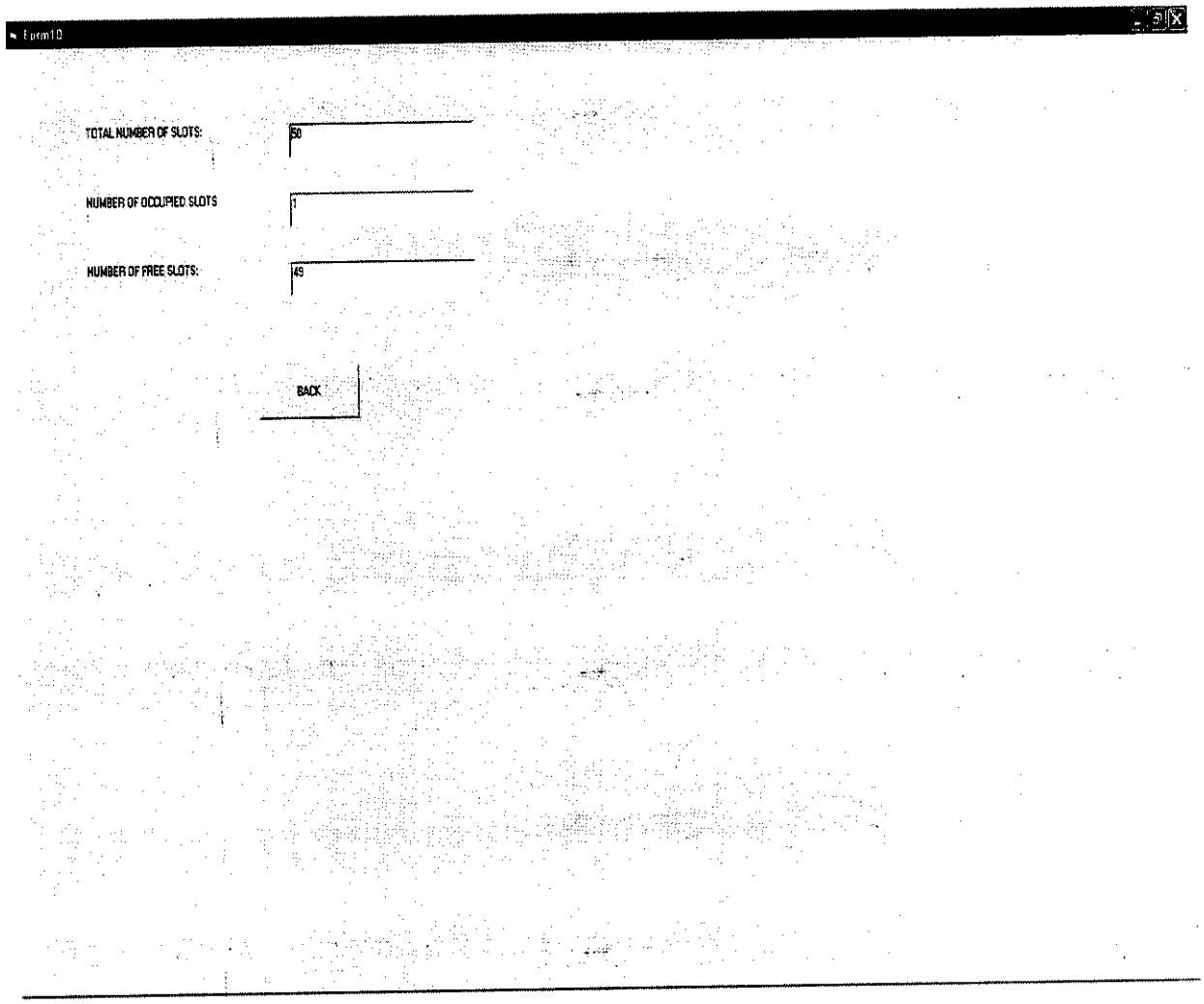
4.1 Customer details:



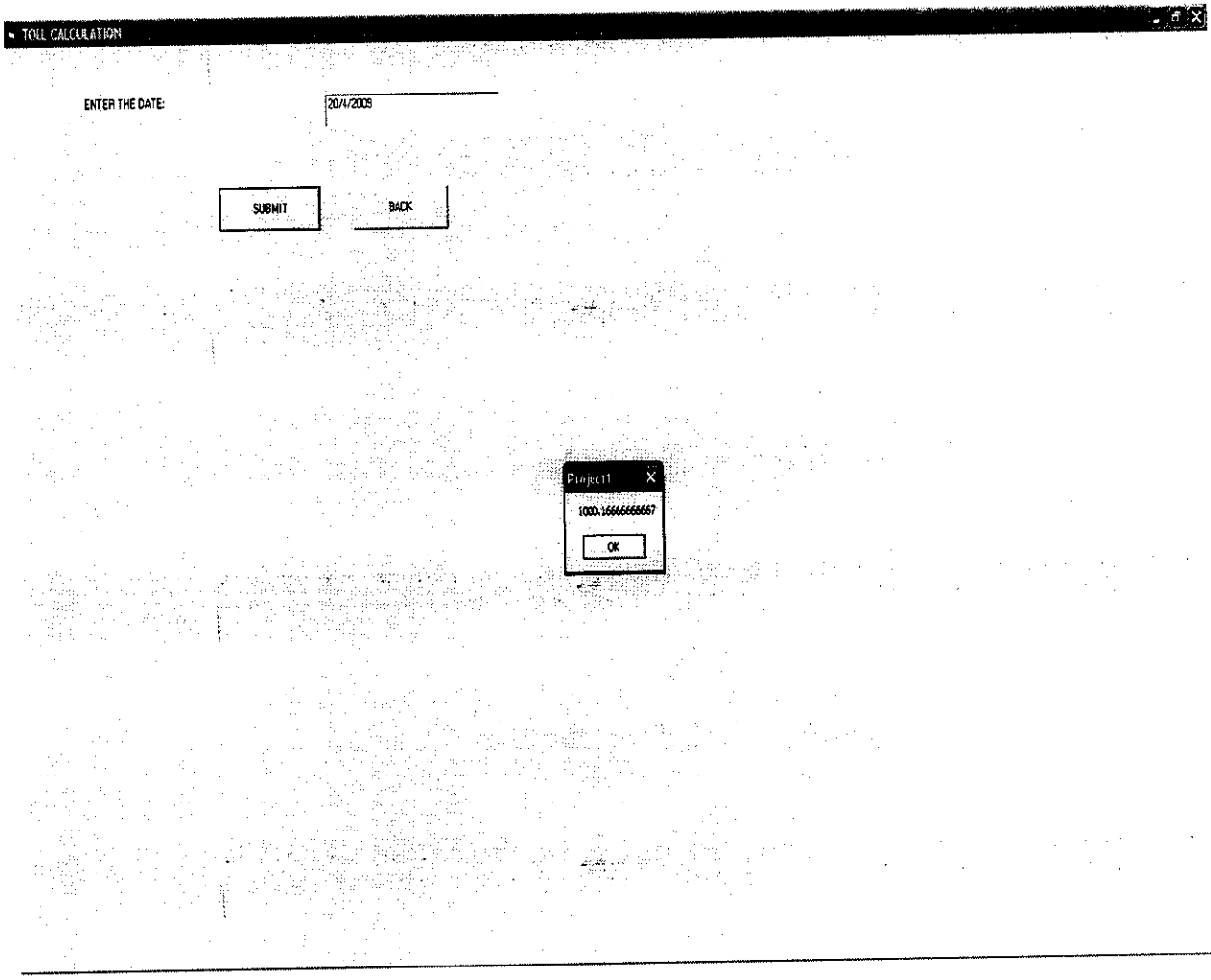
4.2 Total Number of Entries:



4.3 Free pool management:



4.4 Total toll collected:



References:

1. **http://www.rfidsb.com/** - Employee and Vehicle Access Control Systems
2. **http://www.activewaveinc.com/** - Applications and solutions for access control
3. **http://www.gaorfid.com/accesscontrol/** -RFID Solutions for ID Badges and Access Control
4. **http://www.rfidjournal.com/** - RFID working and RFID equipments

   http://www.rfidstores.co.in/ - RFID Access Control System