Vehicle Theft and Toll System

Prateek Dubey, Departmnet of Electronics and Communication Engineering, R.D Engineering College, Duhai, Ghaziabad U.P. India
Corresponding Author- hod.ec@rdec.in@gmail.com

ABSTRACT

Travellers in daily life pay a predetermined amount of tax to the government through the toll booth. The toll gates on national roads and bridges are where drivers pay to use the roadways by standing in queue, which causes a needless delay in their travel.Therefore, in order to avoid this problem, this suggested system approach uses a Radio Frequency Identifier (RFID) and security algorithm to automate toll plaza payment processing. The user is able to log in using the RFID system and input the source and destination in the proposed task. The system then displays any potential obstructions, such as toll booths. The user is led to the payment gateway after selecting the toll booths along the journey. The payment gateway is secured with encryption to promote security.

The Vehicle Theft and Toll System (VTTS) is an automated system developed to reduce car theft and enhance toll collection. In order to guarantee the safety and security of cars and their owners, the system includes a number of technologies, including GPS, RFID, and video systems.

The VTTS also has an automatic toll collecting system that does away with the requirement for cars to pull over and manually pay tolls. The system employs sensors at toll booths and RFID tags affixed in each car to automatically deduct the toll payment from the driver's account. This function enhances the effectiveness of the toll collecting process overall by enhancing traffic flow, reducing congestion, and other factors.

The VTTS offers a thorough solution to both vehicle theft and toll collection overall. The system provides both drivers and authorities with a high degree of security, convenience, and efficiency by integrating cutting-edge technologies.

Introduction:-

The Vehicle theft and Toll system project is a system designed to prevent vehicle theft and to facilitate toll collection at toll booths. The system is made up of hardware and software components such as DC motors, LCDs, microcontrollers, switches, resistance, and LEDs. The project aims to provide a secure and efficient solution to prevent vehicle theft and to streamline toll collection operations. The system detects the presence of a vehicle using sensors and automatically opens the toll gate for authorized vehicles, while unauthorized vehicles are denied access. The project uses microcontrollers and other electronic components to control the system, and the software used for programming is Keil micro vision IDE. This system can be beneficial in reducing traffic congestion and improving traffic management by providing a faster and more efficient way of toll collection.

Additionally, the Vehicle theft and Toll system project can also contribute to improving the overall security of vehicles, as it can detect and prevent theft attempts. The project utilizes various technologies, including infrared (IR) LED and photo diode, to accurately detect the presence of a vehicle and verify its identity. The project also incorporates anti-theft features, such as sensors that detect unauthorized entry and sound alarms to alert the owner and authorities.

Overall, the Vehicle theft and Toll system project has the potential to provide numerous benefits to vehicle owners, toll operators, and transportation authorities. The project's focus on preventing theft, improving toll collection efficiency, and enhancing traffic management can contribute to making transportation systems safer, more secure, and more sustainable

Keywords: Electronics toll collection system, Radio frequency identification (RFID), Vehicle theft prevention, Microcontroller (AT 89S52) Embedded programming language, Automated gates.

LITERATURE SURVEY:-

This paper provides , the toll collection is automated using RFID technology with the help of sensor the with the help of sensor presence of vehicle is detected at toll booths as soon as sensor

detects the vehicle, RFID circuit activates which in turn enables the RFID tag placed on the wind shield. The main disadvantage of this system is the distance between RFID tag and the reader is more. As the tag is placed on wind shield it gets ruined due to rainfall.

In the automatic toll collection system RFID reader with 125 KHz frequency is used for the detection of passive tags installed on the vehicle of the commuter. There are two modes of operation in this system, transaction mode and recharge mode. When the vehicle arrives on the toll booth, the tag gets detected by the reader. The reader will serially communicate the information with the microcontroller (AT89s52) and the specified amount gets deducted from the user's account. The message about the transaction and amount deduction is displayed on the LCD screen and motor driver lifts the barricade, to allow the vehicle to pass through. If the account holder has an insufficient balance, he/she can recharge the card with a specific amount not exceeding the card limit of INR 250 and a message is sent informing the user about the new balance.

In this, the author has simulated automatic toll collection using RFID system, balance reduction system in host computer and control of toll gate. The RFID system uses 13.56 MHz passive RFID reader. Microcontroller is used for controlling the Dc motor and LCD displays the output of the balance deducted or a message on the screen. When a vehicle arrives on the booth, the reader containing an RF module receives a radio frequency signal along with the data from a passive tag. An authorized person checks the ID number, vehicle number and balance amount in a database on PC that contains GUI (Graphical User Interface) along with database of all the users. The ID number is matched with the recorded database and specific amount as per the toll tax is deducted. Microcontroller displays the amount on the LCD and gates are opened. IR sensor, a motion detection device, is designed for 38 KHz frequency along with 555 timer integrated circuit. This sensor detects the motion of the vehicle and closes the gates automatically. If the user is not registered in the database, he/she can register into it and deposit the amount in the account as a prepaid balance that is maintained in the repository. In this system, automatic toll collection, vehicle theft detection, signal breaking avoidance and tracking of over speeding vehicle is implemented. It promotes cashless transaction for the digital India and saving time and resources in the process. In Sept. 2012 Karnataka Government reported loss of about 600 crores worth of toll value due to human error. When a vehicle is bought first, it is registered at the RTO office. Number plate is linked with the RFID tag at the registration and an account is created for smart card with a unique ID. Software stores all the information in the Centralized database server. The antennas at the toll booth are continuously sending radio frequency pulses that return only when it hits an electronic transponder (tag) fixed in the vehicle. Reflected pulses contain all the information about the driver number, account, balance etc. After deduction of toll tax, gates are opened and vehicle can pass through. In case the tag is removed, the cameras that are installed at the toll plaza will capture the front and back number plate's image and since number plate is also linked with the account, specific amount will be deducted from it. In case of stolen vehicle, RFID is blacklisted in the database and when it finds a match, it can be identified at the toll booth only. RFID readers can be installed on signals to keep a check on drivers who ignore the traffic signal and notify the traffic police about the offenders.

It identifies the area of "number plate of vehicles with the assistance of format coordinating and concentrate number from number plate and process it for accumulation of toll". The number plate is labeled in the database with the client's close to home data, ledger and vehicle subtle elements. Toll is actually deducted from customer's money related adjust or Visa and notice is given to the customer. Customers need to take after standard precepts for number plate setup suggested by the toll. "Manual toll office will be obliged unregistered vehicles and if there ought to emerge an event of system frustration".

The identification of Indian vehicles by their number plates is the most fascinating and testing research point from recent years. It is watched that the number plates of vehicles are fit as a fiddle and estimate and furthermore have distinctive shading in different nations. A technique for the discovery and ID of vehicle number plate that will help in the location of number plates of approved and unapproved vehicles. Studies on embedded systems and microcontrollers, such as the AT89S52 microcontroller used in this project, can provide insights into how to design and program such systems to achieve optimal performance.
Existing literature on programming languages, such as the Embedded C used in this project, can provide researchers with guidance on how to write efficient and effective software programs for their projects.

Methodology

The methodology of the vehicle theft and toll system project involves several steps. Firstly, the hardware components are assembled, including the DC motors, EM-18 RFID module, IR sensors, LCD display, and microcontroller. Then, the H-bridge circuit is designed and constructed to control the DC motors for opening and closing the toll gate.

1. Research and Analysis: This involves studying existing systems and analyzing the requirements of the new system.
2. Hardware Design: This step involves designing the hardware components of the system, including the microcontroller, LCD, RFID module, DC motor, and H-bridge.
3. 3.Software Design: This involves designing the software for the microcontroller using Keil micro vision IDE.
4. .Problem identification: The first step is to identify the problem, which is the increasing incidents of vehicle theft and the need for an efficient toll system.
5. Circuit design: The circuit design involves the creation of the electrical circuit that connects all the hardware components.
6. Testing and debugging: The prototype is tested rigorously to ensure that it is functioning as intended. Any issues identified during testing are addressed through debugging.
7. Implementation: Once the system is tested and refined, it can be implemented in real-world scenarios.
8. Maintenance and support: The final step involves the ongoing maintenance and support of the system to ensure that it continues to function effectively over time. This may include periodic software updates and hardware maintenance.

Programming Code:-

```
#include<reg51.h>
#include<string.h>
#include<stdio.h>
#define lcdport P1
sbit col1=P0^0;
sbit col2=P0^1;
bit col3=P0^2;
sbit col4=P0^3;
sbit row2=P0^5;
sbit row3=P0^6;
sbit row4=P0^7;
sbit rs=P1^0;
sbit rw=P1^1;
sbit en=P1^2;
sbit m1=P2^4;
sbit m2=P2^5;
char i,rx_data[50];
char rfid[13],ch=0;
char pass[4];
 void delay(int itime)
{
   int i,j;
   for(i=0;i<itime;i++)
   for(j=0;j<1275;j++);
}
void daten()
{
   rs=1;
   rw=0;
   en=1;
   delay(5);
   en=0;
}
void lcddata(unsigned char ch)
{
   lcdport=ch & 0xf0;
   daten();
   lcdport=(ch<<4) & 0xf0;
   daten();
}
void cmden(void)
{
   rs=0;
   en=1;
   delay(5);
   en=0;
}
```

```
void lcdcmd(unsigned char
ch)
{
   lcdport=ch & 0xf0;
   cmden();
   lcdport=(ch<<4)          &
0xf0;
   cmden();
}
void lcdstring(char *str)
{
   while(*str)
   {
      lcddata(*str);
   }
}
void lcd_init(void)
{
   lcdcmd(0x02);
   lcdcmd(0x28);
   lcdcmd(0x0e);
   lcdcmd(0x01);
}
void uart_init()
{
 TMOD=0x20;
 SCON=0x50;
 TH1=0xfd;
 TR1=1;
}
char rxdata()
{
  while(!RI);
   ch=SBUF;
   RI=0;
   return ch;
}
void keypad()
{
   lcdcmd(1);
   lcdstring("Enter          Ur
Passkey");
   lcdcmd(0xc0);
   i=0;
   while(i<4)
   {
    col1=0;
    col2=col3=col4=1;
    if(!row1)
    {
      lcddata('1');
      pass[i++]='1';
      while(!row1);
    }
        else if(!row2)
    {
      lcddata('4');
      pass[i++]='4';
      while(!row2);
    }
     else if(!row3)
    {
      lcddata('7');
      pass[i+]='7'
      while(!row3);
    }
     else if(!row4)
    {
      lcddata('*');
      pass[i++]='*';
      while(!row4);
    }
    col2=0;
    col1=col3=col4=1;
    if(!row1)
    {
      lcddata('2');
      pass[i++]='2';
      while(!row1);
    }
        else if(!row2)
    {
      lcddata('5');
      pass[i++]='5';
      while(!row2);
    }
        else if(!row3)
    {
      lcddata('8');
      pass[i++]='8';
      while(!row3);
    }
     else if(!row4)
    {
      lcddata('0');
      pass[i++]='0';
      while(!row4);
    }
    col3=0;
    col1=col2=col4=1;
    if(!row1)
    {
      lcddata('3');
      pass[i++]='3';
      while(!row1);
    }
     else if(!row2)
    {
      lcddata('6');
      pass[i++]='6';
      while(!row2);
    }
     else if(!row3)
    {
      lcddata('9');
      pass[i++]='9';
      while(!row3);
    }
     else if(!row4)
    {
      lcddata('#');
      pass[i++]='#';
      while(!row4);
    }
        col4=0;
    col1=col3=col2=1;
    if(!row1)
    {
      lcddata('A');
      pass[i++]='A';
      while(!row1);
    }
     else if(!row2)
    {
      lcddata('B');
      pass[i++]='B';
      while(!row2);
    }
     else if(!row3)
    {
      lcddata('C');
      pass[i++]='C';
      while(!row3);
    }
```

```
      else if(!row4)
    {
      lcddata('D');
      pass[i++]='D';
      while(!row4);
   }
 }
  }
void accept()
{
    lcdcmd(1);
    lcdstring("VEHICAL
SEQURIYU SYSTEM");
    lcdcmd(192);
    lcdstring("VEHICALE
ID");
    delay(200);
}
void wrong()
{
            lcdcmd(1);
            lcdstring("  ");
            lcdcmd(192);
            lcdstring(" ");
            delay(200);
            }
void main()
{
   buzzer=1;
   uart_init();
   lcd_init();
   lcdstring("     VEHICLE
");
   lcdcmd(0xc0);
   lcdstring("Security
system ");
   delay(400);
   while(1)
   {
      lcdcmd(1);
      lcdstring("Place  Your
Card:");
      lcdcmd(0xc0);
      i=0;
      for(i=0;i<12;i++)
      rfid[i]=rxdata();
      rfid[i]='\0';
      lcdcmd(1);
      lcdstring("Your      ID
No. is:");
      lcdcmd(0xc0);
      for(i=0;i<12;i++)
      lcddata(rfid[i]);
      delay(100);

if(strncmp(rfid,"160066A5
EC39",12)==0)
      {
         keypad();
         {
         accept();
   lcdcmd(1);
         lcdstring("DOOR
OPEN ");
         lcdcmd(0xc0);

lcdstring("Person1");
         m1=1;
         m2=0;
         delay(300);
         m1=0;
         m2=0;
         delay(200);
         m1=0;
         m2=1;
         delay(300);
         m1=0;
         m2=0;
        }
         else
         wrong();
      }
      else
if(strncmp(rfid,"160066BD
7AB7",12)==0)
         {
         keypad();
               {
         accept();
         lcdcmd(1);
         lcdstring("DOOR
OPEN ");
         lcdcmd(0xc0);
               m1=1;
         m2=0;
         delay(300);
         m1=0;
         m2=0;
         delay(200);
         m1=0;
         m2=1;
         delay(300);
         m1=0;
         m2=0;
        }
         else
         wrong();
      }
         else if(!row4)
    {
      lcddata('D');
      pass[i++]='D';
      while(!row4);
   }
 }
  }
void accept()
{
    lcdcmd(1);
    lcdstring("VEHICAL
SEQURIYU SYSTEM");
    lcdcmd(192);
    lcdstring("VEHICALE
ID");
    delay(200);
}
void wrong()
{
            lcdcmd(1);
            lcdstring("  ");
            lcdcmd(192);
            lcdstring(" ");
            delay(200);
            }
void main()
{
   buzzer=1;
   uart_init();
   lcd_init();
   lcdstring("     VEHICLE
");
   lcdcmd(0xc0);
   lcdstring("Security
system ");
   delay(400);
   while(1)
   {
      lcdcmd(1);
      lcdstring("Place  Your
Card:");
      lcdcmd(0xc0);
      i=0;
      for(i=0;i<12;i++)
      rfid[i]=rxdata();
      rfid[i]='\0';
      lcdcmd(1);
      lcdstring("Your      ID
No. is:");
      lcdcmd(0xc0);
      for(i=0;i<12;i++)
      lcddata(rfid[i]);
      delay(100);

if(strncmp(rfid,"160066A5
EC39",12)==0)
      {
         keypad();
         {
         accept();
   lcdcmd(1);
         lcdstring("DOOR
OPEN ");
         lcdcmd(0xc0);

lcdstring("Person1");
         m1=1;
         m2=0;
         delay(300);
         m1=0;
         m2=0;
         delay(200);
         m1=0;
         m2=1;
         delay(300);
         m1=0;
         m2=0;
        }
         else
         wrong();
      }
      else
if(strncmp(rfid,"160066BD
7AB7",12)==0)
         {
         keypad();
               {
         accept();
         lcdcmd(1);
         lcdstring("DOOR
OPEN ");
         lcdcmd(0xc0);
               m1=1;
         m2=0;
         delay(300);
         m1=0;
         m2=0;
         delay(200);
         m1=0;
         m2=1;
         delay(300);
         m1=0;
         m2=0;
        }
         else
         wrong();
      }
        else
        {
          lcdcmd(1);
          lcdstring("DOOR
CLOSE");

          delay(300);
```

} } }

Result

The below shown figures are the outcomes of the proposed work. Which includes anti theft and RFID based automatic toll collection system.

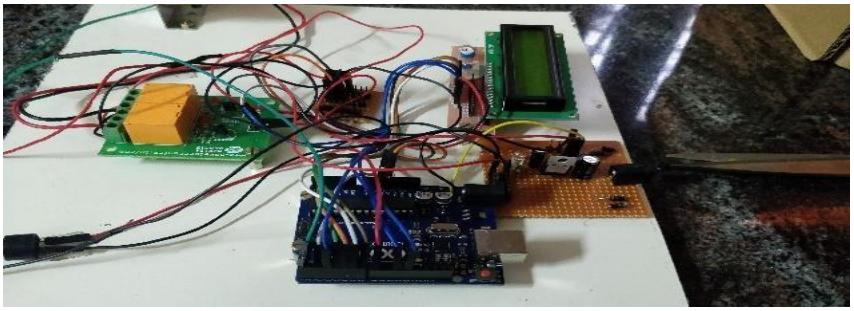

Fig 7: Toll unit

Fig 7 shows the hardware of toll unit. This system is basically to automate the toll collection process. Using RFID technology.

Fig 8: Vehicle unit

Fig 8 shows the hardware of vehicle unit. This includes anti theft system with infrared sensor, metal sensor and ultrasonics. RFID technology in a vehicle theft and toll system project.

RFID (Radio Frequency Identification) is a popular technology used in many applications, including vehicle theft and toll system projects. In such a system, RFID tags are attached to vehicles, and RFID readers are installed at various checkpoints or toll booths along the road. When a vehicle passes through the checkpoint or toll booth, the RFID reader scans the tag on the vehicle, and the system verifies whether the vehicle is authorized to pass or not.

The use of RFID technology in a vehicle theft and toll system project can provide several benefits, such as:

1.Increased security: RFID technology can help prevent vehicle theft by ensuring that only authorized vehicles are allowed to pass through checkpoints or toll booths.

2.Reduced costs: RFID technology can reduce the need for manual labor and decrease the cost of toll collection.

Components used:-

1. Microcontroller (AT89S52)
2. Dc motor
3. LED
4. LCD 16by2
5. Photo Diode
6. Resistance (1-khom)
7. Connecting wires
8. 18. Motors (Required rpm)

9. Ic 2402
10. Em-18 RFID Module

Advantages:-

- Efficient toll collection: The use of DC motors and IR sensors makes the toll collection process more efficient and automated, reducing the need for manual toll collection and improving efficiency.
- The use of microcontrollers and software programming allows for the automation of various processes, reducing the need for manual intervention.
- The LCD display can provide useful information to drivers, such as toll amount and remaining balance
- The system can be easily customized and modified to suit the needs of different toll booth configurations and traffic conditions
- The use of RFID technology enables contactless toll collection, reducing the risk of transmission of diseases such as COVID-19
- The system can help reduce traffic congestion and travel time for drivers.
- The system can generate electronic records of toll collection, which can be useful for tracking traffic patterns and revenue collection
- The system can generate electronic records of toll collection, which can be useful for tracking traffic patterns and revenue collection.
- The use of DC motors allows for precise and efficient control of the toll barrier, reducing the wear and tear on the equipment.

Disadvantages:-

- The initial cost of implementing the system can be high, including the cost of hardware and software development, installation, and maintenance.
- The system is vulnerable to technical malfunctions and failures, which can lead to disruptions in toll collection and traffic flow.
- The use of RFID technology requires the installation of specialized readers and tags, which can be expensive and time-consuming.
- The system may require frequent software updates and maintenance to ensure optimal performance and security.
- The system may not be compatible with allw types of vehicles, especially those without RFID tags.
- The use of microcontrollers and software programming requires specialized technical expertise, which may be difficult to find and expensive to hire.
- The system may be vulnerable to hacking and cyber attacks, which can compromise the security of the toll collection process and the data collected.
- The system may face regulatory and legal challenges related to privacy and data protection.
- The system may require additional training and education for toll booth operators and drivers to ensure proper use and understanding.
- The system may face resistance and opposition from toll booth operators and other stakeholders who may perceive it as a threat to their livelihoods.

CONCLUSION

Vehicle theft is a significant problem that requires effective solutions. Traditional locking and anti-theft systems such as steering wheel locks, immobilizers, and alarms are effective in preventing hot-wiring and electronic hacking, but they are less effective against key theft. Emerging technologies such as biometric and wireless systems have shown promising results

in preventing vehicle theft and are likely to become more widely available in the future. It is important that individuals and society as a whole remain vigilant and take appropriate measures to prevent vehicle theft, including using effective locking and anti-theft systems**.** This project is very useful in the coming future because due to the this the car prevent from stelen and there is areas around the toll tax and it will provide a big safety to the people.

The ant- theft system introduced lately suffered several drawbacks on various grounds of reliability, accuracy, security, range etc. this new ingenious device will come beyond all these limitations as it provides a full proof highly reliable alert system that is both hard to crack and almost impossible to get through. Its range is global unlike the conventional systems that used radio frequency signals for alerts which no doubt became obsolete after a certain distance. Moreover the device's speed limit detection and alert system sets it apart from the other available devices as it paves the way for allowing decent usage of the vehicle resulting in least maintenance and hence longer life.

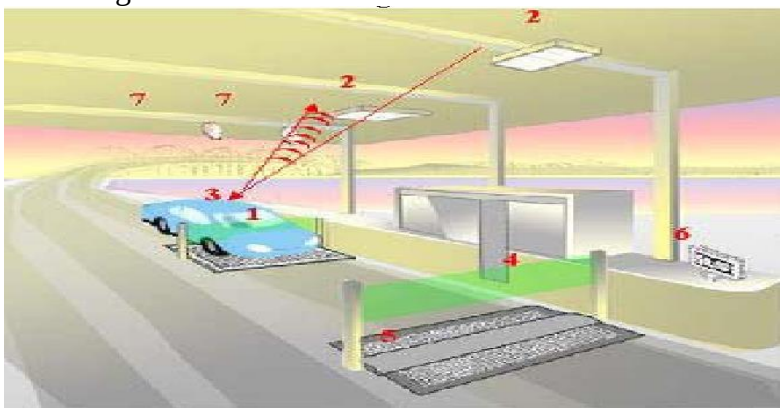

Figure: Implementation of RFID based toll collection system

Future Scope

Future advances in the fields of toll collection and anti-vehicle theft include the following**:**

- The future of preventing car theft rests in smart anti-theft systems, thanks to the growing use of cutting-edge technology like the Internet of Things (IoT), artificial intelligence (AI), and machine learning. To make it far more difficult for criminals to steal automobiles, such systems may incorporate biometric verification, real-time tracking, and automatic notifications.
- Blockchain-based toll systems have the ability to completely transform the industry by enhancing its security, effectiveness, and transparency. A decentralised ledger would be used by a blockchain-based toll system to record toll transactions, doing away with the need for middlemen and cutting expenses.
- By examining data from numerous sources to find probable trends and anomalies that may signal a theft is going to happen, predictive analytics can assist prevent car thefts. The police might then be notified using this information, stopping the theft in its tracks.
- Artificial intelligence (AI) and machine learning: Using these technologies, toll system data may be analysed to find trends that can be utilised to improve traffic flow and relieve congestion. AI might be utilised to create prediction models that would assist in identifying and stopping toll fraud.

Overall, technological advancements, particularly in fields like AI, machine learning, blockchain, and IoT, are likely to have a major influence on the future of vehicle theft prevention and toll systems. As these technologies advance, we may anticipate the emergence of fresh and creative ideas that will improve the security and effectivenss of our roadways.

REFERENCES

1. "Design and Development of RFID-based Automatic Toll Collection System" by K. R. Chavan et al. (2019).
2. "Automated Toll Collection System using RFID and GSM" by V. R. Kulkarni and A. N. Kadam (2018).
3. "Design and Implementation of Vehicle Theft Control System using RFID and GSM" by S. S. Waghmare and V. S. More (2016).
4. An Automatic Toll Collection System using RFID" by S. S. Sawai and S. S. Mote (2015).
5. "Automated Toll Collection System using RFID and Embedded System" by P. R. Mane and M. P. Sonawane (2014).
6. "Design and Development of a Smart Toll Collection System using RFID Technology" by A. U. Osamor and O. J. Oghenevwede (2019).
7. "Design and Implementation of a Vehicle Tracking and Anti-Theft System using GSM and GPS Technologies" by J. O. Adegbehingbe and E. T. Adetiba (2016).
8. National Insurance Crime Bureau. (2021). Hot Wheels: America's Stolen Cars. Retrieved from https://www.nicb.org/news/news-releases/hot-wheels-202
9. Consumer Reports. (2021). How to Stop Car Thieves. Retrieved from https://www.consumerreports.org/car-safety/how-to-stop-car-thieves/
10. Navigant Research. (2018). Biometrics in Automotive: An Emerging Market. Retrieved from https://www.navigantresearch.com/reports/biometrics-in-automotive-an-emerging-market
11. "Design and Implementation of a Vehicle Theft Control System Based on GSM and GPS" by A. O. Adewole and A. O. Ogunyebi (2015)
12. "An Improved RFID-Based Vehicle Toll Collection System" by M. A. Islam et al. (2015).
13. "Development of a Low Cost Automatic Toll Collection System using Arduino and Zigbee" by P. S. Lakshmi et al. (2015).