

AUTOMATIC TOLL TAX SYSTEM USING RFID TECHNOLOGY AND GSM

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Abstract : Nowadays, tremendous increase in the number of vehicles has led to long queues at the toll plazas . One of the reason behind this problem is manual collection of toll at the toll booth. To overcome this problem we have decided to construct the system which reduce the manual work with the help of RFID and Raspberry-pi controller, as a result of this it reduces the traffic at the toll booths.

IndexTerms - Raspberry pi, RFID tag, LCD display, IR sensor, etc.

I. INTRODUCTION

In today's world Automation is one of the most advanced technologies and it is a globally accepted phenomena . One such application of automation is the automatic toll collection system. Traditional Toll collection systems were manual in nature and would often lead to traffic at the toll gates resulting in time consumption and pollution.

With the introduction of Express ways, the manual toll collection systems were thrashed and a semi automatic system was implemented in which databases were created and stored in computers . The gate operation was automatic but still this system did not overcome the problems faced by the previous system which was, time consumed while exchanging money resulting in congestion at the toll gates.

So, a fully Automated toll collection system is the ideal solution to overcome the problems faced by the previous systems. This system enables the driver to complete the transaction with the help of cashless payment . This type of payment method is quick and will consume less time. This system is able to detect a vehicle that enters into the toll plaza and also authenticates the vehicle by comparing the unique ID stored in the RFID tag with the database stored in the processor. After the the vehicles are authenticated, the respective toll amount is deducted from their accounts and then they are allowed to pass. This system also enables us to detect if the vehicle that has arrived into the toll plaza is stolen or not by comparing the number plate of that vehicle with the stolen vehicle database and immediately alerts the concerned person if it matches with that database.

II. LITERATURE SURVEY

- Carini and Malatini [1] proposed automated toll plaza system using RFID, using short range detection, they have maintained a database of information and the system automatically calculates the tax against the type of vehicle, timings, and weight of vehicle. They have also proposed a strict monitoring system, which increases the security enforcements, and reduces the number of black listed vehicles on the roads (especially near the borders).
- S.Nandini and P.Premkumar [2] have proposed a system in which the transactions related information is send to the user using GSM technology making it a reliable system to exchange information between the user and the authorities.

III. PROBLEM STATEMENT

To enhance convenience for drivers by enabling cashless toll payment.

IV. PROPOSED SYSTEM

A. BLOCK DIAGRAM

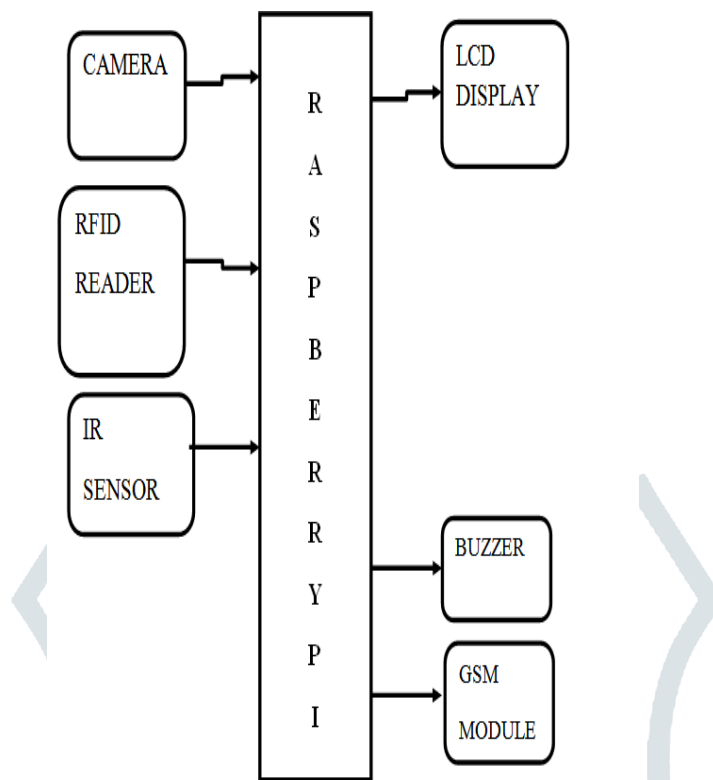


Fig.1 Block Diagram.

CIRCUIT DIAGRAM

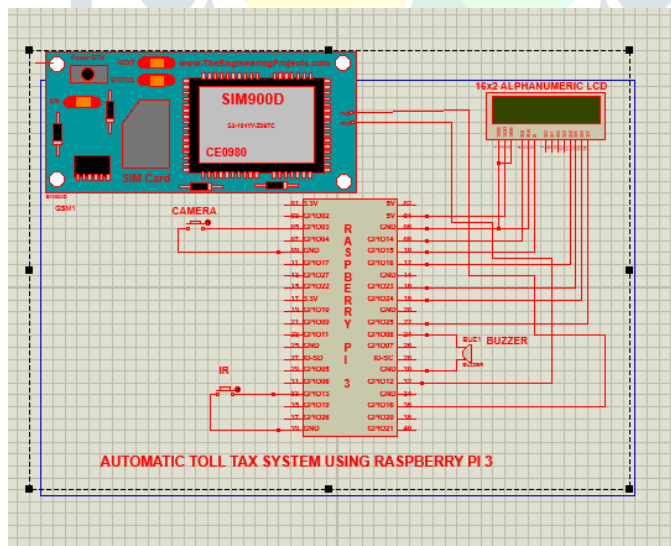


Fig.2 Circuit Diagram

C.METHODOLOGY

Ir sensor:- IR Sensor is used to detect the vehicle which is entering into the toll booth by transmitting IR rays and when the rays strike through the vehicle they will be reflected back to the IR receiver which in turn activates the camera.

Camera:- Here we are using an USB Camera to capture the image of the vehicle number plate. As soon as the camera receives command signals from the IR Sensor it will turn ON. After capturing the image it will send it to the controller and the controller will perform image processing techniques on it.

Raspberry Pi:-the Raspberry Pi is a very advanced processor which can be used in image processing and other applications. The various purpose served by the controller are,

- To provide interfacing between various external devices.
- To store the databases.
- To perform image processing , character segmentation and template matching of the captured image.
- To alert and send the transactions related messages to the concerned person via mail.

Rfid reader:- RFID reader has number of tags which define unique Id. which deduct amount. The RFID tag is used for authorization of a user. The user is asked to swipe his card and the Unique ID in the card is matched with the reader module and then the information is sent to the controller for matching the number with the database. When the unique ID matches with the number stored in the system the amount of toll imposed on him will be deducted automatically from his account and he will be allowed to pass through. RFID systems can be classified by the type of tag and reader.

GSM module :- Here we are using SIM900A as the GSM module. This is used for sending the transactions related messages to the registered mobile number of the driver after the payment is done.This module supports communication in 900 MHz band.

LCD :-We are using a 16*2 LCD to display the toll amount imposed on a vehicle and when ever the vehicle number matches with the stolen vehicle database an alert message will be displayed on the LCD.

D.FLOW CHART

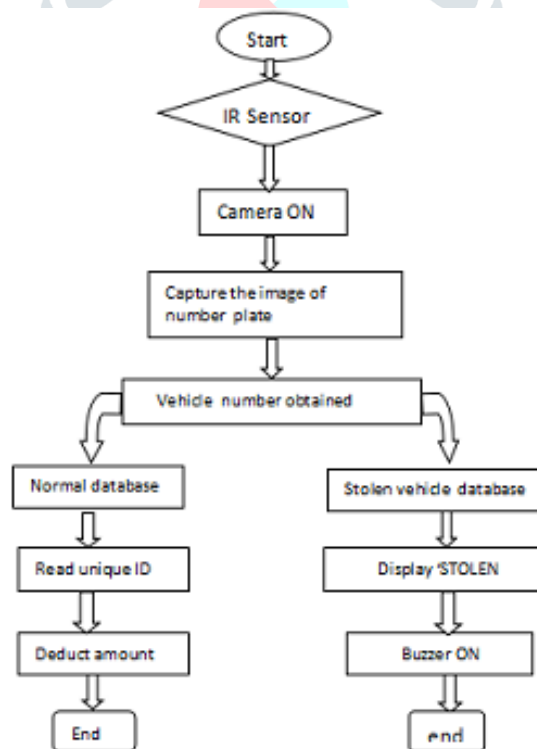


Image processing:-

For Image processing we are using Tesseract OCR. Tesseract is an Optical Character Recognition engine used for detecting text in images.After capturing image tesseract does various image processing operations internally before doing actual ocr.

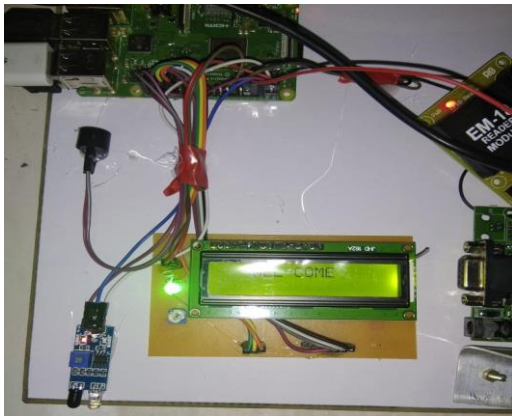
Algorithm for image processing:-

1. **Rescaling:** Tesseract work best on image which have 300 dots per pixel so resize the image.
2. **Binarisation:** This convertS an image into black and white.The result is not good if page back ground is of uneven darkness.

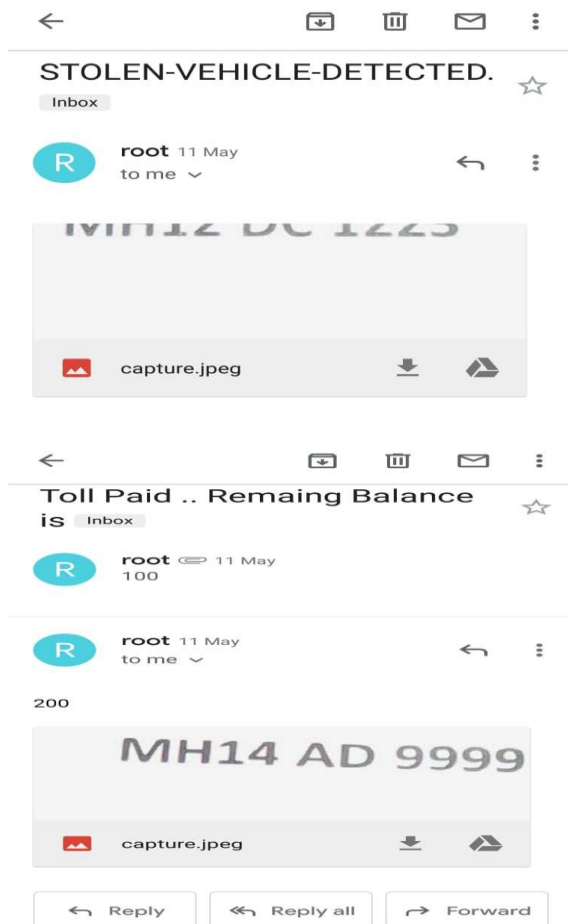
- 3. **Noise Removal:** Noise make the text of image more difficult to read.some noise not remove by tesseract in binarisation step, which decrease the accuracy.
 - 4. **Rotation/Deskewing:** If scanned page is not straight it is skewed image.so in this step rotate the page image so that page lines are horizontal.
 - 5.**Borders:** Scanned image often have dark border which sometime produce random extra character.so this stage remove the scanned image border.
 - 6. **Dictionaries,word lists, and patterns:** It is use to add words to the word lists to help recognition,or to add common character patterns, which increases the accuracy.
- These are the steps tesseract OCR perform to recognize the image.

V. RESULTS

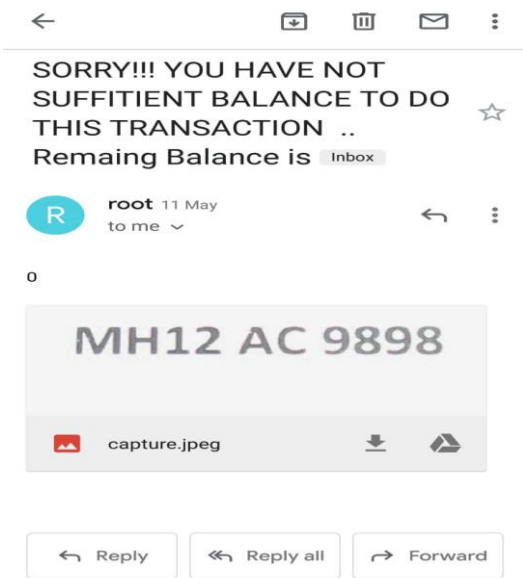
- The system will detect the vehicle entering into the toll plaza.



- System will compare the vehicle number with the databases and will display the relevant message and automatic money deduction will be done.



- If the balance is insufficient the system will alert the user to maintain balance.



VI. APPLICATIONS

- This project can be implemented on highways for toll collection.
- Used in Vehicle Number Recognition system.
- Can be used in authorization of drivers.
- RFID based systems can be used in cashless payments.

VII. CONCLUSION

By automating the toll plazas the time consumption issue can be solved to a very large extent and the man power requirement can be reduced resulting in less traffic at the toll gates and this project also aims at reducing the corruption by implementing cashless payment method at the toll gates. Inconvenience caused to the drivers will be largely reduced. The GSM technology will notify the user about his balance after every transaction made thus making the system very convenient and easy to use.

VIII. REFERENCES

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