

Automated Toll Collection System Using NFC and Theft Vehicle Detection

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Abstract: This article gives an important guideline for Automated Toll Collection System (ATCS) Using NFC and Theft Vehicle Detection. ATCS emerges as a converging technology where time and efficiency are important in toll collection systems nowadays. In this, NFC tag will be placed by toll authority having unique identification number (UIN) and user details. Active NFC tag will be attached to the vehicle. When vehicle passes through the tollbooth system, data on NFC will be read by NFC Reader and also sent to the server for verification. Server will check details and toll amount will be deducted from user's account. Theft Vehicle Detection is done with the help of various algorithms such as OCR and BLOB Detection.

Keywords: ATCS, NFC tag, UIN, NFC Reader, OCR Algorithm, and Blob Detection.

I. INTRODUCTION

Automated Toll Collection System (ATCS) is a technology which facilitates the automatic collection of toll payments using NFC technology. The term tolling is used for charging a well-defined special and comparatively costly infrastructure, like a bridge, a tunnel, a mountain pass, a motorway concession or the whole motorway network of a country. This system can be easily goes with existing infrastructure of toll collection system. ATCS technology can check if a Vehicle is registered at toll system, deduction of toll amount from every user's account. The notification about the toll amount deduction will be sent to the customer via SMS. ATCS also presents smart system to track theft vehicles and unregistered vehicles if vehicles no. is uploaded in the centralized server.

II. SCOPE

An Automated Toll Collection System using NFC and Theft Vehicle Detection is an efficient method in order to control traffic congestion and jams, enhance the payment system without stops and minimizes the pollution and fuel consumption for environmental protection need. ATCS system determines whether the vehicles passing are enrolled in the program, alerts enforcers for those that are not, and debits electronically the account of registered vehicles without their stopping.

Also this system is designed for Theft Vehicle Detection which passes through toll gate. When match for stolen vehicle found, notification will get to the police station by message triggering.

III. PROPOSED METHOD

The three tier architecture of the propose system is shown in Fig.1.

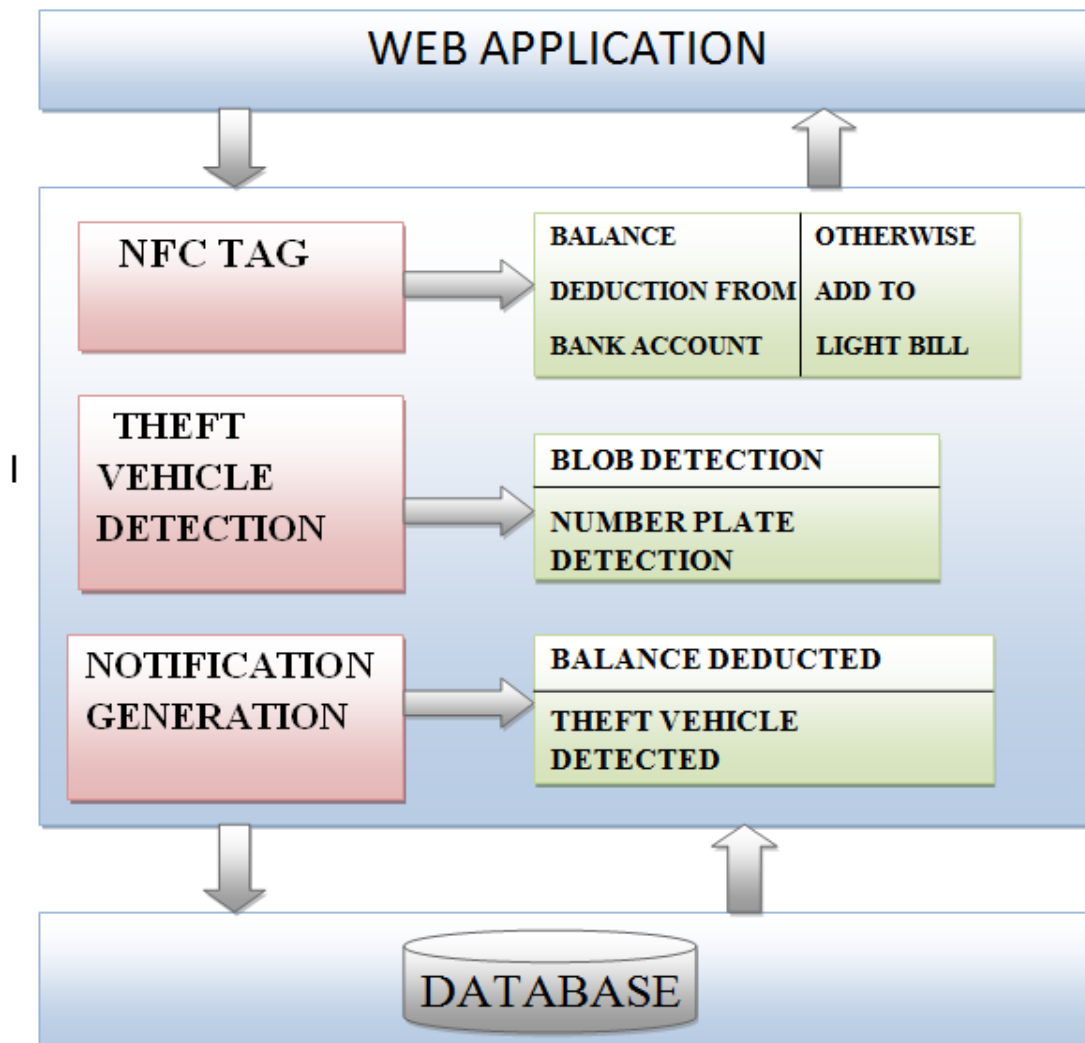


Figure 1 System Architecture

The web application comes under the presentation layer. It includes User login, add/modify vehicle types, user registration, complaint registration part is done in web based i.e. html part. Logical layer consists of NFC Tag , Theft Vehicle Detection and Notification generation as a main component. NFC tag will be on driver’s phone and it is linked with account which actually used for toll transaction. In Theft Vehicle Detection system detects the vehicle using Blob Detection algorithm which extracts the number plate from captured image. The number plate will be matched with the help of OCR (Optical Character Recognition) Algorithm and after match found notification will be sent to the nearby police station by message triggering.

Database is a centralized RDBMS database which maintains all the vehicle related information. And it also consists of the theft vehicle complaint record which used for theft vehicle detection.

IV. METHODOLOGY

1. Use of NFC Technology:

Near field communication (NFC) technology lets smart phones and other enabled devices communicate with other devices containing a NFC tag. . NFC is designed to be a secure form of data exchange, and an NFC device is capable of being both an NFC reader and an NFC tag.

NFC Reader/Writer Mode:

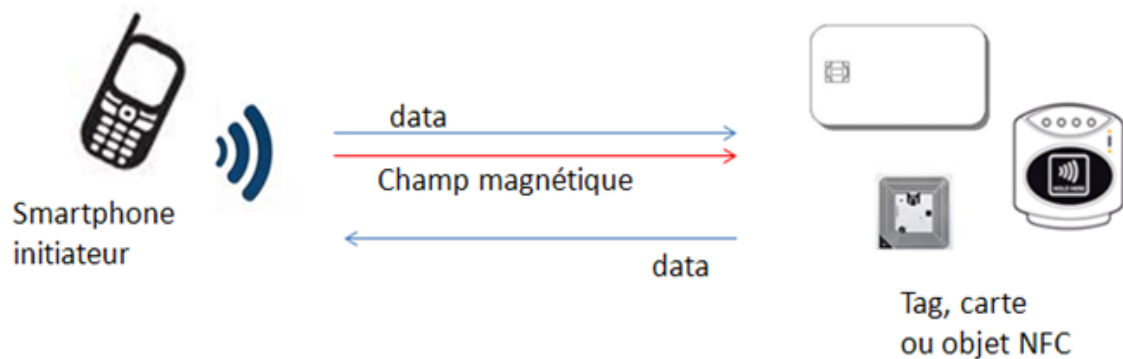


Figure 2 NFC Reader/Writer

The “NFC Device” in reader mode behaves like a simple contactless card reader. It initiates communication by generating a magnetic field and then sending a command to the target. The specificity of NFC operating modes is that the target can be not only a tag or a contactless card, but also an “NFC Device” that behaves like a contactless card. Usages of reader mode are principally information reading, when “NFC Devices” is used to read data by waving it in front of electronic labels available on streets, bus stops, sightseeing monuments, ad banners, parcels, products or on business cards (vCard).

2. BLOB Detection algorithm:

BLOB Analysis Algorithm is the algorithm which is used to count the number of vehicles in our system.

It works in five steps:

- **Background Subtraction** - It collects the color co-occurrences in the image and applies quantization. Accuracy is increased in presence of moving background objects. The important property is to adapt the background model to the changing condition in the scene.
- **Blob Detection** - The background subtraction model supplies the pixels detected as foreground. Pixels are grouped in current frame together. Algorithm groups individual pixels into disconnected classes
- **Blob Analysis** - In Blob analysis the model receives the candidate blob with their position as input and provides the new blob in current video frame. This module identifies which candidate blob in current frame belong to same vehicle.
- **Blob Tracking** - Blob tracking is a method by which computer can identify and trace the movements of objects within images. A blob is a group of pixels the computer identifies as an object. This tracking method allows the computer to find the blob's positions in successive frames.
- **Vehicle Counting** - Blob tracking is a method by which computer can identify and trace the movements of objects within images. A blob is a group of pixels the computer identifies as an object. This tracking method allows the computer to find the blob's positions in successive frames.

3. OCR (Optical Character Recognition):

- OCR is the mechanical or electronic conversion of scanned or photoed images of typewritten or printed text into machine-encoded/Computer readable text.
- The main purpose of OCR system based on a grid infrastructure is to perform the document image analysis, document processing of electronic document formats converted from paper formats more effectively and efficiently.
- This improves the accuracy of recognizing the characters during the document processing compared to various existing available character recognition methods.

V. CONCLUSION

In this paper, from the above research and techniques used we conclude that the system provides a paperless passage for toll gate with fully automated toll collection. Hence the considered system provides an intelligent solution to the traditional & toll collection method. Thus the system achieves performance factor as better user convenience from payment without stops, less traffic congestion, better audit control and transparency at toll transaction.

The only disadvantage is internet connection is necessary.

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