A Novel Approach for Automated Toll System
Using Number Plate Detection
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Abstract— Number Plate Detection by using Image processing is used for Toll Management System. Image processing Technique is used to overcome the important issues of Vehicle Time Congestion and Consumption. In this system image of number plate which is on vehicle will get captured as an input for processing. By using this image or video the number plate of the vehicle is detected and further process continues. Different modules of this system are General Public, Super admin, Toll Admin, Police admin and RTO admin. Using username and password Super Admin registers various locations. By using these details the Toll Admin then logs in into an account. Depending on the type of vehicle Toll Admin Module deduct the toll amount. The Regional Transport Authority (RTO) registers information of the vehicle and links that information with vehicle number plate. In case of any stolen vehicle passes through the toll collection center, number plate is detected and the notification will be sent to the Police Admin. To each number plate of vehicle which belongs to the owner’s account, e-wallet will be assigned. The information of daily toll collection can be obtained and that information will be send to the Government for the purpose of verification. Keywords— Congestion, Consumption, Detection, e-wallet, Verification.

I. INTRODUCTION
At the present time transport or other vehicles are essential element of Traffic control structure at different toll centers. This system is described as automated toll collection techniques where toll collection can be done electronically with the help of image processing technique where we can detect the number plate of the and there by deduct the amount of toll. Automated number plate recognition is image processing technique in which owner of vehicles are identifies by using their number plates. Automatic number plate recognition plays an important role in automatic monitoring of toll systems [1]. The vehicles number plate will be detected using a camera that will be captured at the toll checkpoint. An image processing technique will be put into effect to extract the registration number from the number plate of the car, with the help of this extraction the vehicles owner details will get extracted from the database and respective amount will be deducted, if vehicle owner acquires smart card even that information will get extracted from the database because that person has already paid the amount of toll in advance for a respective duration and toll amount will not be collected from them. In order to overcome the major issues of vehicle congestion and time consumption, image processing technology is used [2]. In this system video will be passed as an input to the camera or can be browsed from any of the location. Using this video the number plate is detected and further process get continues. Different modules of this system are Super admin, RTO admin, Police admin, Toll admin and the general public. With username and password, the Super admin register toll centers at various locations. Toll deduction takes place through e-wallet that is assigned to the concerned number plate of the vehicle that belongs to the owners’ account.

II. TECHNIQUES
2.1 MANUAL TOLL COLLECTION
A manual toll collection can process near about 400 vehicles per hour in comparison to a free flow freeway lane; with huge capacity approaching 2,000 vehicles per hour due to this significant congestion at many of these toll plazas occurred. With this method of payment there are many high costs associated. Manual toll collection is most widely used collection method in India. It needs a toll collector to handle this system. Toll cash is received by the toll collector depending on the type of vehicle. The toll collector, who also provides change, also may accept and sell scrip, tickets, coupons, doing an entry of the vehicle that passes from toll in the system and issuing receipt of the toll to the patron [8]. Due to manual process, the processing time of manual toll collection is highest.

[2.2] NFC BASED AUTOMATED TOLL SYSTEM
Near Field Communication (NFC) system determines
whether vehicle passing are enrolled in the system or not and debits the amount in the IC card of the registered vehicle. NFC reader reads the information of the vehicle like vehicle no. and sends a report to the vehicle owner simultaneously. Using NFC based Automated Toll System Mobile payment method via NFC, faces many challenges for wide and fast adoption, due to the lack of supporting type infrastructure, complex and standard ecosystem of stakeholders. In this system, payments transaction can fail easily as messages get lost and messages sending can be slow. It can take hours for a merchant to get receipt of toll payment. Consumers do not wish to be kept waiting more than a few seconds and it could be high cost [5].

[2.3] RFID BASED AUTOMATED TOLL SYSTEM
In existing system, identification of vehicle is done using radio frequency. A vehicle will hold RFID tag for processing toll. It includes difficulty in installing tags, duplicating tags on an uneasy location and requirement of power (Active Tags) to transmit information. Low frequency get results in lower maximum data rate, although it is fast enough to allow multiple transmissions to increase reliability [5].

[2.4] AUTOMATED COIN MACHINE FOR COLLECTING TOLL
Automated Coin Machine (ACM) is used in Automatic toll collection system which allows tolls to be collected without need of human. Tokens and Coins both are accepted by operating agency of toll. This is based on collection rate of toll. This method reduces transaction time and processing and also reduces operation cost. Processing time and transactional time is more in manual toll collection system. When vehicle stops at toll booth, the operating agency accepts coins as well as tokens. Automatic Toll collection is easier and better as compared to manual toll collection method. Automatic toll collection system speed up the processing time but it needs some improvement at toll plazas. [5] Automated Coin machines are only marginally better than manual toll collection in terms of collection costs and traffic impact.

[2.5] ELECTRONIC TOLL COLLECTION
In this method a vehicle equipped with encoded data tag or a transponder as it moves through a checkpoint or toll lane. Electronic Toll Collection (ETC) is a system automatically identifies that transponder or data tag. Instead of the patron having to stop to pay the toll, the ETC system then charge to a patron’s account or posts a debit. [5] ETC increases the lane throughput the reason is that the vehicles need not stop to pay at the toll booth. E-Tolls aim to eliminate the delay which occurs on toll plazas. All this process is done by collecting tolls electronically. The car that passes through is enrolled in the program or not that is having already is determined by ETC and then alerts are enforced for those that are not. Then it electronically debits money from the accounts of registered car owners. Hence there is no need to stop at toll booth. It requires high budget for implementing this system. But again security is the matter of concern [4].

[2.6] HOUGH TRANSFORM FOR SKEW DETECTION
Hough transform is a commonly used detection method. It can locate and detect straight lines in image. It transforms binary images into Hough parametric space and detects targets by extreme point in the parameter space. The Hough transform is only applied on the weft boundary instead of all pixels to reduce the computational complexity and achieve the purpose of rapid detection. What’s more, a rotation algorithm based on the image linear storage structure is also adopted to reduce the computational complexity and operation time of image skew correction [6]. When objects happen to be aligned by chance it can give misleading results.

[2.7] PROJECTION PROFILE BASED TECH
When we observed extracted sub-images separately then it can be seen that characters are separated by very few pixels of white color and generally they maintain same distance from each other whereas regions consisting full of noise do not have such kind of observation. To gain this, vertical black projection profile has been extracted on sub-images to calculate or determine high density black region [7].

III. PROPOSED MODEL
[3.1] SYSTEM OUTLINE
Automated Toll Collection is beneficial because of this we can reduce the corruption at the toll checkpoints and congestion near the toll collection areas. This system is focused towards the overcome manual toll collection. The Number plate detection is done using Image Processing Technique in automated toll collection system which is convincing solution to the manual toll collection method employed at tollgates. Time, efficiency, fuel and pollution are a matter of priority of present day. The purpose of this system is to propose a technique where toll collection can be done automatically using image processing technique where we can detect the number plate of a vehicle and deduct the toll amount.

In this system, video will be passed as an input or can be browsed from any location. Using this video the number...
plate is detected and further process continues. Various modules of this system are RTO Admin, Super Admin, Toll Admin and Police Admin and general public. The Roll of the Super Admin is to register various toll booths and define charges. The Toll Admin roll is to generate charges report and date wise collection report. The RTO Admin registers the vehicle and associates it with the vehicle owner. The roll of Police Admin is to keep information of stolen vehicle.

The specific objectives of this System are to ensure:
- Smooth traffic flow at toll gates.
- Convenient toll collection without handling cash.
- Reduction of management costs.
- Convenient and quick service to the vehicle owners.

Toll deduction takes place through e-wallet assigned to the concerned number plate of the vehicle that belongs to the owners’ account.

[3.2] ARCHITECTURE

Below figure shows procedure (diagrammatic representation or flow) that is going to implement in Automated Toll System by using number plate detection:

![Diagram of Automated Toll System](image)

Fig. 1: An Automated Number Plate Recognition (ANPR). ANPR has six imperative parts like Image Acquisition from vehicle, Pre-processing of image, Edge Detection, segmentation, feature Extraction and Recognition.

[3.3] TEST CASES

In this system video will be passed as an input or can be browsed from any location. Additionally, the daily toll collection information can be obtained and send to the Government for verification. In proposed system we can overcome the major issues of vehicle congestion and time consumption, image processing technology is used for solving such kind of problems.

IV. RESULTS AND ANALYSIS

This system will help in reducing congestion and saving time at toll centers. This system will also help in monitoring any fraudulent behavior that takes place at the toll checkpoints. The proposed system will record video at the toll checkpoint and will perform necessary processes to detect the vehicle number plate. In this system video will be passed as an input or can be browsed from any location. Using this video the number plate is detected and further process continues.

V. CONCLUSION

In this system we have discussed the image processing technique to implement the automated toll collection in order to reduce congestion and fraudulent behavior and congestion at the toll centers. At the toll collection areas the proposed system will help in reduce the human intervention. The named automated toll collection system using Number Plate Detection by using Image Processing emerges as a convincing solution to the manual toll collection method employed at tollgates.

REFERENCES


