

Number Plate Detection using Image Processing for Automated Toll Collection to prevent fraudulent behaviour

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Abstract- Toll Collection in India is a matter of concern as the toll checkpoints are hotbeds of corruption. The purpose of this research paper is to propose a technique where collection of tolls can be done electronically using image processing technique where we can detect the number plate of a vehicle and thereby deduct the toll amount. Using this technique we can make an attempt to eradicate corruption from toll checkpoints in India. Here in India, people also use smart cards for travel purpose. There will be a mechanism to detect whether the owner of the car owns a smart card and accordingly the smart card will be checked and the toll amount will not be deducted from the vehicle owner's account. The current scenario is that the vehicle needs to slow down at the toll collection area in order to pay the amount which leads to traffic problem and sometimes the toll collector doesn't collect the toll fee from the owner. So the proposed technique will maintain all the records of the toll collected as there is no physical cash involved in this technique.

Keywords—Image processing, number plate detection

I. INTRODUCTION

Automated Toll System has been implemented in some countries like Canada, Poland where the toll amount is deducted from the vehicle owner's bank

account and a notification can be provided in the form of a message. Automated Toll Collection in India is beneficial because it can provide a means with the help of which we can reduce the congestion near the toll collection areas and also help in reducing corruption at the toll checkpoints. Usually the congestion near the toll collection areas is because the vehicle owner pays the toll in the form of physical cash. Automated Toll Collection will also be beneficial for smart card holders. Vehicle owners opt for a smart card facility to reduce the cost overheads for frequent visits in the same locality.

The vehicles number plate will be detected using a camera that will be placed at the toll checkpoint, with the help of which a image processing technique will be implemented to extract the registration number of the car from the number plate, with the help of this extraction the details of the vehicles owner will be extracted from the database and the respective amount will be deducted, if the vehicle owner acquires a smart card, even that information will be extracted from the database because that person has already paid the toll amount in advance for a respective duration

and the toll amount won't be collected from him/her.

II. PROPOSED SYSTEM

The proposed system provides a base for implementing automatic number plate detection using image processing for toll collection at toll checkpoints. This system will help in saving time as well as help in reducing congestion at toll checkpoints. This system will also help in monitoring any fraudulent behaviour that takes place at the toll checkpoints. The proposed system will capture an image placed at the toll checkpoint and will perform certain processes to detect the number plate of a vehicle.

Following are the steps that needs to followed to detect a number plate

- A. Image Acquisition
- B. Image Pre-processing
- C. Licence Plate Localization
- D. Character Segmentation
- E. Character Recognition

Image Acquisition: The first step is to acquire the image from the camera. The image can be captured using a low resolution camera.

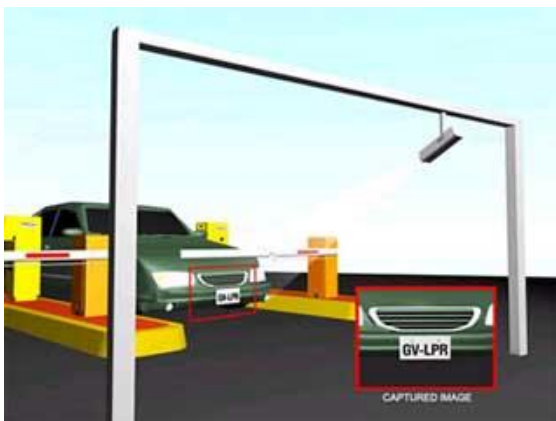


Fig : Number Plate detection using image processing

Image Pre-processing: After acquisition of an image we need to perform certain pre-processing techniques like gray scale conversion, noise reduction, contrast enhancement to remove noises, low contrast, and unwanted background.

License Plate localization: License plate region are localized based on the features of the license plates. Localization can be performed using the following steps.

- Opening and Closing of Image
- Image Binarization
- Elimination of unwanted region
- Mapping of co-ordinates
- License plate extraction

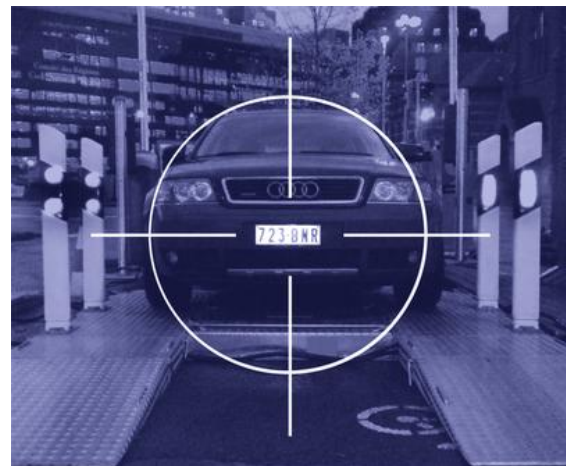


Fig : License Plate Extraction

Character Segmentation: Unwanted objects like dots or some noise needs to be removed. After removing unwanted objects, dilation is performed.

Character Recognition: Character Recognition is the final step in License Plate Recognition. Two main components of License Plate Recognition are Feature Extractor and Classifier.

- Feature Extractor- Given a character image, the feature extractor derives the features that the character possesses. The derived features are then used as an input to the character classifier.

- Character Classifier- Classification is performed by comparing an input character image with a set of templates from each character class. Each Comparison results in similarity measure between the input character and the template.

III. WORKING OF PROPOSED SYSTEM

Algorithm:

Step 1 : With the help of a camera, the number plate of the vehicle will be captured.

Step 2 : The number plate of the vehicle will be processed using an image processing technique.

Step 3 : Once the license number is extracted from the overall image, it will be compared and searched in the centralize database and the respective vehicle owner's details will be fetched.

Step 4 : Along with the details, it will also check whether the owner of the vehicle obtains a smart card.

Step 5 : If the possession of the smart card does not exists, then go to step 7. Else check for the validity of the card.

Step 6 : If the card is not valid, then go to step 7. Else the toll amount will not be deducted from the vehicle owner's bank account.

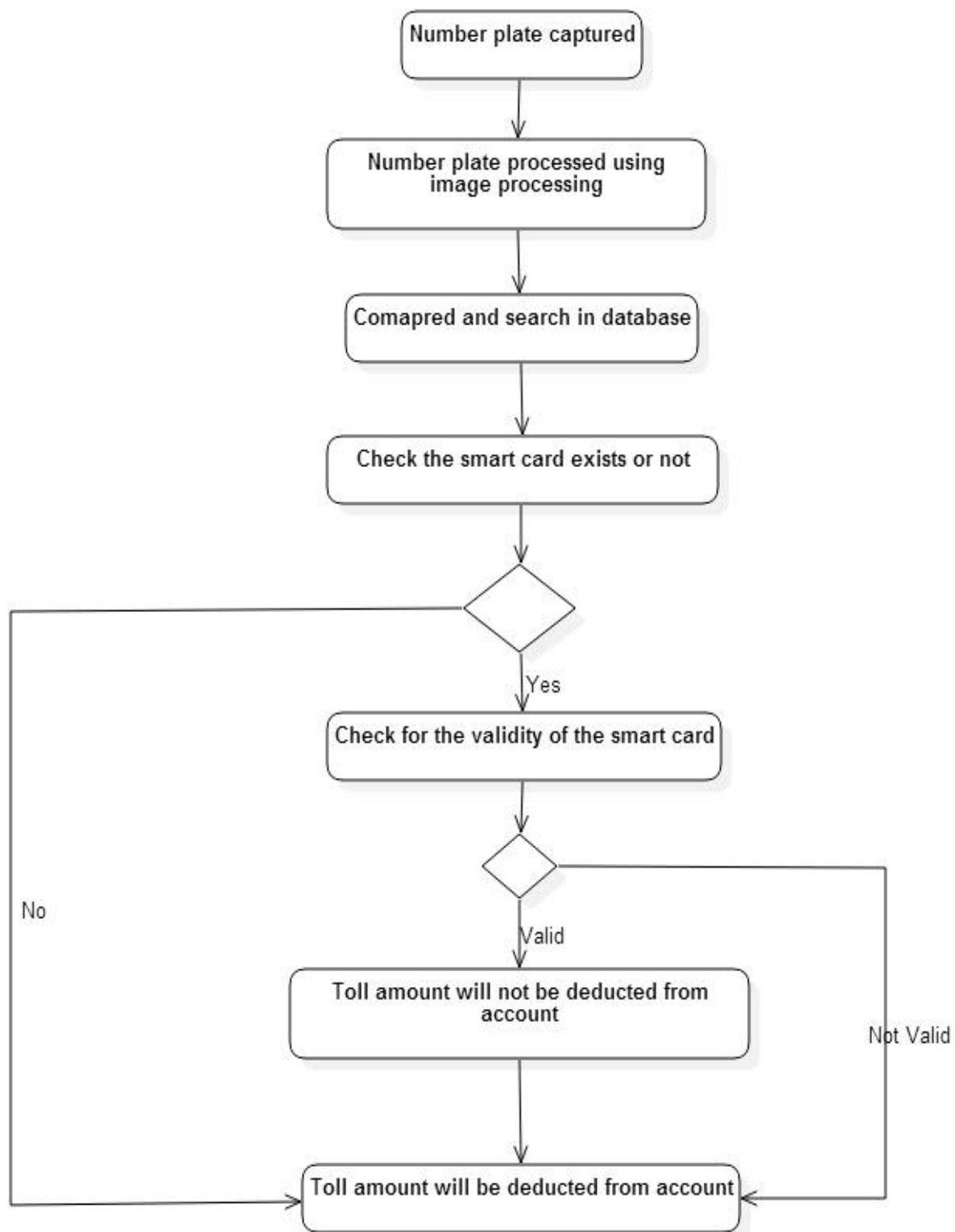
Step 7 : Toll amount will be deducted from the vehicle owner's bank account.

Using the proposed system mentioned above, the overheads of toll collection at the toll checkpoints will be minimised. This system helps in keeping a tab on the total toll amount collected as well as helps those who possess a smart card. There are many techniques used previously to detect vehicle number plate in order to implement automated toll collection but the concept of smart cards was ignored and the ANPR techniques were used to detect the number plate.

In India, Smart Cards are widely used because there are commuters who travel frequently near the toll checkpoint areas, for them smart cards are very much beneficial.

IV. ADVANTAGES

- A. Reduces Traffic near the toll checkpoint areas.
- B. Maintains the record of the total toll collected.
- C. Reduces the overhead of collecting physical cash from commuters.
- D. Reduces fraudulent behaviour at toll checkpoints.
- E. Implementation cost is less.
- F. Acknowledgement of the payment in the form of SMS.



Other Research done regarding Electronic Toll Collection:

In many countries electronic toll collection has been implemented like Poland, Malaysia, Europe where number plate detection is done using RFID technologies which is a bit expensive than image processing technique. In case of a image processing technique for number plate detection, only a camera needs to be placed at the toll collection checkpoints and certain image processing techniques need to be performed that is mentioned in this research paper.

V. CONCLUSION

In this research paper, we have discussed the image processing technique to implement the automated toll collection in order to reduce congestion and fraudulent behaviour at the toll checkpoints. Further we have discussed the working of the proposed system including the smart card implementation and the automated deduction of the toll from the vehicle owner's bank account. The proposed system will help in reduce the human intervention at the toll collection areas. The purpose of this research paper was to improve the toll collection as well as implement a system for smart card users as smart cards are being used by many people in order to avoid physical cash.

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