

Automated System for Toll Collection

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Abstract-Automation has now made work much easier in every sector and our daily life. The paper is based on the automated system for toll collection. The present working system uses RFID to authenticate and authorize the vehicle to continue the drive after the toll payment. RFID tag and reader is used for this purpose. The present paper proposes the similar system for automatic collection of toll using camera. It scans the number plate of the vehicle that uniquely identifies the vehicle and allows the vehicle to automatically pay the toll and continue its ride. The process is carried out with the help of an algorithm that extracts the text from the scanned image of the Vehicle. To achieve the goal, we have proposed a system that allows the vehicle to automatically pay the toll. In this, the vehicle need not stop or slow down for the verification process. This can avoid the traffic congestion and would save time. Also, the system can handle huge amount of data and parallel processing simultaneously that makes the system much more efficient than the existing system.

I. INTRODUCTION

The automatic toll e-ticketing system is the approach used for the vehicle when it reaches the toll plaza, which is detected using Camera. In this, camera captures the vehicle number plate and process/compare with the database and we also assume that an owner maintains a prepaid account, so that toll tax is deducted automatically from the driver's account at toll plaza. If the balance in the owner's account is low, the toll gate remains close. In such a case vehicle owner will have to pay the toll tax in cash and collect the receipt. And if the balance is available, the owner receives an SMS message on his/she mobile about the details of the payment and there is no need for them to stop the vehicle. How many vehicles passing through the toll gate is stored in a database. A software program running on the computer retrieves vehicle details from its vehicle database. According to this information, appropriate toll tax is being deducted from the pre-paid account of the vehicle's owners. Our system also handles violation and acknowledgement when a vehicle's ID number is not found in the database or a driver has insufficient balance to pay toll. If an acknowledgement is received from the database that the balance is not sufficient, the toll plaza gate remains closed. Existing automatic toll collection techniques incur power loss since the receiver is continuously turned on;

even when no vehicle arrives at a toll plaza. In our technique, only the IR sensor is turned on to detect the arrival of vehicles. Only when a vehicle is detected camera will be turned on.

II. LITERATURE SURVEY

A. Automatic toll collection system using RFID

Automated Toll Collection System using RFID used for collecting tax automatically. In this we do the identification with the help of radio frequency. A vehicle will hold an RFID tag. This tag is has the unique identification number for identifying vehicle. This will be assigned by RTO or traffic governing authority. Along with this we will also store all basic information as well as the amount he has paid in advance for the TOLL Collection. Reader will be placed at toll collection centre of the vehicle. Whenever the vehicle will pass the toll booth, the tax amount according to the type of a vehicle will be deducted from his prepaid balance. New balance will be updated. In case if one has insufficient balance, we cannot allow them to cross the toll plaza. In this case the vehicle owner has to pay the toll tax manually by cash.

B. Electronic toll collection system using passive RFID

This technique uses radio frequency technology. The RFID system uses tags that are mounted on the vehicles, through which information stored in the tags are read by RFID readers. The proposed system eliminates the need for vehicle owner and toll authorities to manually collect the toll. Data about the vehicle and its owner is also easily exchanged between the vehicle owner and toll authorities, which makes a more efficient toll collection system by reducing traffic. This also eliminates the possible human errors. If we consider the optical camera recognition technique, since the whole object will be captured it is a time consuming process and also the error rectification in the laser cameras is very difficult. Seeing through the Micro technology it requires different transponders and also it tends to produce various problems regarding reflection of object image. In contrast, the ETC system proposed in this paper will require only minimal changes. Moreover, the existing toll booths could be reused with only slight modifications.

C. Automatic Toll Gate System Using the RFID and GSM Technology

The concept is of automatic toll tax payment system and the transaction of toll tax information is sent to the mobile phone of the vehicle owner through the GSM technology. It is very innovative technology for automatic toll collection system. In this paper, the frame composing and working flow of the system is described and data information is also easily exchanged between the vehicle and toll authorities, so that it enables a more efficient toll collection system by reducing traffic and it also eliminates the possible human errors as well.

III. PROPOSED SYSTEM

A. Current Scenario

In the present scenario, the vehicle's owner has to pay the toll tax manually and take the receipt of payment. This process takes long time to complete the process of toll collection. Each vehicle will take at least 1 minute to complete the process. And to count the numbers of vehicles passing through toll plaza will also need the human power. This results in consumption of time and wastage of fuel and also results in generation of a long queue of vehicles.

B. Proposed Scenario

To avoid the issues of the existing system and to overcome such problems this new system is being proposed. In this proposed system, the toll collection is collected automatically by the use of camera. The camera will capture images of vehicle's number plate and process on those images to obtain the unique identification number to carry on the process of toll collection. The details of the vehicle are uniquely fetched using the registration number of vehicle in the database. If the data is available, system will check that the user has an account balance or not. If balance is not available the user has to pay the toll manually. And if balance is available, system will automatically deduct toll amount from owner's account. Once the payment is done successfully, the owner will be notified with a message on their mobile phone. And vehicle is not required to be stopped at toll plaza.

IV. SYSTEM ARCHITECTURE

In this proposed system, a video camera is being used. This video camera will continuously capture the images of number plate of the vehicle. Then these images will be processed using an image processing algorithm. Using this image processing algorithm, texts will be extracted from the captured images. These texts will be used as a unique

identification of the vehicle to be compared with the details stored in the database.

If the id exists in the database then the system will check for the balance in its wallet. If the balance is available, the required amount as tax will be deducted from his wallet and message as a notification will be delivered to the owner.

In case if the balance is low then vehicle has to undergo the normal process and will have to pay the tax manually.

Another feature added to this system is that if the report is filed about the vehicle theft or loss, the database will be updated with this report and blacklist the vehicle. And so, if any stolen vehicle tries to break through any of the toll plazas, the details of it being blacklisted will be reflected on the screen and so the barrier will not open and won't allow the vehicle to pass.

Hence the system will allow tracking the vehicle easily. A notification will be sent to the nearest police station along with the location.

This whole process will save the time, paper work for receipt and will save the human effort too.

The traffic management could also be made much easier with the use of this automatic system.

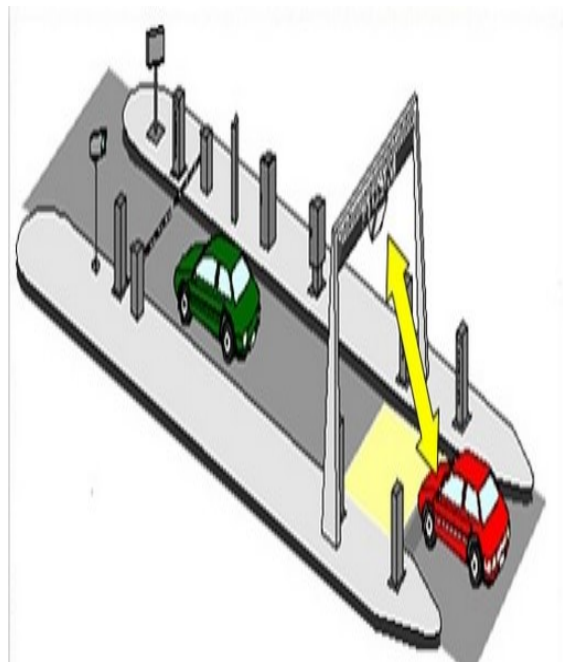


Fig.2. Working of System

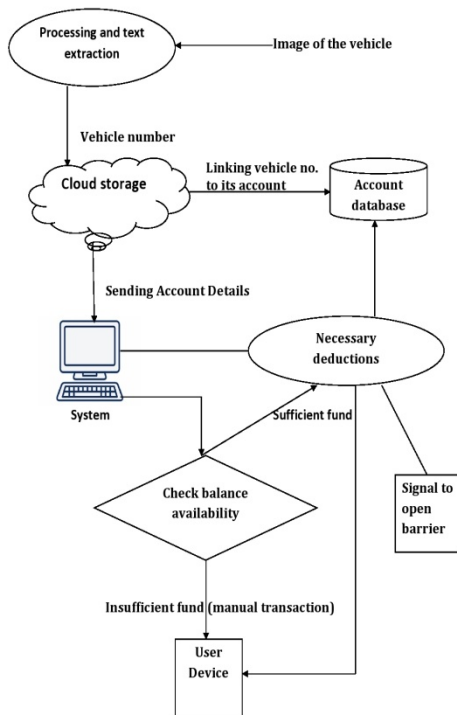


Fig.1. Architecture of Toll Collection System

V. IMPLEMENTATION

A. Optical Character Recognition

To extract the number from captured image we are using Optical Character Recognition (OCR) technique. To produce a ranked list of candidate characters, there are two basic types of core OCR algorithm.

One of them uses matrix matching which compares an image character on a pixel-by-pixel basis. It is also known as "pattern matching" or "pattern recognition". This relies on the input character that is being correctly isolated from the rest of the image, and on the stored character being in a similar font and at the same scale.

Feature extraction decomposes the characters into the "features". These are compared with an abstract vector-like representation of a character, which might reduce to one or more character. Hence the commonly used techniques in intelligent handwriting recognition and most of the modern OCR software are the general techniques of feature detection in computer vision that are applicable to this type of OCR.

Using the technology of Optical Character Recognition, text is extracted from the captured images. Features are passed as a parameter to the function to extract the required text from the image. These features define the coordinates and the required pixel values of the character. This feature is compared with the images processed and obtained as a vector like representation. The complete processing extracts text contained in the image and gives the output of the data of the image in text form.

B. GSM Technology

In this proposed system, GSM technology is also used to notify the vehicle owner about the transactions made at the toll plazas. In case of insufficient balance in the account, with the help of this GSM service the owner will be notified with a message and will also be alerted to proceed with the manual lane.

The data information is easily exchanged between the vehicle and toll authorities, so that it enables a more efficient toll collection system by reducing traffic. It also eliminates the possible human errors as well.

VI. CONCLUSION

We have used an innovative approach where a traveller will be able to pay the toll while in motion using Camera Technology. Through this process of toll collection will save time, effort, and man power. How many vehicles passing through the toll gate stored in a database. We can also find out a vehicle how many times passing through the toll gate in a day. The improvement can be done to develop a multi vehicle amount deducted and send a SMS at a time multi vehicle.

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