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Automated Toll Tax System with Reviewing E-Challan using OCR Technology

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Abstract: -

A toll is a charge or tax for a privilege, especially for expressways or some roads. Electronic toll collection aims at eliminating the delay caused by toll collection process. There has been a problem during rush hours especially in the mornings, evenings and on public holidays of movement of vehicles passing the through the highways due to the time consumed on manual collection of toll tax for each vehicle passing through the toll plaza.

The aim of this project is to develop a system which detects the approaching vehicle automatically. When the vehicle approaches the toll plaza the vehicle number plate gets captured by the camera placed at the toll plazas and it is automatically processed and the system checks for the payment and challan and opens the gate , we have also provided a system which checks whether vehicle has any pending challan or not.

Keyword:- Vehicle number plate detection & recognition, checking Challan, advance payment, OCR, Toll collection

Introduction:-

Transportation, as we all know, is the backbone of every country's economy. Advances in transportation infrastructure lead to a better lifestyle, allowing us to have more mobility, expand the availability of consumer goods and services around the world, and increase the rate of jobs and social mobility. In reality, a country's financial health has long been linked to productive modes of transportation. An increase in the number of cars on the road causes a slew of issues, including traffic congestion, crash rates, air quality, and a slew of other issues. Various

modes of transportation are used in all commercial operations for various tasks As a result, rising transportation has an immediate effect on national competitiveness and therefore the economy. One of the crucial main drivers in global competition is lowering the cost of shipping resources at manufacturing sites and finished products to markets. Since it is being researched and implemented in numerous expressways, bridges, and tunnels that require such a method of Automatic tract, automatic toll collection may be a technology that enables the automated electronic collection of toll costs. This system is that it is talented of eradicating traffic in toll collection-plaza, especially during those period when traffic seems to be chaotic.

OCR called as Optical Character Recognition, is a technology that helps the computers to identify and remove characters from images. Each character is linked to a database of characters in this theory. The database character that most closely resembles the character being read is chosen. The more sophisticated OCR models will examine not only the characters as a whole, but also the basic characteristics such as font size and font weight as curvature, allowing them to differentiate characters that might be alike, such as a "1" (number one) or a "l" (letter) (lower-case L). Finally, the model can consult a spell checker or a dictionary to determine if the words returned make sense. This OCR technology has been used in this system.

This machine is a sophisticated automated toll collection tool in which money is collected on tolls automatically using image-processing methods in which we detect the automobile-vehicle number plate and then subtract the toll amount from the driver.

The camera at the toll collection system saves the image of the automobile and localizes the automobile-number plate of the automobile-vehicle, and with the help of image extraction technique, the vehicle number from the licence plate is taken, and with the use of this image processing technique, the information of those car users are taken from the database and checked to see if the user has made the payment.

In this proposed system live video from the camera placed at the toll collection plaza is passed as an input. Using that live video number plate of automobile-vehicle is saved and recognized. Various modules of this system are Officer, admin and owner of the automobile-vehicle. The role of admin is to register the different toll location to the databases using his user's name and password. The officer in this system issues challan for any violation of traffic rules and regulations. In this system when the number plate is detected, before opening the gate it checks whether

the automobile-vehicle has any pending challan or not, if there is any pending challan user then gate is not opened.

Problem in the Current System: -

1. Malfeasance at toll collection center: - The toll cashier collects the appropriate amount form the user but doesn't submit that appropriate amount to the toll admin, this by not submitting the correct amount to the toll admin give rise to corruption.

2. Congestion at toll collection centers: - In the existing system, user should have a Fast Tag (RFID card) which is scanned by the scanner placed at the toll collection plazas and the amount is removed from the user's credit or wallet. This system employs user has to wait till his Fast Tag is scanned which creates traffic congestion at the toll plazas. This scheme requires users to wait until their Fast Tag is checked, causing traffic congestion at toll plazas.

3. Wastage of Fuels: - In the existing system, the vehicle has to stand in a queue till their Fast Tag is scanned and while waiting some of user don't turn off their vehicle by which fuel get wasted.

4. System Error: - In this system, we have a scanner placed at the different toll plazas which scans the Fast Tag placed the vehicle. Sometimes there can be system error due to which scanner doesn't scans the Fast Tag card or sometimes it might also happen that due to system error, money can not be taken away from the user which again creates the traffic congestion.

Literature Survey:-

Mr. Abhijeet Suryatali et al in 2015 Computer Vision Based Vehicle Detection for Toll Collection System Using Embedded Linux was suggested as a system. This framework is focused on the identification of automobile license plates using the OpenCV library in the Integrated Linux platform. This device has a camera installed at toll plazas that tracks vehicles going through the toll plazas and uses classification to identify the vehicles as light or heavy[1].Satyasrikanth P et al in IJCSMC, Vol. 5, Issue.-8, 2016 suggested a system Automatic Toll-Collection Scheme with RFID in which a RFID scanner is placed at the toll plazas which is used to scan the RFID card placed on the

Vehicle.This system had supposed to reduce the time and cost for travelers since the tag can be scanned from a far distance[2].Mohammad Arslan Javed et al in 2012 proposed a system Vehicle Number Recognition method for automated toll tax-collection, where VNR stands for Vehicle Number Recognition, is an image analysis technique used to detect the vehicle number plate from real-time photographs captured by toll plaza cameras. The machine first identifies the vehicle's license plate and then recognizes it. When a number is recognized, it is reviewed in the database, and the toll is deducted[3].Aheraaz Tamboli et al in IJFGCN Vol. 13 ,2020 suggested a system Vehicle Number Plate Recognition for automatic toll tax-collection Using IoT & Machine Learning where IOT and some ML techniques is used for image analysis. This machine is concerned with IoT components such as a camera sensor and an Arduino-based micro - controller. CNN libraries were used to process the captured image by the IOT system with the OCR package.[4].Rama Takbhate et al in IJRSCSE Volume. 1, Issue 3, July 2014 proposed a system Automated Toll Booth System in which a camera captures a picture of the vehicle's license plate. ANPR recognizes and converts the recorded image into text form, and the toll balance is debited from the owner's account, and the toll gate opens[5]. Ankita S. Bhore et al in 2016 suggested a system this technology, known as the electronic toll system for number plate identification and processing, appears as a viable alternative to the manual toll collection system used at tollgates. Photos and videos can be transferred as input or browsed from any place in this system. The number plate is identified and processed using photographs and recordings. The different components of this system are RTO admin, Toll admin, Police admin, Super admin, and the general public[6]. S. R. Jog et al in 2013 suggested a system A camera is used in this method to capture a picture of the vehicle's license plate. Using ANPR, the captured picture would be translated into code, and the toll would be deducted from the customer's account before opening the doors. Furthermore, if a car is stolen and an entry is made in the central database by the authorities, then if the vehicle goes through the toll booth, a quiet warning would sound, alerting the toll booth operator that the vehicle is a stolen vehicle[7]. Namrata Shirodkar et al in 2015 suggested a system ,in this method, we use image recognition techniques to reduce corruption at various toll plazas. There is also a system that detects if the car's owner has a smart card, in which case the smart card is verified and the toll balance is not withdrawn from the auto owner's account[8].P. Anuja et al in 2017 suggested a system which focuses on an ETC device that employs ANPR (Automated Number Plate Recognition) technology. The created Android program assists in recharging and deducting money from the account. Via security

surveillance, the Automated Registration Number plate is used to identify violence[9].

Proposed Methodology:-

The method proposed here is used to introduce number plate identification for toll collection at various toll plazas using image processing techniques. This machine would save time and fuel while also easing traffic jams at tool plazas. This device aids in the detection of any outstanding challans released by police officers against your car. We can also pay in the toll amount in advance.

There are several steps to identify a licence plate:-

a) Image Acquisition:- In image extraction technique, it is a process where we retrieve the image from some source. In this system the camera placed at the toll plazas are the source of the image of the vehicle as shown in Fig. 1[10].

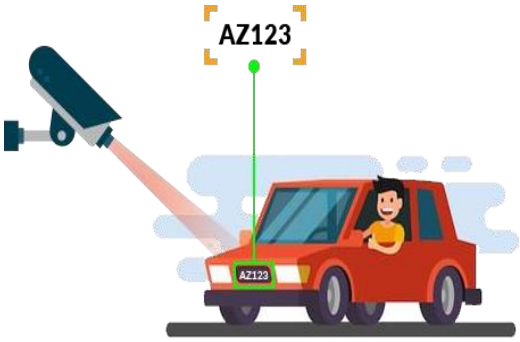


Fig. 1. Image- Acquisition

b) Image Pre-processing:- After acquisition of an image given from the camera placed at the the toll booth, Certain techniques, such as gray scale conversion, noise reduction, contrast enhancement, and unnecessary background removal, are required.

c) Number plate Localization:- The algorithm we have given here is able to distinguish a rectangular section of the number plate from the vehicle's original area The number plate has been described as a rectangular area with some horizontal and vertical edges. For localizing the number plate we have defined a Cascade file which detects the number plate of the vehicle and make a rectangular box around the number plate as shown in the Fig. 2.[11].

Fig. 2. Number plate Localization

d) Character Segmentation:- segmentation is the process of breaking the whole image into subparts, so that further process can be carried out on that. As we all know, an image is a collection or set of different pixels. We group similar attributes of pixels together using image segmentation as shown in Fig. 3.[12].

Fig. 3. Character Segmentation

e) Character Recognition:- After the number plate is detected and characters are segmented, the number is recognized using OCR technology as shown in the Fig. 4.[13]

Fig. 4. Character Recognition

Structure of the System:-

The process starts when a vehicle enters the toll plaza, the camera placed at the toll plaza captures the image of the vehicle and send it to server. The image is taken from the server is processed and vehicle number is detected and recognized. After Recognizing the number plate, it is verified from the database. It is checked if the user has made any advance payment or if vehicle owner has a pending challan or not. If everything is verified toll gate opens. As shown in the Fig. 5.

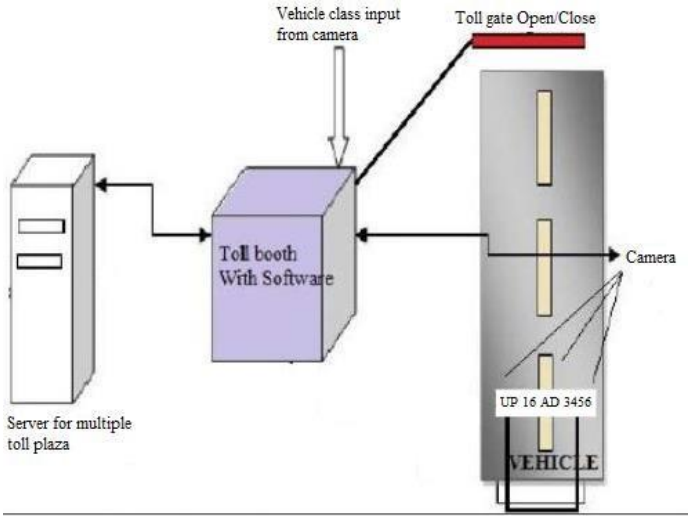
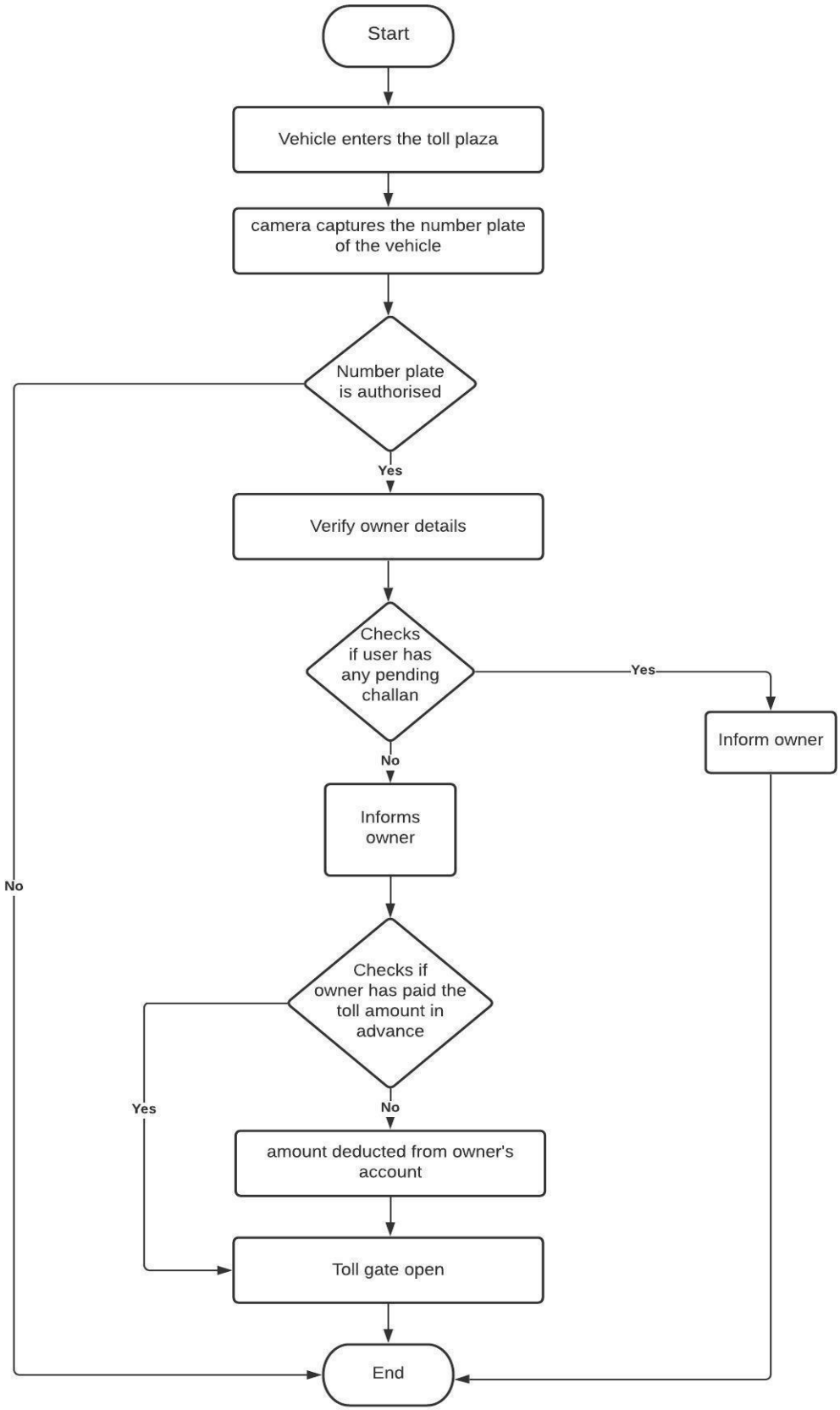


Fig. 5. System Structure

Flowchart for Proposed Methodology:-



In this above flowchart of the system, it is started when the vehicle enters the toll collection plazas, the camera placed at the toll booth captures the image of the vehicle and then detect Number plate on it. The number plate detected is recognized and authorized. After the authorization of the vehicle the system checks if the vehicle has any unsettled challan, if there is any then it is informed to the owner and the system ends. If the vehicle do not have any unsettled challan then the system move further and checks whether the user has made any advance payment or not, If he has made the advance payment then toll gate opens ,If he hasn't paid the toll amount then system ends.

Conclusion:-

In this proposed system we have used Vehicle Number Plate detection technique. In this system we have placed a camera at different toll plazas. The camera placed at the toll plazas saves the image of the vehicle and localize the Automobile-Vehicle Number Plate. By using OCR library vehicle number is detected and recognized. In this proposed system user can make the toll payment in advance for different toll locations. In this system when the number plate is recognized, the system checks for any pending challan on the vehicle from the database. The challan is issued when their any violation of traffic rules and regulations, the officer in the database issues this challan to the system which is checked at different toll plazas. This machine, which is built on image recognition technology, saves time at toll collection booths and reduces fuel consumption because the car is not waiting in the queue. Since the customer has already paid the toll from his account, corruption will be avoided when using this system. Since it employs a number plate identification system, this system is more effective than the previous one.

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