

Advance FASTag and Challan System

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Abstract: This paper shapes the challenges faced by vehicle challans and brings a better and automated solution for vehicle challans. A simple tweak in the FASTag system, can bring a vast change to entire transport system. In order to apply this system a modification in existing TOLL system has to be achieved using additional equipment (machine learning capable system and secure database).

Keywords: FASTag, Object detection, YOLO, TOLL, Object detection, CNNs.

I. INTRODUCTION

A total fine of Rs 577cr have been collected from September 1 2018 - 2019 since the modified Motor Vehicle Act came into power in the country. Speaking in the lower House, Union Road Transport and Highways Minister Nitin Gadkari, in a written reply, explained that traffic police across 18 states and Union Territories released over 38 lakh challans to motorists since the implementation of the new Motor Vehicles Act. [1]

The challenges faced with the conventional challan collection are as follows:

- Traffic police has to stand all the day looking out for vehicles.
- Road transport sector has to invest a lot of money for collecting challans.
- Some people may find other way around the police to overcome the burden of paying fine.
- Two-wheeler vehicles are escaping from challans by finding alternate methods.

These limitations in the normal challan collection systems should be revamped with advanced technology. To tackle this situation a solution has to be taken and the solution is Advanced 'FASTag'. A conventional FASTag uses a RFID and a secured payment system (as shown in below) for collecting toll fees from four-wheeler vehicles which travel on highways.



Image 1: Basic TOLL concept system

By adding additional database to existing FASTag database we can store all the legal information of a vehicle like,

Registration, Pollution certificate, Insurance, etc. By doing so we will automate the expiry details of all those certificates and generate an immediate SMS and challan where SMS will be delivered to registered phone number of owner and challan will be saved in transport challan database, as illustrated below

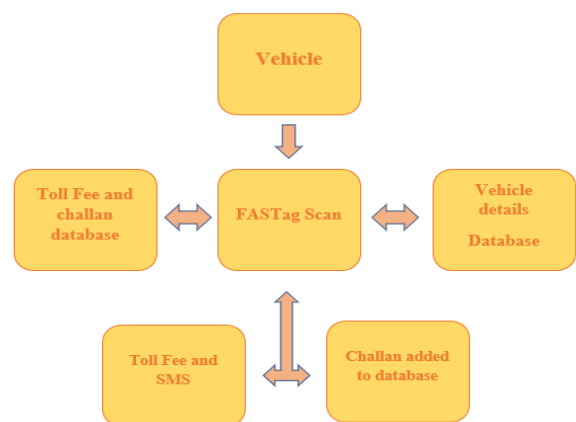


Image 2: Advance TOLL & Challan system concept

Once the vehicle passes through the RFID(FASTag) it will check for information like Registration, Pollution certificate, Insurance. If there is any violation regarding the expiry dates then an automated SMS and challan will be issued to user as a feedback and the data related to the challan will be stored in database. This process will greatly improve the efficiency of tolls and other challans.

II. WORKING

RFID technology enables a device to capture the digital data encoded in RFID tags using the radio waves.

RFID is catalogued under a wide-ranging technology called Automatic Identification and Data Capture (AIDC). It uses radio waves to automatically detect tags, collect data about them and enter the collected data straightforwardly into the computer systems with the help of a micro controller or processor.

FASTag is fixed to the windscreen of the vehicle and is associated to a prepaid account. Toll payments are made over RFID, as the vehicle passes through the toll gate, which means you do not have to stopover at a toll plaza on your journey. The prepaid FASTag account will be deducted for the transaction which makes payments simpler.[2]

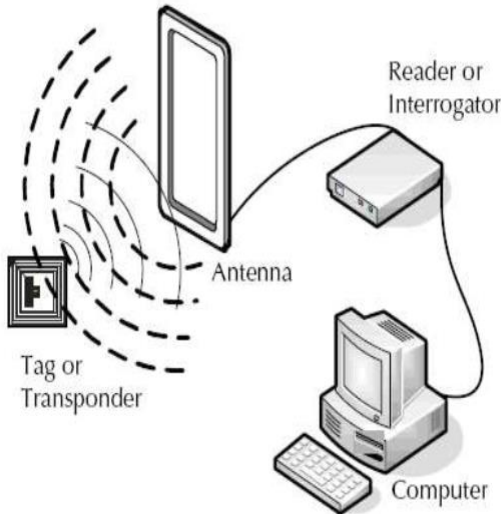


Image 3: RFID I

As far as four-wheelers are concerned FASTag will work fine then what about two-wheeler and vehicles that doesn't have RFID baked into vehicle. For situations like that I came up with a solution, which involves in image processing and machine learning.

III. OBJECT DETECTION

For vehicles that don't have any FASTag will be scanned using object detection. In order to so 'yolo object detection algorithm' is used where we will train a set of images[5]. In order to do this, we need machine(computer) capable of doing machine learning tasks. First, we can train images and get the trained weight file. With help of weights files, we can proceed with the object detection. [3]

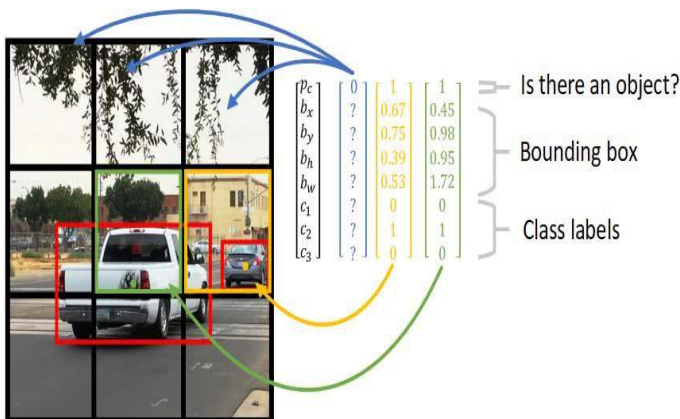


Image 4: YOLO algorithm

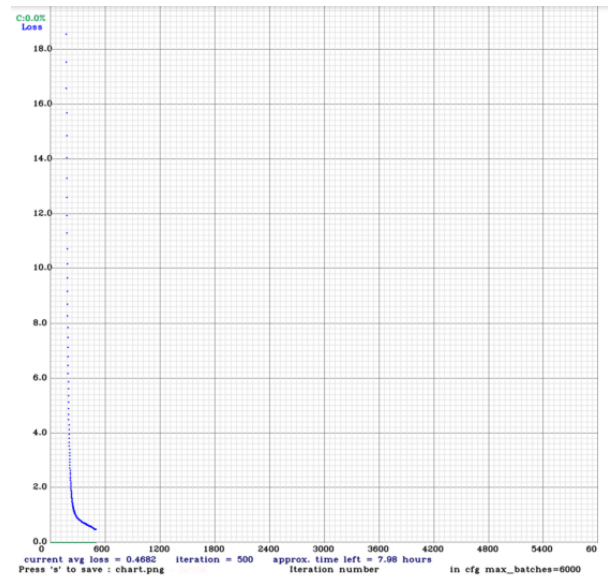


Image 5: LOSS curve of machine learning

In order to get efficient and accurate out we should train the model such that the loss should come under '1'. In general loss under '2' is enough for final output but less than one will provide accurate models. Training a model which contains more than 1000 pictures will be over a day but Google has provided a great tool known as 'Google Colab' which is powerful cloud computing platform that will train the model for us in hours[4]. A PC which doesn't have a GPU will take forever to train the model for such cases google colab is the best solution.

The methodology we used in our model is image classification. For this we used Convolution Neural Networks. In neural networks, Convolutional neural network is one of the main categories to do images recognition, images classifications.

Objects detections, recognition faces etc., are some of the areas where CNNs are widely used[5].

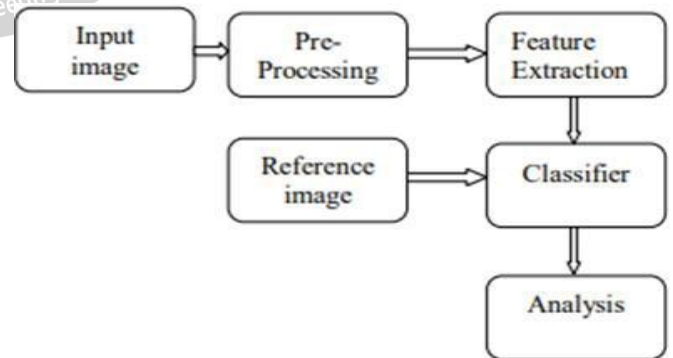


Image 6: CNN Principal

Image class - assigning pixels withinside the photograph to categories or instructions of interest. Image class is a system of mapping numbers to symbols. In order to categorise a hard

and fast of records into special instructions or categories, the connection among the data and the instructions into which they're classified ought to be properly understood. To achieve this with the aid of using laptop, the laptop ought to be trained. Training is fundamental to the achievement of classification. classification strategies had been at first advanced out of research in Pattern Recognition field.

Convolution neural community set of rules is a multilayer perceptron this is the unique design for identification of two-dimensional photo information. In addition to this, in a deep community architecture the CNN layer and sample layer can have a couple of CNN. CNN is not as limited Boltzmann device, want to be earlier than and after the layer of neurons with inside the adjacent layer for all connections, convolution neural community algorithms, aach neuron don't want to do experience worldwide photo, simply experience the nearby location of the photo. In addition to this, every neuron constraint is set to the same. specifically, the allotment of weights and every neuron with the same convolution kernels to de-convolution image. In depth, deep studying models used to discover extensive quantity of neurons. Deep learning algorithms examine extra about the photo because it is going thru each neural community layer. For classifying Neural Network is used. The neural community is a framework for many devices that are studying algorithms

IV. CONCLUSION AND FUTURE WORK

Although FASTag based challan system is grasped as an advantageous mode of toll and challan collection system in India offering many benefits to both—the user and the collector, until its snags or the encounters are not settled to the base, the module shall continue to face significant catastrophe and may not work as intended. By developing appropriate solutions to tackle the challenges faced by challan collection system it can be made a technologically outstanding mode of challan collection eventually proving it self to be a revolutionary technology in automatic challan collection system, in the upcoming years.

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