AUTOMATIC TOLL COLLECTION SYSTEM USING OPENCV

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Abstract : Internet of things (IOT) is a group of all devices fixed with electronics, Software, Sensors, and Network connectivity used to connect and switch over data. It has applied to several fields like Agriculture, Healthcare, Smart home and Transportation. This paper focuses the activities of collecting tax from the vehicle. Traditionally, Collecting tax from the vehicle can be done by manually (i.e.) a labor has been involved for collecting the tax from the vehicles. This Method has several drawbacks of Time consuming; Queuing of Vehicles (Traffic) that emits carbon di oxide will affect the Environment. Moreover, this method has a probability of causing human errors. To overcome the above drawbacks, Process of Tax collection from vehicles can be automated. For automating the above process, Radio frequency Identifier (RFID) can be used. RFID is a wireless technology that uses radio waves to identify the vehicle. Due to High cost and malfunction error, Open Computer vision has been applied to capture the vehicle Number plate accurately and efficiently. In addition to this, Vehicle theft detection can be incorporated which detects the theft vehicle in toll gate by comparing the Vehicle Number plate data with data registered in Road Transport Office (RTO). If so, it will automatically send the notification message to the mobile number of vehicle owner which is registered in RTO. It overcomes the weakness of manual toll collection, RF tags, thereby enabling a more efficient toll collection by reducing traffic and eliminating possible human errors.

IndexTerms- Internet of Things (IOT), Radio Frequency Identification (RFID), Number Plate Recognition, Road Transport Office (RTO)

1. INTRODUCTION

In our Modern world, Internet is very well-known for fulfilling people with various services related to various dissimilar areas. It is a handy ability which can help you in implementation many jobs easily. A new technology, Internet of things (IOT) is a group of all devices fixed with electronics, Software, Sensors, and Network connectivity used to connect and switch over data. This Paper focuses only on transportation area. In our world, there are ten billion vehicles are used by people for various purposes such as Goods, transport etc., People often use highways for moving the vehicles speedily. To maintain highways, Toll gate has been established for collecting tax from the vehicle user. The existing process for collecting tax is done by manually where services to be worked continuously through the day and night, it leads to standing in a long queue or hefty rush at each toll plazas which makes waste of journey time, fuel and it leads to traffic crowding, pollution. The another method of collecting tax is by Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information, RFID reader's interrogating radio waves. The problems in RFID systems are often more expensive and the Tags are application specific. To overcome the drawbacks of existing system, Open Computer Vision (CV) is emerged. This technology recognizing the Vehicle number plate and compare with the Road Transport Office Database. If it not matches with the database, then that vehicle is considered as a Theft vehicle and notification message will send to the registered mobile number of the vehicle owner. Thereby Theft control can be enabled. Automatic Toll Collection System using Open CV aims at successfully removing the unnecessary traffic delays, faster and reliable processing etc.,

The main objective is to automate the entire procedure of toll tax collection system which will reduce the traffic congestion, fuel consumption, time saving, avoidance of queues, environmental pollution and human assistance.

2. EXISTING SYSTEM

This section focuses the related works to this project. Now a day's vehicle users are often like to move from one place to another rapidly. This rapid mindset of people has evolved toll gate. Toll gate is a toll plaza where people have to pay the tax for using those highways. To maintain highway efficiently, Government should require money which will be collected as a tax from the vehicle user. Traditionally, a human labor has been allotted to collect the tax. In this manual method where one person is involved in paying the tax and the toll authority collects the tax and handles the receipts. But this method has several drawbacks of Time consuming, queuing of vehicles, Possible Human errors, Chances of escaping the payment of tax.

Figure-1 manual toll collection

This drawbacks of manual method could leads to Automated the toll tax process by identifying the vehicle number plate. When the vehicle enters into the toll gate, a front picture is captured by camera and use Optical character recognization algorithm which is a technique of electronic conversion of images into machine encoded text. This algorithm classifies the light and heavy vehicle and based on this toll charge can be collected. It helps to trim down traffic congestion and save time without consumption of time and fuel.

The next method uses Radio Frequency Identifier (RFID) technology which will be preset on vehicle's windshield. RFID tag contain 13 digit barcode which consists of unique identifier of vehicles data and Vehicle owner data which will be send through the RFID sender to the toll system. Then toll tax payment will be automatically deducted. If the tag is detached from the vehicle then cameras placed at two location at toll gate take picture of the front and back number plate. Each vehicle registration ID is connected to user's Bank account, toll tax can be deducted from the bank account directly without any human assistance. When vehicle is theft the owner of the vehicle registers complaint on the website with its registration ID and exclusive RFID tag number. Now when theft vehicle passes by the toll plaza, the tag fixed on it is matched with the theft vehicle's tag in the database at the toll booth the vehicle ignoring the traffic signal will be detected by the RFID readers placed at signal crossing and will be alerted to the traffic police. This can be done powerfully and great correctness. Whenever a vehicle is bought by a customer, first that customer require to register a vehicle at the RTO office. RTO officers will allot a unique number plate which it have a state identifier, District code and last 4 digit comprises of vehicle number along with it RFID enabled tag will be issued. Each time a registered vehicle enters into the toll booth, first the Infrared sensors will identify the presence of the vehicle which in turn trigger the RFID circuit to read the RFID enable smart card fixed on the windscreen of the vehicle. Then the amount will be deducted from the vehicle owner's account automatically. The Software automatically generates the bill and it has sent over the registered mobile number. The drawbacks of RFID include high cost, application specific and the system may get malfunctioned in case of battery drain.

3. PROPOSED SYSTEM AND ITS MODULES

Since the existing system has several drawbacks of high cost, application specific, Traffic Congestion, Fuel Consumption, Environmental Pollution. Automatic Toll Tax collection system using Open CV has been proposed, a library of programming functions mainly aimed at real-time computer vision that are platform independent and it is free of cost. The proposed system provides a base for implementing Automatic Toll Collection System to detect the number plate by use of image processing. This system includes camera interfaced with raspberry pi 3 which will capture an image of vehicle's number plate and the image is converted into text or character form through Optical Character Recognization (OCR) algorithm and the details will be compared with the RTO database and if it matches, the amount will be debited and the notification is send to the motorist through SMS. In addition to this, by comparing the vehicle data with RTO Database, it helps easily to identify the theft vehicle. This system help us in time saving, reducing congestion at toll plazas.

3.1 WORKING MODULE OF PRESSURE SENSOR

When the vehicle enters the toll plaza the pressure sensor in the speed breaker sense the arrival of vehicle and generates a signal which will indicates the camera to turn on.

3.2 RECOGNIZING THE NUMBER PLATE

Vehicle Number plate is a one of the unique identifier data which is used to identify the vehicle easily and efficiently. There are number of algorithms and techniques has been proposed to capture the vehicle number plate, Open Computer vision is a library programming function which use the Optical Character Recognization algorithm to captures the images of the vehicle number plate even though it will affect by some outliers, noise etc., It is done with the help of camera where it captures the Vehicle number plate. The region is extracted using the image segmentation. Optical character recognition technique is used for character recognition. The resulting data is then used to compare with the records on a database so as to come up with the specific information like the vehicle's owner, place of registration, address, etc. The system is implemented and simulated in the raspberry pi. It is observed from the experiment that the developed system successfully detects and recognize the vehicle number plate on real images.

3.3 DATABASE CREATION

When the customer buy a new vehicle that vehicle data is mandatory to register in Road Transport Office. The data which is given by the user in RTO office for the owner's identification and vehicle identification is used for the verification process.

3.4 VERIFICATION PROCESS

By recognizing the number plate, the data of owner and vehicle has been generated and generated data will compare with RTO database. By comparing the data, if the user is authorized, the amount will be debited automatically from user's account. If not so, then the user is considered as a unauthorized person and the vehicle is considered as a theft one. When the theft vehicles are trying to pass through toll plaza, alert message of SMS will send to the motorist to the registered mobile number. Thereby this proposed method enable a theft control.

4. ALGORITHM OF THE PROPOSED SYSTEM:

o When the vehicle enters the tollgate, pressure sensor embedded in the speed breaker sense the vehicle depending upon the pressure detected.
o Sensed information indicates and makes the camera to switch on thereby captures the vehicle number plate using OpenCV.
o The data captured using camera is compared with RTO Database.
o After comparison, if it is found the user is authorized the toll tax payment is done automatically (ie) amount will be debited from user account and notification message is sent to the user.
o If not matched so, theft control measures has been taken.

5. CONCLUSION AND FUTURE SCOPE

Fast Mindset of people will make the transportation easily and quickly. For this, the toll tax collection process has been automated for reducing the traffic delays, high cost, time saving, avoidance of queues, Environmental pollution, There are number of techniques has

been proposed to achieve the above process. But all of the techniques has some drawbacks. To overcome those drawbacks, automatic toll tax collection system using openCV has been implemented which will work efficiently.

6. REFERENCES

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