ABSTRACT

User need to pay a certain amount of tax to the government through all plazas in day to day lives. Toll gates are commonly found on national highways and bridges, among other places. Toll user’s needs to pay cash while waiting in line, despite the fact that this practice causes car mobility to be disrupted, resulting in longer travel times, increased fuel usage, and increased emission levels in that area. Instead, the electronic toll Collection System is a method widely used by businesses and industrialized countries. The electronic toll collection system is a technology that allows for automated electronic toll collection from a prepaid account registered in the name of the car owner, as well as deciding if the vehicle is registered and informing toll authorities to prevent toll offence. For the past few decades, a real-time automated toll payment scheme has been introduced. Toll tax management system is a web-based service, which includes all toll plaza statistics, when a passenger checks in electronically and pays the toll he or she will be provided a receipt. User can leave the toll booth with the receipt, there is no need of waiting for the verification call. This system that detects the approaching vehicles and records their number and time of arrival. If the vehicle belongs to the authorized person, the toll gate will automatically open and a predetermined amount will be deducted from the vehicle's account. As a result, traffic congestion at toll plazas is minimized, and fuel demand is reduced. This is a significant benefit to this scheme. This system helps to retrieve license numbers automatically from vehicle plates using image processing techniques. So, it will automatically align with the ledger and produce the bill without delay. In addition, based on the One Time Password (OTP) authentication, the robbery vehicles are detected and a warning will be sent to the relevant individual.

KEYWORDS- Machine Learning, Optical Character Recognition, Radio Frequency Identification, Conditional Random Field, One Time Password, Binarization.

I. INTRODUCTION

Computers are needed to process large amounts of data, perform complex calculation tasks, and extract quantitative data. On the contrary, the human visual cortex is an excellent imaging device, mainly dedicated to extracting high-level information. In addition to medicine, surveillance, and remote sensing, human analysts are also used in various applications. As a result, people’s visual recognition models are often stimulated to use various basic image processing techniques, such as edge detectors and neural networks. Is not Digital images, chemical science standard photographs or drawings are called image processing. In our daily lives, the public usually pays a certain amount of road tax to the country. Toll stations are mainly located on national highways, bridges, etc. This technology automatically sorts the tolls in the payment account registered on behalf of the car owner, determines whether the car has been registered, and informs the toll management agency to avoid tolls. Many large random pixels, and divide into traditional groups within the image value on the connected device. Unlike supervised classification, the unattended classification does not require the use of guidance results determined by the analysts.
II. LITERATURE REVIEW

The field of license plate identification has gotten a lot of attention lately, and advances in image capturing technologies are helping to improve or develop new ways to carry out this goal. A tool for real-time identification and segmentation of car license plates based on image analyzing and processing techniques are described in this paper. The findings show that the computational cost and accuracy performance for real-time applications using the proposed solution was proper, with an execution time of less than one second. Two datasets were used to test the proposed process (A and B). It had a detection success rate of 92 percent for dataset A, 88 percent for digit segmentation for datasets A and B, and a digit classification accuracy rate of 95 percent for dataset B. The resulting hardware is ideal for applications where device design constraints include expense, compactness, and performance. Another value is its limited size and capacity to run offline calculations without the need for Digital Signal Processing (DSP). In remote areas where cumbersome acquisition systems are not possible, the architecture would be favored. This low-cost dedicated hardware computer can be used to send only the extracted text data over wireless data connections, lowering operating costs (G. L. CORNETO, 2017; G.Kahiravan et al, 2021).

III. EXISTING SYSTEM

Congestions are popular around highway toll gates these days owing to growing traffic volumes. As a result, a new technique is desperately needed to address the issue of traffic congestion. One strategy for resolving the above conditions is to use an automated toll collection scheme. Several subsystems make up the automated machine. Radio Frequency Identification (RFID) technology, a database on a server, a power source, a microcontroller, a motor, and an inferred interface are all included. Toll gates can benefit from an automated system in many ways, including saving time and reducing the number of human employees. This system replicates the operating states of different toll gates, such as passing and waiting time. At the moment, there are two methods for collecting toll taxes in use. The conventional manual process, in which one person collects the money and issues a receipt, is the first choice. The other is a Smart Card scheme, which requires the user to present their smart card to a system built at the toll tax depot in order to unlock the barrier. A microcontroller, RFID scanner, RFID Tag, and bill printer are all part of the current setup. The reader obtains details about the ID number and determines the vehicle's identity. The bill is also printed at the time of departure to recover the fee. The motor here is used to automatically open and close the doors. The truck module and the chassis module are the two types of modules. A passive RFID tag is used in the vehicle module. The base module consists of an RFID scanner, a host computer system, and a gate control system.

IV. PROPOSED SYSTEM

This is an Automated toll Collection System. User has two portals like new user login and new existing login. In New user login, user have to add the details like username, user phone number, address, email id, username and password. If it is exiting user can use the username and password to login. The details of the user have been stored in database. User can also update the other persons at the time of while crossing the plaza. User can collect the information of booking and payment details in the booking info.

In Admin side, information provided by user all have been displayed. If user vehicle crosses the toll plaza the camera will capture the number plate using Binarization algorithm and the detection done by Conditional Random Field algorithm. For recognizing the number plate Optical Character Recognition algorithm is used, it will extract each word from the number plate and compared with the database. If the scanned number and the number in database are same it will provide an OTP to the user’s mail id and phone number. User have to cross verify the OTP with the admin. If the OTP is valid then the amount will be automatically debited from the user account. If there is - an issue for receiving the OTP or a wrong OTP then it will be considered as an unauthorized or theft vehicle. The alert message will be sent to the police as shown in figure 1.
4.1. Framework Construction

The Automated Toll Collection is a cashless tolling device that helps to reduce queues on toll roads. It is fast becoming the most innovative technology for travelers who travel through toll plazas. Users can record their personal information, such as their name, phone number, and other data, in this module. Information about license plates were extracted and preserved in a database. Both records may be stored in a single database by the administrator as shown in the figure2 (Roy, Animesh Chandra, et al, 2016; R.Punithavathi and M.Sharmila, 2019).
4.2. Image Acquisition

The web camera can be captured using this module. The picture can be detected as a 2D image by the camera. To detect the foreground pixels, use the Binarization method as shown in the figure 3. Binarization is a crucial stage in a variety of text image processing activities. The division of each pixel colour into two sets, black for the foreground and white for the background, is known as image Binarization (Hedjam, Rachid, et al., 2015, Punithavathi et al., 2021).

![Image Acquisition Diagram](image.png)

Figure 3: Image Acquisition

4.3. Text Detection and Recognition

Implement a number detection method focused on text strokes values that are specified in the form of minimum and maximum values in order to obtain only the license plate and exclude other very small or very large detected artefacts that were beyond the threshold range in this module. The items that passed predetermined threshold criteria were sent to the training phase. Text strokes in number plates are found in this module using a Conditional Random field (CRF). Bounding boxes are drawn around detected messages. The Optical Character Recognition algorithm can read text. Implement Optical Character Recognition to identify the observed text in this module as shown in the figure 4. (Hang Jun Si, et al., 2018).

![Text Detection and Recognition Diagram](image.png)

Figure: 4
Optical Character Recognition (OCR) is a piece of software that reads text and images into a digitized form, allowing computers to control them. Because of the various languages, fonts, and styles in which text can be printed, as well as the complicated laws of languages, OCR is a difficult problem to solve (Omran, Safaa S, et al., 2017).

4.4. Membership Access

The user can book the trip ahead of time by selecting the source and destination. After that, figure out how much the toll will be and pay it online as shown in the figure 5. For potential proof, the user often updates their neighbour numbers. The user can change the system's booking information in this module. Booking information includes the booking id, booking name, source, destination, toll plaza information, vehicle styles, number, date, and vehicle image information, among other things. This information is saved in the system. As a result, the admin will quickly access user booking information in the system.

4.5. Payment with Alert System

After verifying the owner's details, this system will send an OTP to the owner's cell phone number. Payment may be made electronically or in cash at the point of sale. If the OTP cannot be sent within seconds, the car is immediately considered stolen. Give a warning to the police department's phone line as shown in the figure 6. A user-created password, particularly one that is weak and/or repeated across several accounts, is less secure than an OTP. OTPs can be used in place of or in addition to authentication login information to add an extra layer of security.
V. FUNCTIONALITIES

Tollgate mechanism is automated by using number plate detection and recognition mechanism using camera and the user details is verified while processing the prefilled details in the user portal and the toll fee is collected after one time password is verified.

In this system the number plates are Recognized by using high-definition camera without any uses of sensors.

In this system users can easily add and update the phone number for the authentication process before paying the toll fee through online.

This system helps the toll authority to find the burglary vehicles.

VI. CONCLUSION AND FUTURE ENHANCEMENT

The entire toll tax system is automated by this system. The proposed scheme is less expensive to introduce and requires fewer modifications to the existing system. It offers a safe and dependable monitoring device for stolen vehicles. The use of an electronic toll system will assist in proper traffic control, toll collection, and security as a result, a device built on image recognition that is used as an automated toll collection booth saves time at the toll booth and reduces fuel demand when the car is in its best state. It also assists in the provision of a robbery vehicle detection device that is safe and extremely accurate. It can be used to eliminate all of the existing system's flaws such as time and human effort, and it doesn't even need a tag; all that is needed is a high-quality camera and a fixed font number plate for each car. Developers can add more features and advanced techniques to this system in the future. It has the potential to be broadly deployed on toll roads. This device saves time for both the driver and the person on the roadside receiving tolls.

REFERENCES


