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AUTOMATED NUMBER PLATE RECOGNITION IN TOLL SYSTEM

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ABSTRACT

Automatic Number Plate Recognition (ANPR) is a technology that detects number plates from images and uses optical character recognition to read them. Its primary aim is to accurately identify vehicle number plates aiding in vehicle tracking and traffic data collection while minimizing the need for direct driver interaction. It has various applications, including law enforcement, toll collection, parking management, and traffic monitoring. This technical report outlines the development, implementation, and evaluation of an ANPR system.

Keywords: Automated Number Plate Recognition (ANPR), image processing, YOLOv8, Machine learning, Deep learning, CNN.

1. INTRODUCTION

1.1PURPOSE

In this system named automated toll system for number plate detection and collection emerges as a convincing solution of the problem to the manual toll collection system applied at tollgates. Time, efficiency, fuel and pollution are a matter of present day. In order to remove the major issues of vehicle congestion and time consumption, image processing technology is used. In this system images and videos will be passed as an input or can be browsed from any location. Using images and videos the number plate is detected and further process .This system various modules are RTO admin, Toll admin, Police admin, Super admin and the general public. The role of the Super admin is to register toll centers at various locations using User name and Password. These credentials are sent to the toll admin, using which he login into the account. Toll admin module is basically used for the calculation purpose of toll deduction based on vehicle type. The RTO registers the vehicle information and associates it with the number plate of the vehicle. In case a stolen vehicle passes through the toll collection center, the number plate is detected and the notification is send to the Police admin module. Toll deduction takes place through e-wallet assigned to the concerned number plate of the vehicle that belongs to the owners' account. Additionally the daily toll collection information can be obtained and send to the Government for verification.

1.1SCOPE

The main scope is Number Plate Recognition system is a securitysystem. Image processing concept is used in Number Plate Recognition system. OCR (Optical Character Recognition) scheme is also applied in this for reading the image of vehicle number plate. Number Plate Recognition system is used for many purposes like tollway authorities uses this system for allowing the vehicle to enter the toll road by detecting their number plate automatically and provide them with pay-slip and then open the road for that particular car. Parking authorities also use this system for allowing the vehicle to park in their area. In this system, firstly we capture the image of number plate then process it and read each and every character present in the number plate for their perfect recognition. The mostsignificant phase is OCR, where the letterings on the image of number plate are changed into the texts which can be decoded later. In this given research paper, a full algorithm and network flow for ANPR and its efficient applications are shown.

The concept of ANPR system is based on the matching of templates and exactness (result) of this system was established as 75-85% for Indian number plates

1.3. NEED FOR SYSTEM

A large enhancement in today's information technologies regarding all the fields/areas of work in present time initiated the demand for handling vehicles as theoretical means in information systems.

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Study of important information provided by vehicles for actuality and information purposess can be done by a person or by distinctive brainy kit which is capable to identify vehicles by their number plates in a actual world and redirect it into a theoretical means. As the number of vehicles is increasing day by day, it is a difficult task to find a car park for a huge number of scholars and professors at Scholastic Institutes or in the multi-storey buildings. A large number of car parkings are managed by hand via security guard who is not interested in keeping a record of the count of vehicles arriving and departing that parkings. This creates an inconvenience for the vehicle driver to find a vacant space for their car to park that leads to a consumption of more time in addition not to forget the unease and hindrance that driver feels. Sometimes absenteeism of the safe keeper may cause robbery of the vehicles

2. SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION

2.1. RELATED WORK

This system is defined automated toll collection technique where collection of tolls can be done automatically using image processing technique where we can detect the number plate of a vehicle and there by deduct the toll amount. The vehicle s number plate images and videos are maintained in the database, with the help of those images the image processing technique will be implemented to extract the registration number of the car from the number plate, with the help of this extraction the details of the vehicles owner will be take from the database and particular amount will be deducted, if the vehicle owner acquires a e-wallet, even that information will be take from the database because that person has already paid the toll amount in advance for a respective duration and the toll amount won't be collected from him/her. In order to overcome the biggest issues of vehicle congestion and time consumption, the e-wallet system is used. In the proposed system video will be passed as an input or can be browsed from any location. Using this video the number plate is detected and further process continues. Various modules of this system are RTO admin, Toll admin, Police admin, Super admin and the general public. The role of the Super admin is to register toll centers at various locations using User name and password. Toll deduction takes place through e-wallet assigned to the concerned number plate of the vehicle that belongs to the owners' account. The main motivation of this system is to provide a base for building automatic number plate detection using image processing for toll collection at toll checkpoints. This system will help to save time as well as help to reduce congestion at toll checkpoints. This system will also help in monitoring any fraudulent behaviour that takes place at the toll checkpoints. The proposed system will maintained the database of captured images placed at the toll checkpoint and will perform certain processes to detect the number plate of a vehicle. In this system video will be passed as an input or can be browsed from any location. Using this video the number plate is detected and further process continues.

Automatic License Plate Recognition

A Comparative Study Automobiles are an necessary part of our present life. Generally, license plates are used for identication of every vehicle. Automatic License Plate Recognition (ALPR) is the process of automatically Capturing number plate and extracting license plate information. Access control systems, Parking entrance control, toll road payment collection, and border crossing security are some of the many applications in this area where, ALPR can be effectively utilized. However, perfect detection and reading of license plate contents are vital in making ALPR successful in any of these applications. The perfect reading of vehicle number plate information from an image is a challenging task due to following reasons. Depending on the acquisition time, environment, and climate changes, the background of the vehicle and lighting conditions may changes. The angle between the vehicle and the camera can also change and can have a signicant impact on accurate getting of plate contents. In addition, different types of fonts, colors, use of background images and plate standards make the task of automatic license plate recognition quite challenging task.

2.2. PRODUCT ARCHITECTUER

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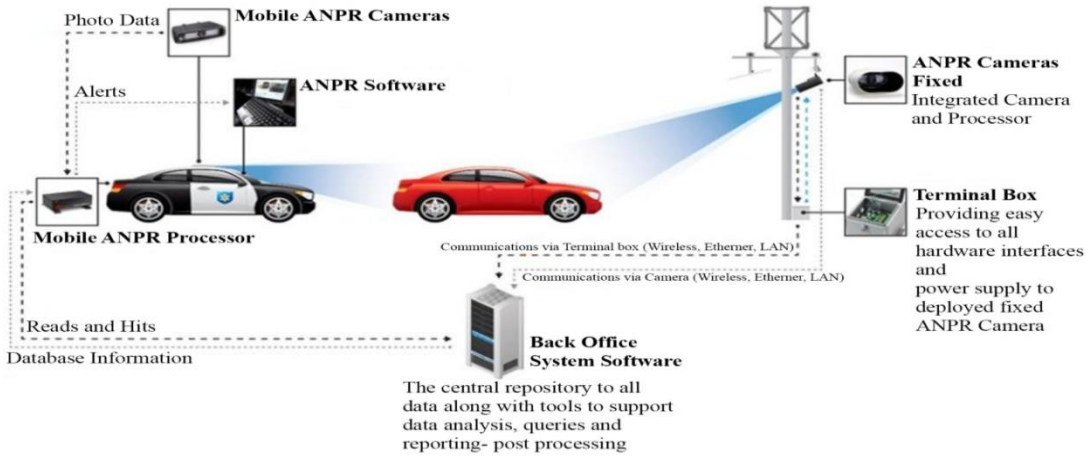

Fig.1.1: System Architecture

III.EXISTING SYSTEM

This method is used to mine license plate regions from background images as shown in Figure. 1, it is a combination of edge statistics and morphology techniques. This process has achieved a 98 percent recognition rate from 9,745 images—supposing that the number plate frame's edges are perfect and plane. Moreover, this method of extracting characters from the binary image to define the no plate region is time-consuming because it processes all the binary objects. Furthermore, it gives an incorrect result if there is other text in the image

Disadavantages:

- PC knowledge and character recognition, processes for certified plate recognition plays a main part in analyzing of licensed number plate.
- The basic componentsof any ANPR system is being developed. Number Plate Recognition scheme comprises of a camera, a edge capturing device, a PC, and custom intended software for image handling technique, examine and recognition.

PROPOSED SYSTEM

In Feature extraction process we find, we mark, and save all the features from the number plate segmented. To recognize the character in number plate images we use zonal density feature. In Zonal density function image is divided into different areas and object's pixel in each of the area is been counted. The density of each area is the total object's pixel. Total area in the image equal to total features acquired in the image. For 16 zonal density we divide a 32x32 image, so that in an image there are 16 features. In order to be divided into 16, 64, 128, 256 zones the pixel should be 32 x 32

Advantages:

- The objective of this segment is to provide a detailed information about how to find a number plate in the captured image? Generally a monochrome camera with colour camera is used in ANPR system
- Three processing categories. To recognize separated characters, some processes use pattern image, grayscale, and colour. Character separation is a crucial method for recognition of characters, which we can similarly separate out /matching of template or learning- based classification

IV.PRODUCT FUNCTIONS

The proposed system provides a base for implementing automatic number plate detection using image processing for toll collection at toll checkpoints. This system will help in saving time as well as help in reducing congestion at toll checkpoints. This system will also help in monitoring any fraudulent behaviour that takes place at the toll checkpoints. The proposed system will capture an image placed at the toll checkpoint and will perform certain processes to detect the number plate of a vehicle. Following are the steps that needs to followed to detect a number plate.

A. Image Acquisition

B. Image Pre-processing

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C. Licence Plate Localization
D. Character Segmentation
E. Character Recognition

Image Acquisition

The first step is to acquire the image from the camera. The image can be captured using a high resolution camera.

Image Pre-processing

After acquisition of an image we need to perform certain pre-processing techniques like gray scale conversion, noise reduction, contrast enhancement to remove noises, low contrast, and unwanted background. License Plate localization: License plate region are localized based on the features of the license plates. Localization can be performed using the following steps.

I. Opening and Closing of Image
II. Image Binarization
III. Elimination of unwanted region
IV. Mapping of co-ordinates

Character Segmentation

Unwanted objects like dots or some noise needs to be removed. After removing unwanted objects, dilation is performed.

Character Recognition

Character Recognition is the final step in License Plate Recognition. Two main components of License Plate Recognition are Feature Extractor and Classifier.

Feature Extractor:

Given a character image, the feature extractor derives the features that the character possesses. The derived features are then used as an input to the character classifier.

Character Classifier:

Classification is performed by comparing an input character image with a set of templates from each character class. Each Comparison results in similarity measure between the input character and the template.

RFID

Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. Some RFID tags can be read from several meters away and beyond the line of sight of the reader. The application of bulk reading enables an almost-parallel reading of tags. RFID tags can be either passive, active or battery assisted passive.

Passive RFID does not use a battery, while an active has an on-board battery that always broadcasts or beacons its signal. A battery assisted passive (BAP) has a small battery on board that is activated when in the presence of a RFID reader. Most RFID tags contain at least two parts: one is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialized functions; the other is an antenna for receiving and transmitting the signal.

V.SCREENS

Screen : Amount Successfully paid based on Image

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VI.CONCLUSION

The development and implementation of the ANPR system demonstrated its capability to accurately detect and recognize license plates in real-time. Further optimizations and refinements could enhance its performance for practical applications such as traffic management, law enforcement, and toll collection. Continued research in computer vision and machine learning will contribute to the advancement of ANPR technology.

This project will focus on developing the software components of the ANPR system where we considered the vehicle number plate as input image and system should extract that number from the image and should search the database for that recognized number plate. Hardware requirements, such as cameras and computing resources will be considered but are not within the primary scope of this project.

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