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A Survey on New Approach for Vehicle Number Plate Detection

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ABSTRACT

In LPR, there is always need to deal with a large variety of license plates. Each state in has its own license plate color, pattern and formats of numbers and characters. In most cases, License Plate Detection is an essential strategy before LPR. Techniques to find the license plate area in images or recordings from past literature can be assembled into the accompanying classifications: Binary Image Processing, Gray-Level Processing, Color Processing and Classifiers. Character segmentation is likewise an imperative advance before character recognition. The methods for character segmentation can be grouped into Binary Image Processing, Gray-Level Processing and Classifiers. In this synopsis a survey of literature for LPR has been carried out. based on the literature survey problem of LPR has been recognized and objective has been set to accomplish expected outcome to enhance the performance of LPR system based on SVM (Support Vector Machine) in previous work.

Keywords

ANPR (Automatic Number Plate Recognition), Vehicle surveillance, Vehicle Parking, Optical Character Recognition.

INTRODUCTION

1.1 History and Background

In the contemporary era, the number of vehicle is growing day by day. According to a recent survey, the number of cars on the roads reached one billion last year. This increases the new challenges for traffic police such as red light violations, parking problems, wrong lane violations & toll booth violations. There is a need to automate various processes in addition to increasing traffic police force.

To resolve this issue traffic police installed plenty of surveillance devices such as traffic light cameras, parking booth cameras or toll booth cameras. It requires man-power to check these images, note down the vehicle's registration number and forward it to the appropriate department to take an action on rule violators [2, 3].

Identification of vehicle registration license numbers is the main topic of our research. Vehicle registration license number is a unique identity for all vehicles in a given state; it represents a legal license to participate in the public traffic. Therefore, the license number is the primary, most widely accepted, human readable and mandatory identifier for motor vehicles [2, 3].

Conventional systems for traffic estimations, for example, inductive loops, sensors or EM microwave indicators, experience serious shortcomings of genuine deficiencies, costly to introduce, they request traffic interruption amid establishment or upkeep, they are cumbersome and they can't distinguish moderate or impermanent stop vehicles. Despite what might be expected, frameworks that are based on video are anything but difficult to introduce, utilize the current foundation of traffic surveillance. Moreover, they can be effectively overhauled and they offer the adaptability to update the framework and its usefulness by just changing the system algorithms. Those frameworks permit estimation of vehicle's speed, tallying the quantity of vehicles, grouping of vehicles, and the ID of traffic occurrences, (for example, mishaps or substantial congestion).There is a wide assortment of frameworks based on record and image processing utilizing diverse strategies to recognize vehicles and objects.

1.2 Traffic surveillance

Traffic surveillance framework is a functioning exploration point in computer vision that endeavors to identify, perceive and track vehicles over a succession of images and it additionally makes an endeavor to comprehend and describe object behaviour, vehicle activity by replacing the aging old traditional method of monitoring cameras by human operators. A computer vision system can screen both quick unapproved conduct and long term suspicious behavior, and subsequently alarms the human administrator for more profound examination of the occasion. The video surveillance framework can be manual, self-loader, or completely programmed relying upon the human inclusion. Human operator is responsible for monitoring in manual video surveillance system. The entire task is done by him by watching the visual information coming from the different cameras. It's a dull and challenging job of an operator to watch the various screens and in the meantime to be careful from any unfortunate occasion. These frameworks are ended up being ineffectual for occupied huge places as the quantity of cameras surpasses the capacity of human specialists. Such frameworks are in far reaching over the world. The semi-automatic traffic surveillance framework takes the assistance of both human administrator and PC vision. The item is being followed by the PC vision algorithm and the job of classification, personal identification, and activity recognition is done by the human operator. Lower level of video processing is utilized in these frameworks, and a significant part of the undertaking is finished with the assistance of human operator intervention. In the completely programmed framework there is no human intercession and the whole employment is being finished by the PC vision. These frameworks are wise enough to naturally follow, arrange, and perceive the item. Also, it shrewdly recognizes the suspicious behaviour and does the action recognition of the object.

1.3 Digital Image Processing (DIP)

It refers to process real world images digitally by a computer. It is a broad topic, which includes studies in physics, mathematics, electrical engineering, computer science. It considers the calculated establishments of the obtaining and organization of images and in detail the hypothetical and algorithmic processing in that capacity. It also aims to improve the appearance of the images and make them more evident in certain details that you want to note.

The human uses the faculties to repeat with the world they live. The faculties enable you to know reality. Along these lines get a control on data about general surroundings. We can feel objects, distinguish smells, hear sounds, identify flavors and in particular we can see the world in which we live.

Of every one of the faculties the most created is in sight. It is the methods by which we get data. It enables us to see and comprehend our general surroundings and records for almost 70% of the data we get. Among this type of information include the identification of faces, reading, images, etc...

The scenes often perceive three-dimensional (3D) and when we capture by devices (cameras or video, X-ray screens, etc...) we obtain two-dimensional images (2D). The human interacts with a three-dimensional world, when we want to capture a piece by some device usually we get two-dimensional images.

For every one of these reasons, the images are ending up progressively conspicuous job in our general public. Individual photos, video conferencing, genuine maps, films, news and sound; every one of these components share practically represents that store images. In this manner we are quick to research and grow great frameworks for image processing.

1.4 Number Plate Recognition

Due to the mass integration of information technology in all aspects of modern life, there is a demand for information systems for data processing in respect of vehicles.

These systems require data to be archived or by a human or by a special team which is able to recognize vehicles by their license plates in real-time environment and reflect the facts of reality in the information system.

Therefore, several techniques have been developed recognition and recognition systems are license plates used today in many applications.

In most cases, vehicles are recognized by their license plate numbers, which are effectively comprehensible by people however not machines. For machines, an enrollment number plate is only a dark spot that is inside a district of an image with a certain intensity and luminosity. Along these lines, it is important to structure a robust mathematical framework ready to see and extract what we need from the captured image.

These functions are actualized or numerical patterns in what is classified "ANPR Systems" (Automatic Numbers Plate Recognition) and mean a change between the genuine situations is seen and data frameworks need to store and deal with such data.

The structure of these frameworks is one of the territories of research in zones, for example, Artificial Intelligence, Computer Vision, Pattern Recognition and Neural Networks.

Systems of automatic identification of license plates are sets of equipment and programming to process a signal that is changed over into a graphical portrayal, for example, static images or arrangements of them and perceive the characters in the plate.

The fundamental equipment of these frameworks is a camera, an image processor, event logger memory and a storage unit and communication..

The license plate recognition systems have two main points: The quality of license plate recognition software with recognition algorithms used and the quality of imaging technology, including camera and lighting.

1.5 Applications

In the parking, the recognition of license plates is utilized to compute the length in which the vehicle has been parked. At the point when a vehicle lands at the entrance to the parking, the registration number is automatically perceived and put away in the database. At the point when the vehicle leaves the parking later and reaches the entryway, the registration number of the plate is recognized again and compared with the first put away in the database. The time distinction is utilized to compute the cost of parking. This technology is used in some companies to grant access only to authorized personnel vehicles.

In some countries these systems are installed recognition throughout the city area to detect and monitor traffic. Each vehicle is registered in a central database and, for example, can be compared to a blacklist of stolen vehicles or congestion control access to the city during peak hours.

They can also be used to:

- Service stations to keep track of drivers who leave the station without making payment.
- A marketing tool to track usage patterns.

LITERATURE REVIEW

S. Babbar, S. Kesarwani, N. Dewan, K. Shangle and S. Patel, [1] Identification of vehicles and their proprietors is a dreary and error inclined employment. The appearance of programmed number plate identification can help handle issues of stopping and traffic control. The framework is structured utilizing image processing and machine learning. Another framework is proposed to enhance identification in low light and over introduction conditions. The image of vehicle is caught, which is preprocessed utilizing systems like grayscale, binarization. The resultant image is passed on for plate localization, for extracting the number plate using CCA (Connected Component Analysis) and ratio analysis. De-noising of number plate is finished utilizing different filters. The characters of the number plate are portioned by CCA and proportion investigation also. At long last, the perceived characters are analyzed utilizing systems, for example, SVC (straight), SVC (poly), SVC (rbf), KNN, Extra Tree Classifier, LR+RF, and SVC+KNN. The proposed techniques help the system to detect well under dim light, over-exposed images and those in which the vehicle is angled.

The new proposed technique “Threshold Modification” proved to be successful for detecting number plates even in low light conditions, extreme brightness which otherwise failed in previous machine learning systems. Various OCR techniques such as LR+RF, SVC+KNN, Extra Trees, SVC (Linear, Poly, Rbf, Linear.svc) have been applied and compared, with SVC (Linear) giving the best accuracy of 97.1% segmented characters correctly recognized

R. Panahi and I. Gholampour, [2] this work presents an online profoundly precise framework for automatic number plate recognition (ANPR) that can be utilized as a reason for some genuine ITS applications. The framework is intended to manage vague vehicle plates, varieties in weather and lighting conditions, distinctive traffic circumstances, and high speed vehicles. This examination reported different issues by introducing appropriate equipment stages alongside continuous, vigorous, and imaginative algorithms. Gathered enormous and exceptionally comprehensive informational collections of Persian license plates for assessments, examinations, and enhancement of different included algorithms. The data sets include images that were captured from crossroads, streets, and highways, in day and night, various weather conditions, and different plate clarities. Over these informational indexes, reported framework accomplishes 98.7%, 99.2%, and 97.6% correctnesses for plate identification, character segmentation, and plate recognition, separately. The false alarm rate in plate location is under 0.5%. The general precision on the grimy plates part of our informational collections is 91.4%. Our ANPR system has been installed in several locations and has been tested extensively for more than a year. The proposed algorithms for each piece of the framework are profoundly powerful to lighting changes, size varieties, plate clearness, and plate skewness. The framework is additionally autonomous of the quantity of plates in captured images. This framework has been likewise tried on three other Iranian informational indexes and has accomplished 100% accuracy in both location and recognition parts. To demonstrate that our ANPR isn't language dependent, proposed work tries framework on accessible English plates informational index and accomplished 97% by and large accuracy.

M. T. Shahed, M. R. I. Udoy, B. Saha, A. I. Khan and S. Subrina, [3] In this examination, we propose associated part examination based algorithm to automatically distinguish and peruse Bengali number plates utilized in the metropolitan urban areas of Bangladesh. Our proposed automatic number plate recognition (ANPR) framework includes image pre-processing and morphological activity pursued by edge detection, regional localization and character segmentation to distinguish the Bengali characters in the number plate productively just as with less computational multifaceted nature. For different climate conditions, proposed algorithm demonstrates a recognition precision rate of ~95% with a normal processing time of 0.75 seconds. Proposed framework may be very viable progressively traffic control, security improvement too in electronic toll accumulation.

V. Sikri, [4] although much has been professed about the productivity of smart vehicles, road crash statics cast a shadow on the veracity of those claims. Grim reports on vehicle crashes and related passings are attestation to the way that we are not even close to the savvy vehicle worldview. The two most unmistakable foundations for these passings are over-speeding with respect to driver and a postponed reaction by crisis specialist co-ops in the event of an accident. The given examination proposes a Smart Number Plate as an answer for these issues. The number plate is equipped with an accelerometer that continuously measures the acceleration of the car and if the acceleration is greater than 4g (g=9.8 m/s²) it alerts the relatives of the driver and the emergency service providers by sending an SMS consisting of location coordinates obtained via GPS module. The number plate is also equipped with GPRS module that sends vehicle's location coordinates and details (number and model) on a server in case vehicle exceeds the speed limit. This data can be accessed by police control room via website and expeditious action can be taken against the defaulters. A website consisting of a Google map to display location coordinates of vehicle is also developed. Additionally, the Smart Number Plate is provided with an ultrasonic proximity sensor to assist vehicle in parking it appropriately. The Smart Number Plate is also tested for its ability to resist false positive detections of accidents under simulated environment. The work adds an element of smartness in the vehicle's number plate and takes us a step closer to the smart vehicle paradigm.

S. Miyata and K. Oka, [5] this examination work reported a new method of detecting license plates in images of vehicles where the license plate is shown, and reports the detection results when this method was applied to detection of license plates on vehicles in Japan. This license plate location process distinguishes just the edge vertical parts, and the hopeful license plates are limited utilizing the forms gotten by widening and disintegration processing and region fill processing. A SVM (Support Vector Machine) based on negative and positive examples are used to determine whether or not a candidate area is a license plate, and finally the position of the license plate is identified. This study examined how the license plate detection results in license plate and non-license plate images were affected by differences in aspect ratios, differences in brightness between the vehicle body and license plate, and the number of positive and negative examples used for learning. The effectiveness of this method was confirmed to yield a license plate detection rate of approximately 90%.

R. Islam, K. F. Sharif and S. Biswas, [6] Automatic Number Plate Recognition (ANPR) is a sort of image processing innovation for perceiving the vehicle number plate. This framework likewise offers clients to put, check out and screen moving vehicles automatically by extricating their number plates. It likewise assumes an essential job in savvy traffic control framework. This research presents a prosperous method to identify vehicle number plates. The reported system is based on morphological activities based on various organizing components so as to maximally avoid non-intrigued district and enhance object area. This framework has been experienced utilizing a database of number plates and simulated outcomes show significant upgrades when contrasted with other regular frameworks. The achievement rate of the proposed technique is about 92% with changing light conditions.

A. H. Ashtari, M. J. Nordin and M. Fathy, [7] in this work, an Iranian vehicle license plate recognition framework based on another restriction approach, which is adjusted to reflect the local context, is reported, alongside a hybrid classifier that perceives license plate characters. The strategy exhibited here is based on a changed format coordinating procedure by the investigation of target color pixels to recognize the area of a vehicle's license plate. A modified strip search empowers limitation of the standard color-geometric format used in Iran and a few European nations. This approach uses periodic strip search to find the hue of each pixel on demand. Likewise, when a gathering of target pixels is recognized, it is examined to check that its shape and angle proportion coordinate those of the standard license plate. Notwithstanding being scale and rotation invariant, this technique maintains a strategic distance from tedious image algorithms and changes for the entire image pixels, such as resizing and Hough, Fourier, and wavelet transforms, thereby cutting down the detection response time. License plate characters are perceived by a hybrid classifier that involves a decision tree and a support vector machine with a homogeneous fifth-degree polynomial kernel. The execution location rate and the general framework execution accomplished are 96% and 94%, individually.

A. Rabee and I. Barhumi, [8] in this examination reported a very solid license plate identification and recognition approach utilizing scientific morphology and bolster vector machines (SVM). The methodology is made out of three primary stages including license plate identification, character segmentation and recognition. A reprocessing step is connected to enhance the execution of license plate limitation and character segmentation if there should arise an occurrence of serious imaging conditions. The first and second stages use edge discovery, scientific morphology pursued by associated part investigation. While SVM is employed in the last stage to construct a classifier to categorize the input numbers of the license plate into one of 9 classes. The algorithm has been connected on 208 vehicle images with various background, license plate angles, distances, lightning conditions, and colors. The average accuracy of the license plate confinement is 97.60%, 90.74% for license plate distinguishing proof, and 97.89% for number recognition.

Table: 2.1 Table of Literature Survey

SR. NO.	TITLE	AUTHOR	YEAR	APPROACH
1	A New Approach for Vehicle Number Plate Detection	S. Babbar, S. Kesarwani, N. Dewan, K. Shangle and S. Patel	2018	To improve detection in low light and over exposure conditions a new system is reported. The vehicle image is captured, and preprocessed utilizing approaches such as grayscale, binarization
2	Accurate Detection and Recognition of Dirty Vehicle Plate Numbers for High-Speed Applications	M. T. Shahed, M. R. I. Udoy, B. Saha, A. I. Khan and S. Subrina	2017	Reported numerous problems by using proper hardware platforms along with robust, real-time and innovative algorithms
3	Automatic Bengali number plate reader	M. T. Shahed, M. R. I. Udoy, B. Saha, A. I. Khan and S. Subrina	2017	Connected component examination is reported based on algorithm to detect and read Bengali number plates utlized in the metropolitan cities of Bangladesh automatically

4	The smart number plate	V. Sikri	2016	Reported to equipped number plate is with an accelerometer that continuously measures the acceleration of the car .
5	Automated license plate detection using a support vector machine	S. Miyata and K. Oka	2016	A new method of detecting license plates is reported in images of vehicles where the license plate is shown and reports the detection results
6	Automatic vehicle number plate recognition using structured elements	R. Islam, K. F. Sharif and S. Biswas,	2015	The reported technique is built on morphological operations based on different designing segments in order to largely exclude non-interested region and improve object area.
7	An Iranian License Plate Recognition System Based on Color Features	A. H. Ashtari, M. J. Nordin and M. Fathy	2014	Reported a new localization approach for Iranian vehicle license plate recognition system which is modified to reflect the local context,
8	License plate detection and recognition in complex scenes using mathematical morphology and support vector machines	A. Rabee and I. Barhumi,	2014	a highly reliable license plate detection and recognition approach is implemented utilizing mathematical morphology and support vector machines (SVM)

EXPECTED OUTCOME

The number plate recognition process has been employed, and accuracies of the different techniques and limitations of the previous design Support Vector Machine (SVM) [1] have been discussed in this work the accuracy of the previous work was reported 97.1%.

There is a need to expand the previous work SVM the types of vehicles that can be detected: trucks, buses, scooters, bikes. The design should also provide help in toll plaza, parking lots, theft of vehicles and in accidents. This technology can be further improved to detect the crashed vehicle's number plate in an accident and alert the closest hospital and police station about the accident, thus saving lives. India being the 4th largest auto market that requires.

Number plate detection to assist traffic authorities and curb criminal activities. In proposed work based on various surveys on literature there is also a need to enhance the performance of proposed scheme ahead of 97.1%.

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Author’s Profile

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