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EFFICIENT APPROACH FOR NUMBER PLAQUE ACCREDITATION SYSTEM USING WIKI DEVICES

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Abstract - *Now a day, there are many number of vehicles in urban and interurban roads, their identification becomes a key problem for several applications as security control, traffic management or organization of parking spaces. ALPR for vehicle identification is an essential module in many of these applications. Real time number plate recognition plays an important role in maintaining law enforcement and maintaining traffic rules. It has wide application areas such as toll plaza, parking area, highly secure areas and boarder areas etc. Number plate recognition is designed to identify the number plate and then recognize the vehicle number plate from a moving vehicle automatically. ALPR has two major parts: Vehicle number plate extraction and OCR. Number plate extraction is that stage where the vehicle number plate is detected and extract the number plate text. Whenever they want to know the details of any vehicle just scan the number plate and that scanned image will be processed and they will get the desired information about that vehicle. vehicle document tracking based on Aadhar card number. Not necessary to carry all the documents and license every time.*

Key Words: Optical Character Recognition, Automatic License Plate Recognition, Customer Relationship Management

1. INTRODUCTION

Since the past decades, many researchers proposed their methods to recognize the vehicle number plate. One of the methods is template matching which is executed in the optical character recognition (OCR) step of the automatic number plate recognition (ANPR) system. In previous researches, many researchers are used a high end desktop PC and high resolution camera to implement the ANPR system. In this paper, the optimization of ANPR algorithm on limited hardware of Android mobile phone is presented. First, various steps to optimize ANPR and OCR block using template matching are described. Our proposed algorithm was based on Tesseract library. For comparison purpose, the template matching based OCR will be compared to Artificial Neural Network (ANN) based OCR. The optimization on ANPR was performed as currently there is no image processing tool available on the standard Android mobile phone. By optimization of ANPR, many advantages could be achieved, such as higher recognition accuracy, less resource consumption, and less computational complexity. Results on 30 images showed that the recognition rate was 97.46% while the processing time was 1.13.

2. EVALUATION

2.1Existing system

There are still various problems with license plate recognition system. Vehicle identification becomes a key problem in security control. Provides users and car details by entering the license number. It can be used in many areas from speed prosecution and management of parking lots. It can be used also to detect and prevent criminal activities and road control of parking violations in the prohibited area.

This system speed can be increase with high resolution camera which can be able to capture clear images of the vehicle. The OCR method is sensitive to misalignment and to different sizes, so we have to create different kind of templets for different RTO specifications. The statistical analysis can also be used to define the probability of detection and recognition of the vehicle number plate. At present there are certain limits on parameters like speed of the vehicle, script on the vehicle number plate, skew in the image which can be removed by enhancing the algorithms further.

2.2Drawbacks

- Time complexity
- Need more manual work
- There is no security

2.3Proposed system

Today, everything in the world is smart and digitalized. Many advances have been made in the transportation sector too.A user-friendly and convenient android application which provides authorization for the vehicle identification and registration. It also provides mutual authentication between the police and users in order to avoid misusage. The proposed project analyses the vehicle document tracking based on Aaddhar card number. By using this application, it is not necessary to carry all the documents and license every time. By using our system, the driver goes through the verification process through a reliable and efficient manner.

It is just simply the ability to extract and recognition a vehicle number plate's character automatically from an image. It captures the image of the license plate and that image will be processed. The segmented characters are normalized. They will get the desired information about that

vehicle. Today advances technology took Number Plate Recognition systems from hard to set up, limited expensive, fixed based applications to simple mobile ones.

2.4Features

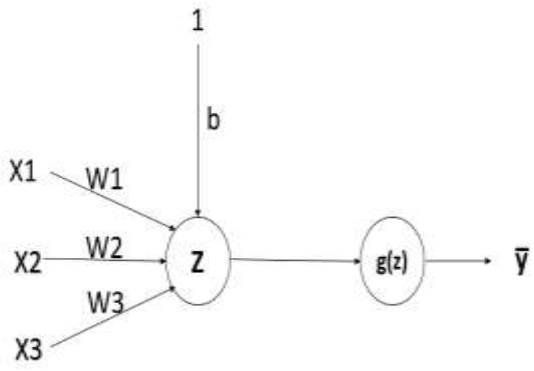
- User friendly system
- Identify the vehicle and provide desired information about the vehicle
- Improved security system
- This system easily captures who against traffic control.
- Reduce the complexity in terms of time and computational steps

3. REVIEW

The system use series of image processing techniques for identifying the vehicle from the database stored in the PC. The system is implemented in Mat lab and it performance is tested on real images. The simulation results show that the system robustly detects and recognize the vehicle using license plate against different lightening conditions and can be implemented on the entrance of a highly restricted areas. The camera used in this project is sensitive to vibration and fast changing targets due to the long shutter time.

4. MATH

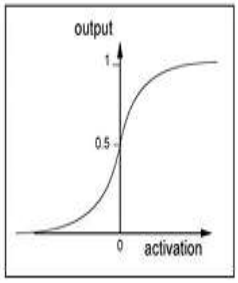
Neural Network is similar to logistic regression (perceptron) but with more layers and hidden units. Here's is what a single layer perceptron (logistic regression) looks like.



Here x1, x2,x3 are the features of the input, w1, w2, w3 are the parameters, b is the bias. Now Z= w1 X1+w2 X2+w3 X3+b. g(z) is the activation function. There are many available activation functions like sigmoid, tanh, relu, leaky relu etc. If the problem is a classification problem, the most common choice of activation function is sigmoid. The formulae and plots of these activation functions are:

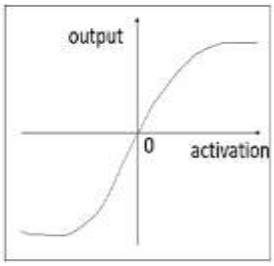
Sigmoid:

$$\sigma(z) = \frac{1}{1+e^{-z}}$$



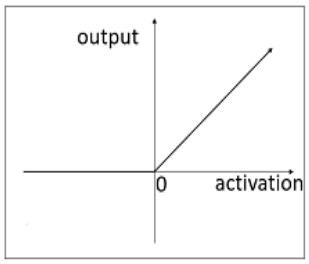
Tanh:

$$\sigma(z) = \frac{e^{-z} - e^{z}}{e^{-z} + e^{z}}$$

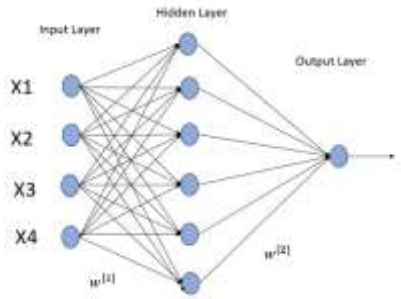


Relu (Rectified Linear Unit):

$$\sigma(z) = \max(0, z)$$



Similar to the perceptron model, a simple one-layer neural network looks like :



5. IMPLEMENTATION

Image acquisition is an important stage to the ANPR system because it provides the input data for the subsequent processes. There are numerous ways to acquire the license plate's images. The existing literature discusses the different image acquisition approaches used by various researchers. For example, a digital camera with or without embedded infrared lighting have been used to acquire license plate. It has utilized video camera to acquire the license plate image. Another method is using an image acquisition card as use in to convert video signals into digital images based on some hardware-based image. In summary, the license plate image could be captured either by digital camera or video camera.

It improves image quality captured previously. The acquired color image was converted to gray scale, and non-linear medium filter was used to enhance the image. Sobel filters and histogram equalization were used while power law transformation was used. It can be summarized that the choice of pre-processing algorithms depends on the complexity and the level of noise of the acquired image. Due to low processing power of smartphone, we need to carefully select the preprocessing algorithm so as not to burden the processor but producing a reasonable enhanced image.

Localization of the license plate is the process to detect the rectangular area of the number plate in a captured image. In human descriptions, a number plate is a small plastic or metal plate pasted to a vehicle for official identification purposes. However, the machines do not understand well this description. Therefore, we need to find an alternative description of a number plate based on descriptors that will be understandable for machines. The two neural network based filters and post processor were used with high reliability but it has rather complex computationally. Hough transform and contour algorithm were used, while Sobel vertical edge detection, threshold and vertical projection were utilized. In our design, the license plate image was captured by smartphone, in which a relatively proper image could be obtained by using rectangular guide during capturing. Hence, localization algorithm requirement is minimized.

Many different methods of character segmentation have been proposed in the literature and. The connected-component method which is simple, straight forward, and robust was used. However, if there are joined or broke characters, the segmentation might fail. Horizontal projection and vertical projection were employed, in which the algorithm can handle character with some rotation. This window scanning 56x1 pixels was utilized which is straightforward and fast, but is more susceptible to the noise.

OCR is the process to convert the images of handwritten or typewritten into machine encoded text. In previous researches, there are numerous methods such as simple Euclidean distance, Hidden Markov Model, Artificial Neural Network (ANN), Support Vector Machine (SVM) and template matching. It shows the various algorithms for OCR along with its strengths and weaknesses. The Tesseract OCR library was used as it can be integrated into Android SDK as well as it can provide two methods, including ANN and template matching.

5.1Abbreviations and Acronyms

ANPR	Automatic License Plate Recognition
AI	Artificial Intelligence
CNN	Convolutional Neural Networks
CRM	Customer Relationship Management
AGI	Artificial General Intelligence
OCR	Optical Character Recognition
SQL	Structured Query Language
OS	Operating System

5.2Characteristics

- An individual record in a security video should not easily identifiable by human observers and face recognition algorithms(privacy);
- The privacy protected video should still allow identification of suspicious behaviors and gathering of non-sensitive information such as the number of people in a given area(intelligibility);
- In case of a crime, the privacy protected footage could be reversed to obtain the original unprotected footage by authorized users (reversibility);
- This reversal could only be performed by legally authorized parties and not by any third parties who may have acquired the protected content by some means (security); and
- Privacy protection should be robust in that it should not depend on fragile computer vision algorithms or manual annotations that may fail to detect sensitive regions in some frames (robustness).

5.3Algorithm and Techniques

OCR is the process to convert the images of handwritten or typewritten into machine encoded text. In previous researches, there are numerous methods such as simple Euclidean distance, Hidden Markov Model (HMM), Artificial Neural Network (ANN), Support Vector Machine (SVM) and template matching. It shows the various algorithms for OCR

along with its strengths and weaknesses. The Tesseract OCR library was used as it can be integrated into Android SDK as well as it can provide two methods, including ANN and template matching.

Android is a software environment made for mobile devices such as smartphone and tablet. It has to be stated that Android is not a hardware platform. Android consists of a Linux kernel-based OS, a rich UI, end-user applications, code libraries, application frameworks, multimedia support, and much more. Android was founded by Open Handset Alliance in July 2005. In the next sections, Leptonica and Tesseract libraries will be discussed.

Leptonica is an open source C library which is useful for efficient image processing and image analysis applications. The library is developed since 2001 by a Google employee, Dan Bloomberg, and it is licensed under a Creative Commons Attribution 3.0 United States License. This library can be downloaded from http://www.leptonica.org.The library supported following operations, including rasterops, binary and grayscale morphology, convolution, scaling, rotation, affine transformations, seed filling and connected components, and various image enhancement algorithms.

Based on the information from the paper written by Ray Smith, Tesseract was developed between 1985 and 1994 at Hewlett Packard Laboratories Bristol and Hewlett Packard Co, Greeley Colorado. It appeared for the first time in 1995 at University of Nevada Las Vegas (UNLV) Annual Test of OCR Accuracy. It was a PhD research project conducted in HP Labs, Bristol, and it had the momentum as a possible software and hardware add-on for the HP's line of flatbed scanners. After ten years, due to lacking any further development, HP released the Tesseract as open source in late 2005. Currently, Tesseract library is available at https://github.com/tesseract-ocr. Tesseract is suitable for use as the backend and can be utilized for more complicated OCR tasks.

MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:

- Math and computation
- Algorithm development
- Modelling, simulation, and prototyping
- Data analysis, exploration, and visualization
- Scientific and engineering graphics
- Application development, including graphical user interface building

Figures and Tables

Fig 1. Matlab system

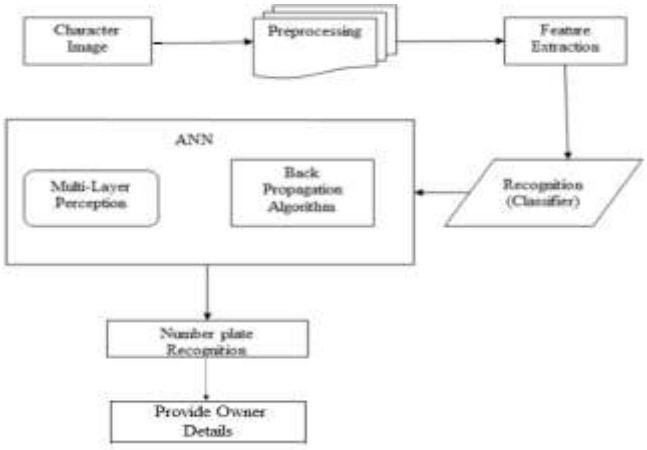


Fig 2. System Architecture

6. RESULT AND DISCUSSION

6.1Admin

a. Add Police: Admin can add new police with his/her details and provide valid login credentials.
b. Manage Police: Admin can manage all the added police details by updating their information.
c. Blacklist/Whitelist: Can view a blacklisted Car Registered Number, Color and List Type.
d. Notification: When blacklisted car is spotted admin is notified with date-time and its location.

6.2Police

e. Login: Police need to login with their valid login credentials in order to access the application.
f. Scan Car: By scanning the number plate using android mobile phone, it Identifies Car Number -> Check List -> Notify and insert entry into the database.

g. Blacklist/Whitelist: Police can view a blacklisted Car Registered Number, Color and List Type.

6.3Applications:

- The system can be used for toll plaza, parking area, highly security areas, boarder's areas etc.

7. CONCLUSION

The image segmentation problem in license plate recognition for Indian License Plates has been examined in two stages: license plate Localization and extraction from the scene followed by the separation of the characters from the previously extracted license plate region background. Various approaches for license plate detection in an image, and extensive experiments have been devised to test them are presented. The main objective is aimed at contributing towards the research in the fields of machine vision, pattern analysis and image processing. The system developed investigates the possibility of automating the whole process of license plate recognition for a wide range of environments. Given an input image, the system extract extracts the license plate, isolates the characters, and finally identify the characters. For each task, a set of methods are proposed, designed and developed. A better performing class of LPL algorithms in comparison with the available algorithms in the field is developed.

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