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Vehicle Number Plate Detection and Recognition

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Abstract: The study of this paper presents a new technique to use automatic number plate detection and recognition. This system plays a significant role throughout this busy world, owing to rise in use of vehicles day-by-day. Some of the applications of this software are automatic toll tax collection, unmanned parking slots, safety, and security. The current scenario happening in India is, people, break the rules of the toll and move away which can cause many serious issues like accidents. This system uses efficient algorithms to detect the vehicle number from real-time images. The system detects the license plate on the vehicle first and then captures the image of it. Vehicle number plate is localized and characters are segmented and further recognized with help of neural network. The system is designed for grayscale images so it detects the number plate regardless of its color. The resulting vehicle number plate is then compared with the available database of all vehicles which have been already registered by the users so as to come up with information about vehicle type and charge accordingly. The vehicle information such as date, toll amount is stored in the database to maintain the record.

Keywords: Vehicle License Plate Detection and Recognition, Automatic Toll Tax Collection, Grey Scale Image, Neural Network.

I. INTRODUCTION

Vehicle Number Plate Detection and Recognition (VNPDR) is an imaging technology used to identify plates for their vehicles. The purpose of LPR was to build a system capable of detecting number plate and recognize it using a neural network.

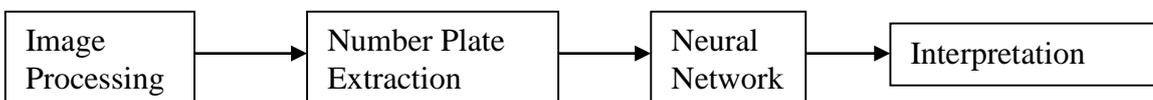


Fig1: - General Block Diagram of System [3].

Figure 1 shows the general block diagram of the recognition scheme of the logging system. License plates are processed and recognized with the use of a four block system. The first block deals with segmenting the image resulting in a cropped part of the original image in which the plate is included. The image processing block is where the extracted licensed plate image is converted into numerical values. This block serves as the pre-processing stage for the neural networks block. These values are then fed to the third block which is the neural networks block. Based on the pre-trained neural network, this will generate numeric values in accordance with the numeric values fed by the previous image processing method. The output of the third block is then processed by the interpretation part. The neural network is expected to generate a numeric value which is in the range designed by the researcher. This value is then compared to its equivalent number or character assigned to it. This serves as a reference block in which all of the equivalent ideas for each generated numeric values are hold with.

II. PROPOSED METHODOLOGY

This system identifies and detects the number on the vehicle number plate to make it easy for the security check at tools and helps for easy toll management.

There is various software created automatic number plate detection and recognition, out of this most the systems are based on Optical Character Recognition and few systems are based on neural networks. This proposed system uses neural network's algorithm for recognition. Various foreign countries like UK and Dubai are using ANPR system for traffic control but it is not much implemented in India because the number plates here are not standardized. Moreover, the numbers on the number plate are written in a different fashion and make it difficult for the system to recognize the character. Even such number plates exist which are difficult to identify. With the help of this system, we can avoid the long waiting queues on the tools, which will lead to proper time management. It makes a major impact on reducing the breaking of rules. The proposed system will be using image processing for detection and localization of the number plate and neural networks for recognition of characters. The neural network with its learning ability will also be able to identify fancy number plates.

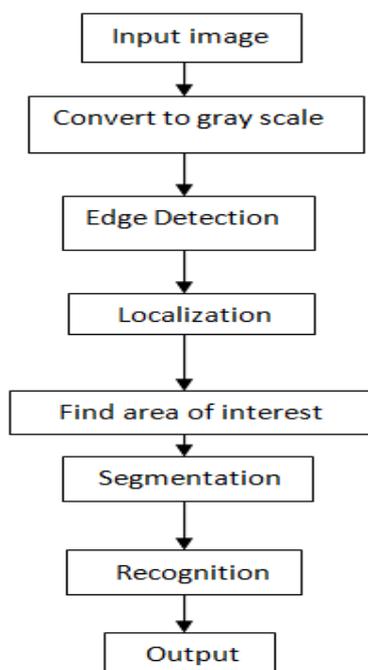


Fig2. Architecture Diagram

The proposed system follows the following phases

1. Input Image: -The image that is provided as input to the system has to satisfy following conditions: - (refer fig3)

- License Plate must be clearly visible
- The image must itself be clear enough for the system to recognize.
- Image of the vehicle should be straight of the front end or straight of the backend.



Fig3. [4]

2. Localization: Localization of image is done using the histogram. Once the image is taken as input it is converted into gray scale image. Dilation and Erosion operations are performed on the images to remove the noise. From this noise, free image edges are plotted horizontally and vertically. This horizontal histogram needs to be smoothed using low pass filter. Later on, the horizontal histogram values are filtered out by applying a dynamic threshold. The Same procedure is done for edges vertically. Once the system analyses the horizontal and vertical histograms the probable candidates for a license plate in the image are identified. This candidate is the region of interest which is extracted. On further processing, the most probable region of interest in identified which is isolated and thus, the localization of license plate take place.(refer fig4) This localized license plate is then passed on to the next phase for segmentation.



Fig4 [4]

3. Segmentation:

The localized license plate goes as an input for segmentation. The gray scale image is converted into a binary image and all the image containing less than 30px are removed. This removes the noise from the image. Properties are measured in this noise free image and thus, a bounding box (refer fig5) is a plot. Finally, extracted characters individually displayed.

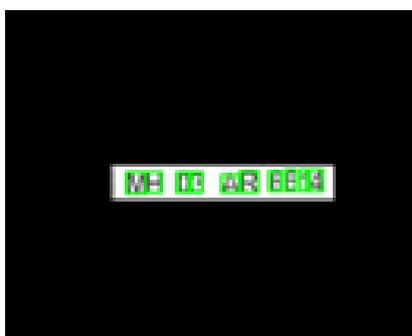


Fig.5.[4]



Fig6.[4]

4. Recognition

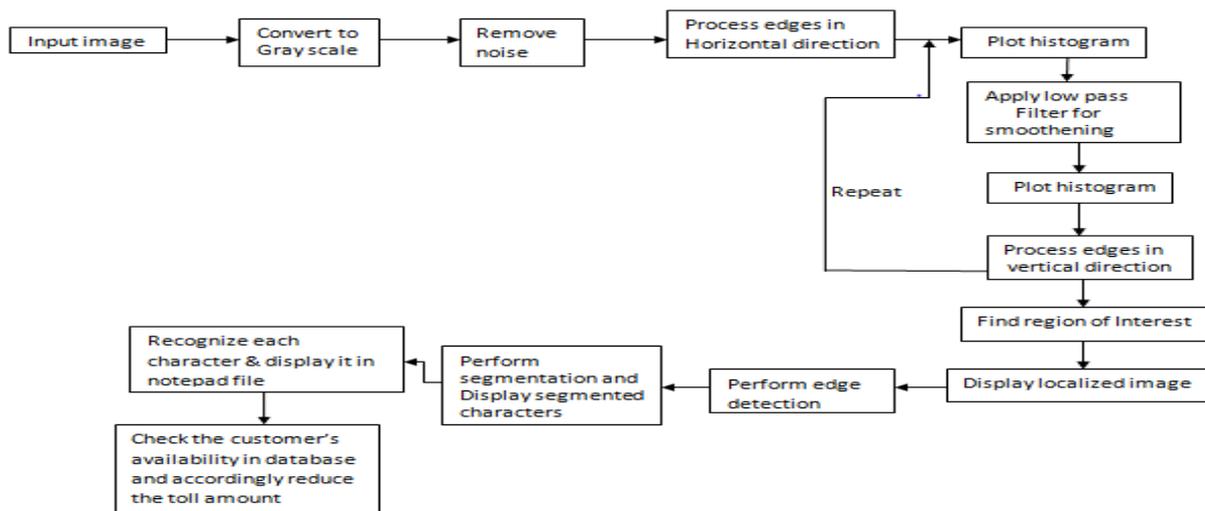
Recognition part is implemented using Artificial Neural Network available in the Neural Network toolkit in MATLAB using Feed-Forward algorithm [3]. Firstly, for using Neural Network we need to train it: For, training character recognition supervised learning technique is used. In this, training and input are given which has corresponding output with it which is the desired output from the Network. Feature extraction is used the peculiar features using which the characters are distinguished. There are two types of Neural Networks that can be used for character recognition:

- Single layer feed-forward.
- Multilayer feed-forward.

5. Algorithm

- 1: Start.
- 2: Import image.
- 3: Start pre-processing of the image.
- 4: Convert the image into grayscale image.
- 5: Generate a histogram of the image [5].
- 6: End of pre-processing of the image.
- 7: Localize the number plate.
- 8: Display the localized number plate on the screen.
- 9: Start Segmentation of localized number plate.
- 10: Display segmented image on the screen.
- 11: Start recognition of segmented characters.
- 12: Extract the features of each character.
- 13: Recognize the character.
- 14: Save the recognized characters of number plate in Notepad.
- 15: Search for the availability of vehicle number plate's number in database.
- 16: If available- Deduct toll amount from the customer's account.
- 17: If not available –Create customer's account.
- 18: End

III. BLOCK DIAGRAM OF PROPOSED SYSTEM



IV. COMPARATIVE ANALYSIS

Approach	Application	Advantages	Disadvantages	Colour Model
Neural networking	Number, nameplate detection	Can detect any plate with any font and style	Takes more time for training dataset purpose. Implementation is costly.	RGB to grayscale
Template matching	Number plate detection	Successful detection of number plates for standardized font and style. Implementation is cheap.	It will not detect the plates with any other styles or fonts.	Black/white/gray scale/colour.
Fuzzy logic	Edge detection, segmentation.	This methodology is generated to manipulate uncertainty in image concepts like brightness, edges etc. Fuzzy techniques can manage the vagueness and ambiguity efficiently	Costly. Same as neural networks.	RGB, gray scale.
Optical character recognition	Automatic number plate recognition	Cheaper than paying someone to manually enter large amounts of text	Not 100% accurate, If the original document is of poor quality, more mistakes will occur.	Black/white/gray scale/colour.

V. FUTURE ENHANCEMENT

This system can be developed as mobile applications which can be used to retrieve the details about the owner of the vehicle. A system can be developed which can use to place complaint about rash driving online. Other applications such as unmanned parking lots, safety and security of vehicle can be developed.

SUMMARY

This proposed system is used to detect number plate using the efficient algorithm. Steps to be followed: -

- Take car image as an input and convert into gray scale.
- Localize the number plate and display it on the screen.
- Segment the characters from the image and display each on the screen.
- Recognize each character using the neural network and compare with the database and accordingly deduct the toll amount from the user’s account if available in the database.

CONCLUSION

The System will use image processing for detection and localization of the number plate and neural networks for recognition of characters. The neural networks with its learning ability will be able to identify fancy number plates. Vehicle License Plate Detection

and Recognition thus uses efficient algorithms to detect the vehicle number from real-time images. Some of the applications of this software are automatic toll tax collection, unmanned parking lots, safety, and security. The system detects the license plate on the vehicle first and then captures an image of the license plate. Vehicle number plate is localized and characters are segmented. The system is designed for grayscale images so it detects the number plate regardless of its color. The resulting vehicle number is then compared with the available database of all the vehicles which have been already registered by the user so as to come up with information about the vehicle type and to charge accordingly. The vehicle information (such as date, toll amount) is also stored in the database to maintain the record. The current system is being implemented for traffic control, toll tax collection and by the police enforcement in many countries. In India, as the number plates are not standardized using neural networks should be a better option. Important Role in this System: -Pre-processing of the image. The angle from which the image is taken is important for localization. Use of neural networks: -To identify characters of various styles, fonts, and formats to make the system more efficient.

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