Problem Statement: License Plate Recognition system

License Plate Recognition System

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Technical Papers

Abstract--- License plate recognition (ALPR) is a process of identification of the license plate from an image taken at any signal stop or parking station. The Identified information or the number plate can be used for keeping a check on signal stops or for monetary settlements at parking lots or toll stations. It can also be used around the world for law and administrative works like checking a vehicle if it is registered or not. It also finds its use in safety supervision system. The system may fail a number of times if the quality of the picture is not up to the mark. So, ALPR depend a lot in the image quality, and hence the challenges in its real-life application. It may be used both indoors and outdoors but it must be able to process the images both quickly and successfully in all sorts of environments, be it daytime or night time, sunny or rainy. .

1. **Keywords** :License, Recognition ,pixels, image, binarization , padding ,License plate Recognition, Line Detection, Text box generation.

2. About Project :

ALPR(AutomaticLicencePlateRecognition) the first step is to read a license plate. Automatic license plate recognition system can be used as an automated monitoringsystemsforcontrollingroadtraffic ,computerized fee assortment solution, inspection devices and safety administrationsystems.Thistechnologyfavor stobespecific with respect to location, owing to plate disparity from region to region. ALPR uses visual character perception or OCR (Optical Character Recognition) on pictures taken by cameras. In 2002, Dutch vehicle registration made changes to the font, introduced small blanks in some letters (like S and Q) making them more specific and therefore more lucid to such systems. Some license plate has different variety of font sizes and positions, ALPR systems can cope with such distinction for being truly effective. More intricated systems can endure with universal versions, though many algorithms are personally fitted to each country. The cameras used can involve existing road-rule case or sealed-circuit television cameras, as well as mobile group, which are normaly connected to vehicles. Infrared cameras are

used by some systems for taking a clear image of the license plates. In 1976 ALPR was discovered at the Police Scientific Development Branch, UK. In this paper, a comprehensive project on the application of ALPR system is presented by using ancapablealgorithm.

Despite their capability, there are notable objections related with ALPRs. One of challenging objection is that to take in relative speeds of about 100 mph (160 km/h), the processor and the cameras must work has to be fast enough. Relative speed will affect the ability of the camera to literally learn the character from the license plate. Algorithms has to recoup for all variables that can alter the ability of the ALPR to produce a authentic read, such asday- time of day, weather and angles between the position of the specific cameras and the specific license plates. The illumination wavelengths of a system may also have aexplicitimpactontheresolutionaswellasthe efficiencyofa read in thesesituations.

We describe the ALPR technology, on the different types of number plates used in different countries across the world and in different states within India. We will also give description about images, pixels, sub pixels, mega pixels, RGB Color Model and major graphic file formats. Our proposed method has been supported by screenshots, performanceanalysistablesandcharts

our average efficiency rate, which is a clear indication of the capability and quality of our algorithm.

3. PREVIOUSWORK

License plate recognition was invented in the year 1976 in UK at the police scientific center. Various researches have been conducted over the years by citing different journals, conference papers, books and gathering information from other resources in this field of research for detecting vehicle license plate. The primary steps involved in this research are-capturing image, image preprocessing, VLP localization, VLP authentication.

To mention a few descriptions of the previously done researches:

A way to create an ALPR system using the machine learning approach was suggested by Bagade, Kamble, Pardeshi, Punjabi and Rajpratap Singh [1]. After getting the image what they did was, preprocessing, number plate localization, edge detection, character segmentation, pre- recognition character enhancement and character recognition. What they did was they removed all the background noise from the image at the beginning, which enhanced theirproject

Hung and Hsieh suggested a real-time mobile vehicle plate recognition and detection system [2]. They started with

background filtration, which was followed by license plate detection and character segmentation. The used the wavelet transformation and projection method to detect the location of the license plate correctly. First a rough location is detected for the license plate, which is followed by an accurate location of the license plate, and character recognitionprocedure.

Automatic number recognition system by Badr, Abdelwahab, Thabet and Abdelsadek also proposed a four stage algorithm consisting of preprocessing, license plate localization, character segmentation and character recognition [3]. The preprocessing applies filters to the image in order to enhance the dark values in the picture. Then the license plate is located and character segmentation is performed on the image operated upon. Finally character recognition is done and the result is received.

Shidore and Narote proposed an algorithm to recognize Number plates of Indian vehicles [4]. First, they performed vertical edge detection, followed by plate area detection and true number plate extraction. They cutoff the extra area of the image and only consider the number plate portion of the image for evaluation. Then character segmentation is performed where the character region is enhanced and vertical projection analysis is done for the characters to be recognized.

A smart vehicle number plate detection

system for different countries was designed by G. Naveen Balaji and D. Rajesh [5]. First, they selected an optimal frame and extracted the license plate, then they isolated the characters and identified the characters separately. They used an ant colony optimization algorithm for segmentation to get a better result in number plate detection. Elimination of noise from the image is again an important step in their algorithm, which is followed by license plate localization and character segmentation.

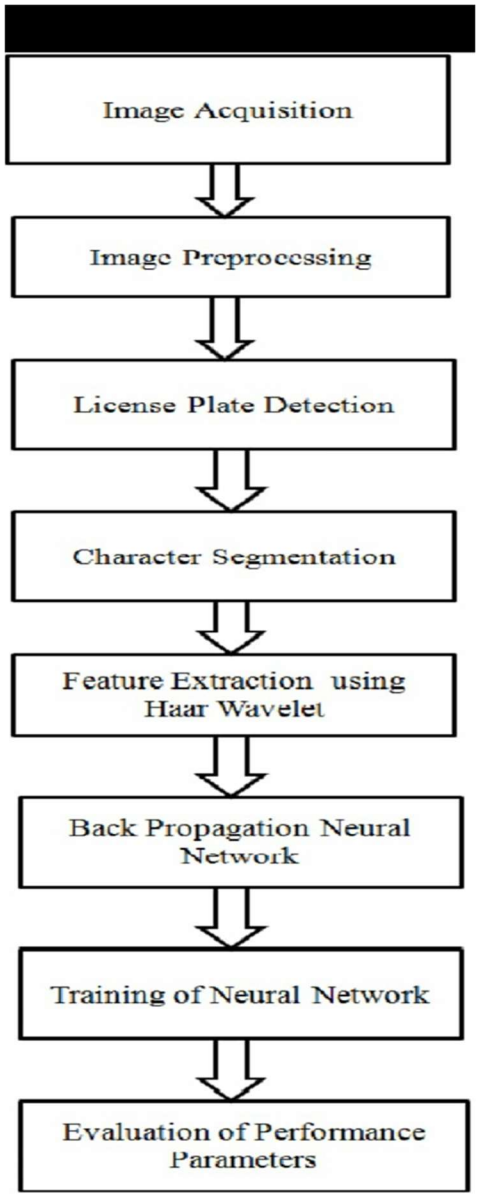
Zhang [6] used Hough Transform for character segmentation. Using this, the plate area's horizontal edges were decided, helping the characters to segment with large rotation. Characters were segmented with the help of prior knowledge of the plate model using vertical projection analysis.

It has been observed from the survey that there are certain short comes regarding the proposed algorithms:

Poor image resolution and less efficiency
Computational cost is comparativelyhigh.
The plates of the vehicles lackstandard.
Some characters may not be recognized if their organization is notproper.

Hence the suggested methodologies will give a clear idea of our research for better outcomes.

4. flowchart:



5. ALGORITHM PROCEDURE

1: Begin

2: Input: Original Image

3: Output: Characters

4: Method: K-Nearest Neighbors

5: LP: License Plate

6: Finding all contours in image

7: Search & recognize all possible character in image

8: Crop part of image with highest candidate LP

9: Crop the LP from original image

10: Apply steps from 6 again on crop image

11: Print the characters in LP

12: End

Algorithm

```
import cv2
import pytesseract
import numpy as np


pytesseract.pytesseract.tesseract_cmd = r'C:\Program Files\Tesseract-OCR\tesseract.exe'
cascade = cv2.CascadeClassifier("haarcascade_russian_plate_number.xml")
states={"AN":"Andaman and Nicobar","AP":"AndhraPradesh","AR":"Arunachal Pradesh","AS":"Assam","BR":"Bihar","CH":"Chandigarh","DN":"Dadra and Nagar Haveli","DD":"Daman and Diu","DL":"Delhi","GA":"Goa","GJ":"Gujarat",
"HR":"Haryana","HP":"HimachalPradesh",
"JK":"Jammu and Kashmir","KA":"Karnataka","KL":"Kerala","LD":"Lakshadweep","MP":"Madhya Pradesh","MH":"Maharashtra","MN":"Manipur","ML":"Meghalaya","MZ":"Mizoram","NL":"Nagaland","OD":"Odissa","PY":"Pondicherry","PN":"Punjab","RJ":"Rajasthan","SK":"Sikkim","TN":"TamilNadu","TR":"Tripura","UP":"Uttar Pradesh",
"WB":"West Bengal","CG":"Chhattisgarh","TS":"Telangana","JH":"Jharkhand","UK":"Uttarakhand"}
```

```
def extract_num(img_name):
img = cv2.imread(img_name)  # Reading Image
   # Converting into Gray
   gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
   # Detecting plate
nplate = cascade.detectMultiScale(gray, 1.1, 4)
   for (x,y,w,h) in nplate:
      # Crop a portion of plate
a,b = (int(0.02*img.shape[0]), int(0.025*img.shape[1]))
      plate = img[y+a:y+h-a, x+b:x+w-b, :]
      # make image more darker to identify the LPR
      # iMAGE PROCESSING
      kernel = np.ones((1, 1), np.uint8)
      plate = cv2.dilate(plate, kernel, iterations=1)
      plate = cv2.erode(plate, kernel, iterations=1)
plate_gray = cv2.cvtColor(plate,cv2.COLOR_BGR2GRAY)
      (thresh, plate) = cv2.threshold(plate_gray, 127, 255, cv2.THRESH_BINARY)
      # Feed Image to OCR engine
      read = pytesseract.image_to_string(plate)
      read = ''.join(e for e in read if e.isalnum())
      print(read)
      stat = read[0:2]
      try:
         # Fetch the State information
print('Car Belongs to', states[stat])
      except:
print('State not recognised!!')
      print(read)
      cv2.rectangle(img, (x, y), (x + w, y + h), (51, 51, 255), 2)
      cv2.rectangle(img, (x, y - 40), (x + w, y), (51, 51, 255), -1)
      cv2.putText(img, read, (x, y - 10), cv2.FONT_HERSHEY_SIMPLEX, 0.7, (255, 255, 255), 2)
      cv2.imshow('PLate', plate)
      # Save & display result image
      cv2.imwrite('plate.jpg', plate)

   cv2.imshow("Result", img)
   cv2.imwrite('result.jpg', img)
   cv2.waitKey(0)
   cv2.destroyAllWindows()


# Let's make a function call
extract_num('image/maha30.jpg')
```

6. Merits:

advantages

Added security

ANPR largely acts as a deterrent. The knowledge that their number plate is being recorded and checked is usually enough to stop criminal behaviour in advance. ANPR is also useful for the police, who can browse the data collected and check for suspicious vehicles, or vehicles that were involved in a crime. Thanks to the need to store the data for a short while, ANPR data can provide both alibis and incriminating data. ANPR also provides security on a lower level, such as open workplace parking where it can manage permit parking for staff vehicles, or recognise a vehicle that has previously been banned from your premises. ANPR offers an extra measure of security for both public and private use.

Automated service

anPR cameras are an efficient and cost-effective way to monitor parking solutions. In car parks, they negate the need for parking wardens. Thanks to their high-accuracy readings and 24/7 operation, they are more efficient than most individuals and therefore provide a more dependable service. They also offer a confrontation-free parking solution, which some have found to be beneficial when delivering fines to drivers. Parking management teams often find that both traffic personnel and ANPR cameras work well together, especially in traffic and parking enforcement, where staff can rely on ANPR to provide the necessary information, minimising the time they spend on the streets.

Real-time benefits

ANPR is beneficial to many industries thanks to the real-time imaging it offers. Historically, number plate recording would take time, and then longer still to send out penalty notices to those who violate traffic laws. With ANPR however, number plates can be recognised and checked against the database almost instantaneously. From this, it takes as little as 48 hours to issue a penalty notice. The fast nature of these cameras allows for an immediate response to criminal activity, making sure no unwanted behaviour goes unchecked.

7. Disadvantages

Privacy concerns

Using ANPR cameras raises privacy concerns for many people, who dislike the idea of their data being stored for months. There is the concern that storing information could lead to data leaks and theft, or misuse of their personal information. People also dislike the idea of their whereabouts being known at all times. However, ANPR is not considered an infringement on an individual's privacy, and the data is always stored securely and should only be accessed for good reason by a senior official.

Extreme circumstances

While a great addition to a car park, ANPR is not a fool-proof method. ANPR cameras may struggle to work in adverse weather conditions, such as heavy rain, or snow, where the number plate is obscured or distorted. These cameras also rely on sensible driving from cars. For example, if, when leaving the car park, you were too close to the car in front and your number plate was obscured, the cameras may not recognise that you had left, and could end up overcharging you. Not only this, some ANPR cameras are not advanced enough to recognise number plates that vary from the standard, such as vanity or foreign plates.

In these situations, it would be useful to mix both personnel and automated systems.

Human behaviour

A disadvantage of ANPR parking systems is that they rarely take into account human error and behaviour. ANPR systems do not usually consider giving a grace period when you enter a car park. This means that those drivers who enter the car park and don't find a space can be charged, as the camera saw them enter and leave, but can find no matching ticket. Similarly, a mistyped ticket at a ticket machine, for example, using the letter 'O' instead of a zero, can result in a fine, as the system cannot find a matching ticket to the number plate the cameras read

8. **Conclusion**:

A technology like ALPR is a significant tool in the law enforcement and public safety agencies. This technology can automate a tedious, distracting and manual process that officers regularly complete in their daily operations and it vastly helps to improve their efficiency and effectiveness in identifying vehicles of interest among those hundreds or thousands which they observe in routine patrol. Besides this, it generates a rich and enduring record of vehicle sightings, complete with time, date and geographic location along with the information for each of the observation. This data can greatly uplift the investigative capacity of law enforcement agencies, and greatly contribute to intelligence collection and analysis functions.

By realizing the core business values that ALPR promises, which can only be achieved with proper planning, implementation, training, deployment, use and management of technology and the information which it provides ALPR can be put to really good work. Similarly like all tools and technologies which are available to law enforcement, ALPR must also be managed very carefully. The articulate must be cleared by the agencies and their strategic goals and tactical objectives for the technology.

The quality of the data and the security of the system must be ensured to strictly enforce and develop the policies, the privacy of information gathered and the compliance with applicable laws and regulations.

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