International Journal of Engineering Technologies and Management Research

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A SFPM METHOD FOR INDIAN AUTOMOBILE RANGE PLATE RECOGNITION

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Abstract:
Automobile range plate recognition is a challenging task in cyber crime. The numbers are stated of being in the automobile range plate, that is different shape and pattern in different countries. In India the automobile range plate uses white as background and black as foreground colour. In this paper we propose a SFPM methodology, first we find out the shape of license plate then enhance the image and calculate the characters of the license plate by using segmentations method. At the end of algorithm we apply fuzzy and pattern matching for character recognition. In our work we use two databases, first database store different-2 alphabet format and second database store a different-2 format of number.

Keywords: *Gray Image; Segmentation; Image Classification; Fuzzy System; Pattern Matching.*

Cite This Article: Ashok Kumar Shrivastava. (2018). "A SFPM METHOD FOR INDIAN AUTOMOBILE RANGE PLATE RECOGNITION." *International Journal of Engineering Technologies and Management Research,* 5(2:SE), 35-42. DOI: 10.29121/ijetmr.v5.i2.2018.611.

1. Introduction

Automatic range plate recognition (ARPR) could be a method that uses optical character recognition on pictures to scan automobile registration plates. It will use live television, road-rule social control cameras, or cameras explicitly plan for the task. ARPR is employed by police forces around the world for enforcement function, together with to ascertain if a automobile is registered or authorized. It's conjointly used for electronic toll assortment on pay-per-use roads and as a technique of cataloguing the motion of traffic as an example by highways agencies.

Automatic range plate recognition is wont to store the pictures captured by the cameras yet because the text from the registration plate, with some configurable to store a photograph of the driver. Systems usually use infrared lighting to permit the camera to require the image at any time of the day.[1][2][3] ARPR technology should take into consideration plate variations from place to place.

Issues regarding these arrangements have targeted on quietness panic of presidency pursuit citizens' motions, misidentification, high delusion rates, and inflated government defrayment. Critics have delineated it as a variety of mass police work.

Today crime is a big problem and vehicles play an important role of any type of crime in India. We know that day to day simultaneously vehicles and vehicles related problem are increasing very fastly. Problems are such that theft, kidnapping, murder, vehicle theft, vehicle hit & run etc. sometimes you spot a suspicious vehicle on the street or on private property such as junk yard or parking lot and may have to wait several days for information concerning it. Leave it parked where you found it but put an identifying mark on it. So numbers of vehicles are played a key clue for criminal detection in all most cases.

A license number (RTO Registration No.) recognition system has provided much to yield the good results in identification and recognition of checking vehicles status at any place. The number plate recognition system of any type of vehicle consists of three important part: first it is called license plate location, second is called license plate segmentation and third character recognition.

The identification and recognition of any type of vehicle license plate stage to effective in the accuracy of an SFPM system. The input of the SFPM organisation is any type of automobile picture, and the result image is a portion of the picture incorporates the license plate [2]. We know that the license plate can exist anyplace in the image of vehicle. In West Bengal, a state of India, the traffic management system developing on each successive day [3]. In India most of the number plate consist white background with black foreground colour for personal automobile and for the commercial automobile used yellow as background and black as foreground colour. The number plate having two character for representing "state code" followed by two digit numeral followed by single letter after those four succeeding digits as shows in the below figure1[1, 2, 3].

2. Background

There square measure varied of technique for the range plate detection and recognition system. For real time exercise, the necessary task is that the machine time of the rule. However, there's continually a trade-off between machine time and performance rate. A stronger performance rate can usually want more machine time [1].

Figure 1: Sample of automobile range plate

Figure 2: (a) Single row automobile range plate (b) Double row automobile range plate

For range plate detection or localization, techniques supported edge data point and mathematical morphology provides a awfully sensible outcome as reported in Bai and Liu (2004) work. They use vertical edge data, calculate the sting density of the picture and followed by morphology ways like dilation to extract the area of interest. This method works well because of the actual fact that range plate continually encompasses a high density of vertical edge. To boot, this technique is appropriate to be enforced once the camera is fastened to urge best photograph to the automobile [3]. A photograph is taken into account sensible once it's taken underneath intense lighting condition, right angle and also the automobile range plate and its character is showing high distinction to every alternate. However, this rule is tough to be employed during a complicated background since it's influences to unwanted edge up background which can puzzled the system.

Color based mostly method square measure planned by Dai et. al. (2001) and Paolo et. al.(1995). This method executes well once the lighting state is constant however period application sometimes has varied lighting illumination. Moreover, the planned technique is country such as a result of every country can have totally different code for vehicle range plate [4].

In Oz and Ercal (2005) analysis, connected component analysis (CCA) technique is employed to discover the range plate region. CCA is helpful for easier the detection task. It labels binary picture into many element supported their property. The criterion to see whether or not pixels square measure connected relies on 4-adjacency or 8-adjacency of pixels property. CCA works along side spatial mensuration and filtering provides an honest end in range plate detection. Spatial mensuration refers to mensuration of spatial features of linked part like space, orientation, ratio et al. Filtering works to remove distinct or undesired elements. The rest of element square measure the potential candidate of automobile range plate.

Besides, a straightforward horizontal examine of the picture by yearning for the majority of continuation brightness changes is that the technique employed in Kong et. al. (2005).A range plate continually has important number of brightness changes due the transition from the character to background and contrariwise. This technique needs the automobile range plate to be parallel to the picture's horizontal level for achieving best detection rate. Partial row scanning is associate updated technique to avoid wasting the machine power and time. It scans solely in N-row distance rather than all of the image's rows.

There are some image transformation techniques have been enforced in range plate detection. Hough remodel enforced by Duanet. al. (2005) provides an honest result. However, it's reported that this technique utilize high machine power and so it's not appropriate to be enforced in real time. Gabor filter is enforced by Kahramanet. al.(2003). Gabor filter could be a sensible tool to research texture in unlimited range of directions and scales however it's time overwhelming

technique. Wavelets remodel that is enforced by Hsiehet. al. (2005) is found to be slow too though it provides an honest result.
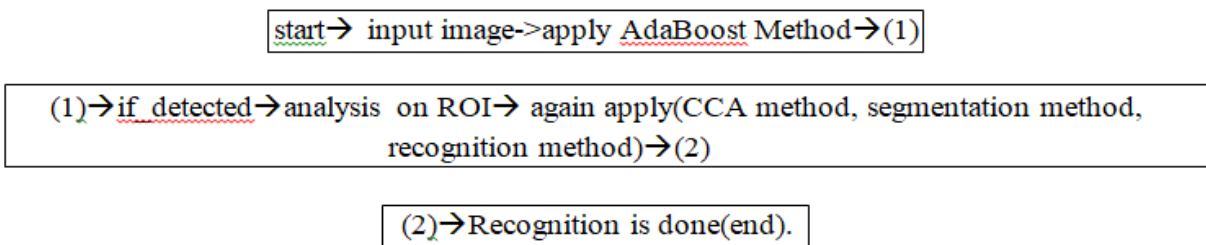
start→ input image->apply AdaBoost Method→(1)

(1)→if_detected→analysis on ROI→ again apply(CCA method, segmentation method, recognition method)→(2)

(2)→Recognition is done(end).

Figure 3: Basic of CNPR system

3. Materials and Methods

The recognition procedure of the SFPM algorithm is very accurate and effective. In this work we used two database, the first database is stored all possible format of alphabet like A, a, a, a, a, a, a, a, a, a, a, a, a etc. and second database stored 0, 0, 0, 0, etc.

In SFPM algorithm, first of all it is applied segmentation method on enhance image and then extract the digits like m,p,0,7..etc. After that here we are done two successive method fuzzy and pattern matching.

SFPM Algorithm:-

Algorithm:-

Input- vehicle input image
Output- recognized the vehicle image

Note:-
     Here we used two databases.

Dalt= database of alphabets
Dalt=(Dalt1, Dalt2, Dalt3,…….. Dalt27)

Dnum= database of numbers
Dnum=(Dnum0, Dnum1, Dnum2…… Dnum9)

Step1 – The captured the image by CCTV camera or other sources.
Step2- read the image and selected number plate of vehicle and it is storing in variable for further process.
V1=Imread_function('vehicle_image')
V_fi=crop_function(V1)

Step3- Apply segmentation for extract and save the digit of the vehicle number plate.

Seg_digt(a, b, c, d, e, f, g, h, I, j)   =Morphi_function(Vi_fi)

Step4- All digits are separated in two form alphabet and number.

Gp1= group of alphabet
Gp2= group of number

Note- for example MP07CA1077

First_ group= (M P C A)
Second_group= (0 7 1 0 7 7)

Step5- The groups compared with corresponding database by using fuzzy and PM.

Fuzzy-set_alpt= (Fuzzy_a, Fuzzy_b, Fuzzy_c, …..Fuzzy_z)
Fuzzy-set_num= (Fuzzy_0, Fuzzy_1, Fuzzy_2, ….. Fuzzy_9)
Where
Fuzzy_a=(a1, a2, a3,…………………………a30)
Fuzzy_b=(b1, b2, b3,………………………b30)
Fuzzy_c=(c1, c2, c3,…………………………c30)
.
.
Fuzzy_z=(z1, z2, z3,…………………………z30)

Fuzzy_0=(f01, f02, f03,………………………f020)
Fuzzy_1=(f11, f12, f13,………………………f120)
.
.
.
Fuzzy_9=(f91, f92, f93,………………………f920)
Recognize_1=Compare_function(Gp1, Fuzzy-set_alpt)
Recognize_2=Compare_function(Gp2, Fuzzy-set_num)
Recognition(template)=(Recognize_1, Recognize_2)

Step6- at the end we are achieved the result as recognition of the vehicle. The result either may be one vehicle number or probable of vehicle number.

The results section should provide details of all of the experiments that are required to support the conclusions of the paper. The section may be divided into subsections, each with a concise subheading.

It is advised that this section be written in past tense. It is a good idea to rely on charts, graphs, and tables to present the information. This way, the author is not tempted to discuss any conclusions derived from the study. The charts, graphs, and table should be clearly labeled and should include captions that outline the results without drawing any conclusions. A description of statistical tests as it relates to the results should be included.

4. Results and Discussions

Our work is implemented in matlab7.10 and these algorithms apply on 100 Indian vehicles. First we captured the image by CCTV camera and after apply SFPM algorithm for recognize the vehicle number.

So in SFPM algorithm we improve the image quality of crop image of number plate. After that applying the segmentation method on the number plate image and at time we gathered the individual digit. All digits are separated in the group of number formats and group of alphabet formats. Finally both group are matched with two pre defined database by fuzzy and pattern recognition system.

Figure 4: A set of query for testing

Experiment on another original image

Crop Query Image   Gray Image

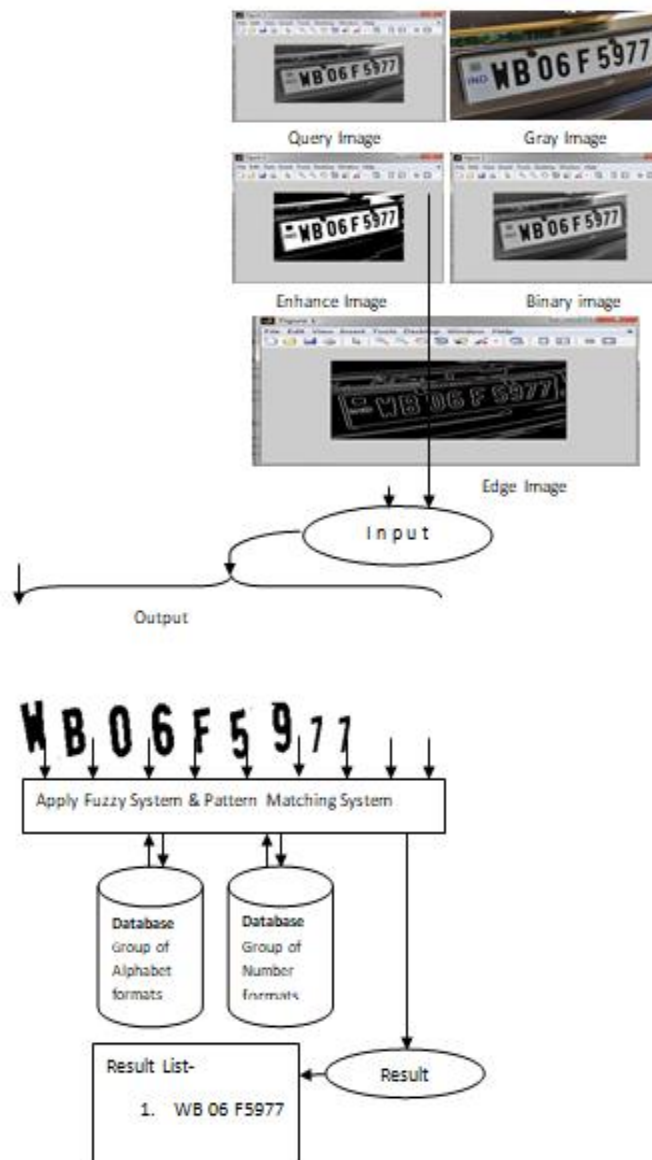Enhance Image   Binary image
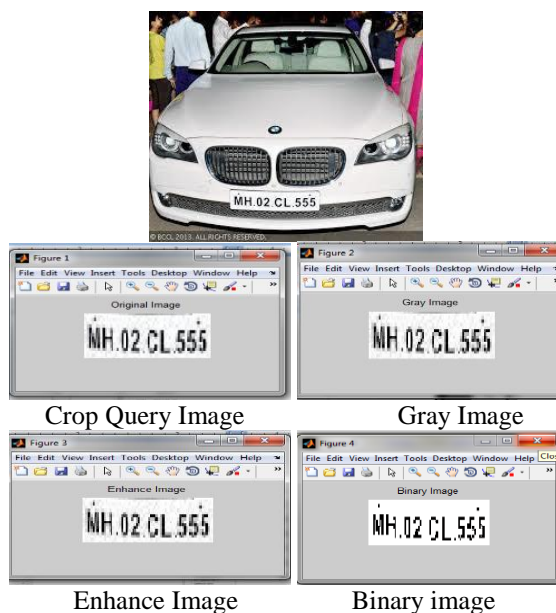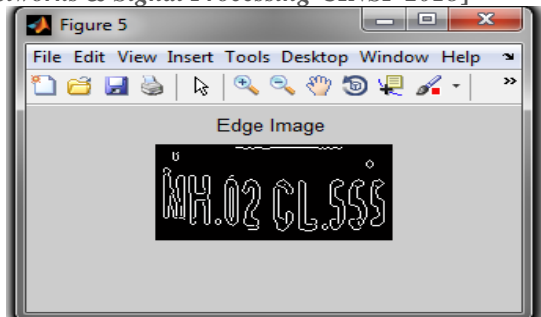
Edge Image

Table 1: showing the recognition of some vehicles number and also present the similar number

S. No.	Vehicles Recognition Status	Vehicles Number	Getting Similar Number
1	Recognized	WB06 F5977	0
2	Recognized	MH02 CL555	0
3	Not Recognized	MH15 BD8877	0
4	Recognized	MH12 DE1433	0
5	Not Recognized	----------------	3
6	Recognized	MH04 ZZ0000	0
7	Recognized	KA03 MB2784	0
8	Recognized	DL1Y A3550	0
9	Recognized	MP07CA1077	0
10	Not Recognized	------------------	7

Recognized number of Vehicles=189
Not Recognized number of Vehicles=11
Getting less than 50 Similar Number of Vehicles=7
Recognition rate (in %) = (Total Recognized/ Total sample)*100
= (189/200)*100
        Recognition Rate (in %) = 94.5%
FAR (in %) = (False Acceptance / Total sample) *100
= (7/200)*100
False Acceptance Ratio (in %) =3.5%

5. Conclusions

Our experiment with recognition of vehicles number show that a solution of vehicle crime. We proposed a SFPM methodology that showed a very effective result with high recognition rate because here we have merged the footing concept of fuzzy system with pattern matching. Here fuzzy system provides a list of possible variation in digit and after it is done by patterns matching.

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