

Number Plate Detection Using Optical Character Recognition

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Abstract - Number Plate Recognition using OCR (Optical Character Recognition) or ANPR (Automatic Number Plate Recognition) is a system designed to help in recognition of number plates of vehicles. This system is designed for the purpose of the security and it is a security system. This system is based on the template matching using correlation technique of image processing. This system helps in the functions like detection of the number plates of the vehicles, processing them and using processed data for further processes like storing, allowing vehicle to pass or to reject vehicle. This system also helps to conduct the graphic images of the vehicles which can be further stored in the database in text format reducing size of data to be stored.

Index Terms: OCR, ANPR, correlation.

1. INTRODUCTION [9]

Massive integration of information technologies into all aspects of modern life caused demand for processing vehicles as conceptual resources in information systems. Because a standalone information system without any data has no sense, there was also a need to transform information about vehicles between the reality and information systems. This can be achieved by a human agent, or by special intelligent equipment which is able to recognize vehicles by their number plates in a real environment and reflect it into conceptual resources. Because of this, various recognition techniques have been developed and number plate recognition systems are today used in various traffic and security applications, such as parking, access and border control, or tracking of stolen cars.

At entrance gate, number plates are used to identify the vehicles. When a vehicle enters in input gate, number plate is automatically recognized and stored in database and black-listed number is not given permission. When a vehicle later exits the place through the gate, number plate is recognized again and paired with the first-one stored in the database and it is taken a count. Automatic number plate recognition systems can be used in access control. For example, this technology is used in many companies to grant access only to vehicles of Authorized personnel.

In some countries, ANPR systems installed on country borders to automatically detect and monitor border crossings. Each vehicle can be registered in a central database and compared to a black list of stolen vehicles. In traffic control, vehicles can be directed to different lanes for a better congestion control in busy urban communications during the rush hours.

2. HISTORY [12]

ANPR was invented in 1976 at the Police Scientific Development Branch in the UK. Prototype systems were working by 1979, and contracts were let to produce industrial systems, first at EMI Electronics, and then at Computer Recognition Systems (CRS) in Wokingham, UK. Early trial systems were deployed on the A1 road and at the Dartford Tunnel. However it did not become widely used until new developments in cheaper and easier to use software was pioneered during the 1990s. The first arrest through detection of a stolen car was made in 1981 and the first documented case of ANPR in helping solve a murder occurred in November 2005 after the murder of Sharon Beshenivsky, in which City of Bradford based ANPR, played a vital role in locating and subsequently convicting her killers.

3. OBJECTIVES [4, 5, 6, 7]

1. To be familiar with image processing technique for detection of Number plate area.

2. To be familiar with OCR.
3. To be familiar with MATLAB software.
4. To interface hardware using serial port of the computer.
5. To develop a line tracking robot, which can move in a guided track and detect the closed door using IR.?
6. To be familiar with Microcontroller and related components for building automatic robot.
7. To know assembly level programming language and implement it in ALR.
8. To develop a security system.

4. SYSTEM BLOCK DIAGRAM [9, 10, 11]

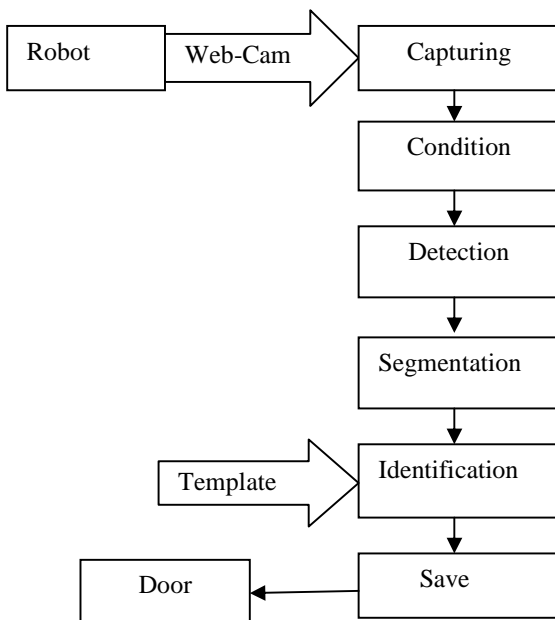


Fig 1. System block diagram

The system is developed as a security system & Figure 1 shows the block diagram for this system. The vehicle is a Robot which contains number plate. The webcam is fitted in the door and when robot comes in front of it, it detects and captures the image of robot along with the number plate. The computer loaded with MATLAB software processes the image and saves the number plate in text file along with date and time. Then it sends command to serial port of the computer and with the circuitry along with serial port, the door is opened. When vehicle enters the gate, it closes the door.

5. TEMPLATE MATCHING [1, 4, 8]

We are making ANPR system. In which real time images are processed to track the image and translate to word format. A template matching using correlation is the technique applied. It's coded in MATLAB. Technique used in classifying objects. Template matching techniques compare portions of images against one another. Sample image may be used to recognize similar objects in source image. If standard deviation of the template image compared to the source image is small enough, template matching may be used. Templates are most often used to identify printed characters, numbers, and other small, simple objects. The matching process moves the template image to all possible positions in a larger source image and computes a numerical index that indicates how well the template matches the image in that position. Match is done on a pixel-by-pixel basis.

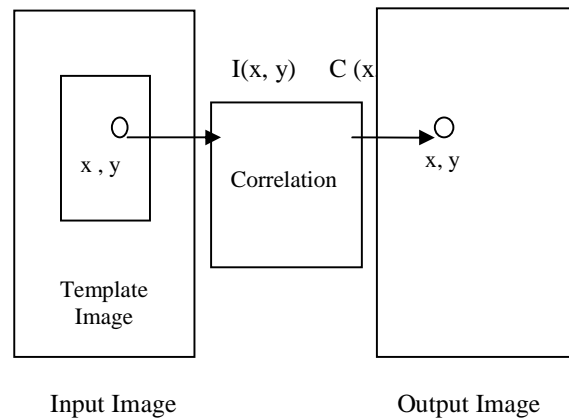


Fig 2. correlation diagram

Correlation is a measure of the degree to which two variables agree, not necessary in actual value but in general behavior. The two variables are the corresponding pixel values in two images, template and source.

6. ALGORITHM[1,2,3]

Algorithm for ANPR system

1. Input image from webcam.
2. Convert image into binary.
3. Detect number plate area.
4. Segmentation.
5. Number identification.
6. Save to file in given format.

6.1 Input image from file

1. Capture image from webcam..
2. Store the captured image into a image file for

further processing.

Figure 3 shows the input image from webcam.



Fig 3..Input image from source file or webcam

6.2 Convert image into binary

Figure 4 shows the binary image & steps for conversion of input image to binary are shown by below flowchart.

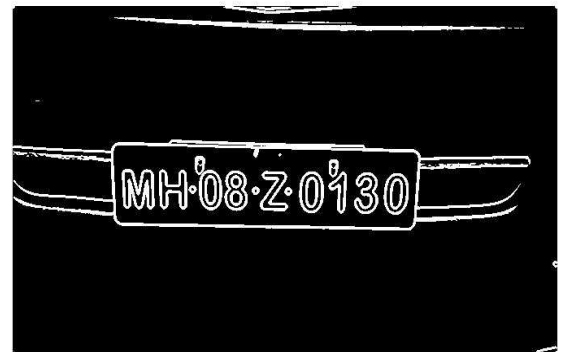
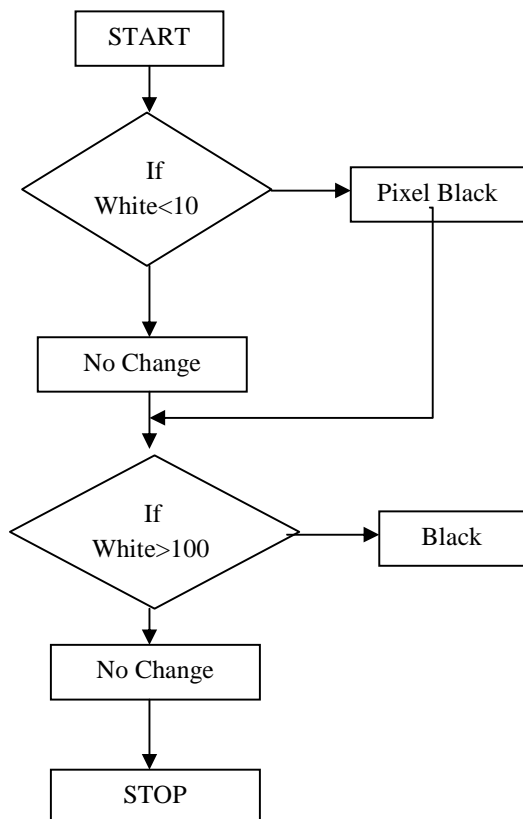


Fig 4 .Binarized gray scale image.

6.3 Detecting number plate area

1. Fill small holes including numbers of Number plate so that number plate area will be large to isolate from figure.
2. Determine width and height of the image.
3. Scan each pixel of line counting number of white pixels in the following system,

If number of 'white' pixels < x; pixels become 'black'
 Else; no change

If number of 'white' pixels > y; pixels become 'black'
 Else; no change

The value of x and y may be changed according the i mage intensity and plate area.

4. Use the step no. 3 for both horizontal and vertical direction.

5. Check number of possible areas.

If number of areas > 1

Select suitable area

6. Logically AND with binary image obtained at "Convert image into binary" algorithm.

7. Crop the required area.

Figure 5 shows the image obtained after detecting number plate area.



Fig 5. Number plate detection

6.4 Segmentation

1. Filter the noise level present in the image.
2. Clip the plate area in such a way that only numbers of plate area extracted.
3. Separate each character from the plates.
4. Detecting number plate area

6.5 Number plate identification

1. Create the template file from the stored template images.
2. Resize image obtained from segmentation to the size of template.
3. Compare each character with the templates.
4. Store the best matched character.

6.6 Save to file in given format

1. Open a text file in write mode.
2. Store the character obtained from the number identification process to text file in given format.
3. Close the file.

Figure 6 shows the numbers detected & displayed in notepad.

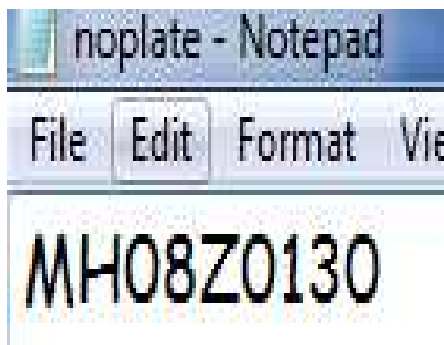


Fig 6. Number plate detected in notepad

the character recognition. In this work, we proposed and designed the algorithm for detection of characters from number plate. Template matching method is used in this work. The number plate detected is displayed in notepad so it becomes easy for buffering of information. This system can be implemented at toll stations to make them totally automated. The database in text format can be created at each toll station to avoid manual entry of each vehicle & the waiting time of vehicles at toll station is reduced.

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7. CONCLUSION

The vehicle information is obtained from License Plate Recognition System. The recognition and extraction of the license plate is successfully done by