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Automatic Number Plate Recognition System for Vehicle Identification using Optical Character Recognition

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Abstract: ***Automatic License Plate Recognition (ANPR) is an image processing technology that uses a license plate to identify the vehicle. The goal is to design an efficient automated vehicle identification system using the vehicle license plate. The system is implemented at the entrance of the security control of a highly restricted area, such as the military zones or the area around the main government offices, for example. Parliament, Supreme Court, etc. The developed system spots the vehicle and then captures the vehicle image. The region of the vehicle's plate is extracted using the segmentation of the image into an image. The optical character recognition technique is used for character recognition. The resulting data is used to compare it with records in a database for specific information such as the owner of the vehicle, place of registration, address, etc. in real image. It is observed in the experiment that the developed system successfully detects and recognizes the vehicle's plate in real images.***
Keywords: Number Plate Recognition; vehicle identification; optical character recognition; Character Recognition

I. INTRODUCTION

Automatic number plate identification (ANPR) system It has been a practical technique in the past decades. A type of Intelligent Transportation System (ITS) The technique is automatic number plate recognition (ANPR) which can separate each vehicle as unique Identifying the characters of the number plates. Finds automatic number plate detection system Just to fit the wide variety of applications to yourself Controlling access to a toll collection point or parking very. In the ANPR, a camera vehicle captures images And a computer processes them and recognizes them. Information on number plate by applying various applications Image Processing and Optical Character Recognition Technique. Before character recognition, Number should be separated from plates Background vehicle images. This work is considered The most important step in the ANPR system is Affects overall accuracy and processing speed Importantly the whole system Because there are Bad image quality, image problems Perspectives distortion, other untimely or reflection on the surface of the vehicle, and color similarity Between the number plate and the background vehicle Body, number plate is often difficult to be located Accurate and efficiently Generally the vehicle number Plate detection is divided into several steps Number plate extraction, including image area Contains a number plate, character Division, and character recognition In general, To identify vehicle number plate, Area of the number plate should be removed Accurate detection of vehicle image plate area The process required to go to the stage of the character is Recognition There are two main ways to remove Number plate area,

II. SYSTEM MODEL

The overall ANPR system can be divided into software models and hardware models. The section will discuss in detail in both the models.

A. Software Model

The main and most important part of this system is the software model. The software model uses a series of image processing techniques that are implemented in MATLAB 7.0.1. The ANPR algorithm is broadly divided into three parts: • Capture Image • Remove the plate from the image • Identify numbers from the extracted plate The first step is to capture an image using a PC-connected USB camera. The images have been captured in RGB format, so this number can be further processed for plate extraction. The second stage of the ANPR algorithm is the extraction of number plate in the image. A yellow search algorithm is used to extract the possibility ROI in an image. Since the official number of Sindh is yellow background with alphanumeric character written in black in the plate, Therefore it is easy to spot plate area by searching yellow pixels. The image is search for

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yellow pixels or something that is close to yellow value. If the pixel value is yellow, then the pixel is set to 1, otherwise the pixel value is set to 0. The image taken after the search algorithm is in the form of black and white format. After identifying ROI, the image is filtered using two different filtering techniques The first technique involves deleting all white patches which are connected to any limit and set their pixel value to 0. The second filtering technique uses the pixel counting method to remove small areas in the image other than the plate area. The number of continuous white pixels is inspected and in areas where the number of white pixels less than the predefined threshold is set to 0.In this stage only the vehicle number plate is in the image. Blurred algorithms [x] are used after removing number plate in an image. Smearing algorithm is the discovery of the first and last white pixels starting from the top left corner of an image. Then the image crushes, in which only the vehicle number is the plate. The third phase of the developed ANRP algorithm uses optical character recognition (OCR) algorithms to identify the vehicle number. The resultant crop image obtained after the second stage is reversed i.e. all white pixel black and black pixels are converted into white. Now the text is white and the plate background is black. Before inserting the OCR, separate rows in the text are separated using the line separation process.Line isolation adds the line to each pixel value. If the result of the resulting row is zero, which means that a line is not present in the pixel line and if the resulting row is more than the line, it means that the text exists in the line. The first result greater than zero represents the beginning of the line and after that represents the end of the first resultant sum line equal to zero. In the line, the starting and ending value of the line is used to crop the starting line.The same process is going to separate the second line in the text. Once the lines have been separated in a plate number drawn, the line separation process is now implemented according to the column so that the individual character can be separated. Different individual characters are stored in different variables. OCR is now used to compare each individual character against the complete alphabet database. OCR actually uses correlation method to match the individual character And finally the number is recognized and stored in string format in a variable. The string is then compared to the stored database for vehicle authorization. The resultant signal is given as a result of comparisons. The full description of the software model is shown in figure 1.

B. Hardware Model

The hardware models have sensors to understand the presence of the vehicle, to capture the image, to control the barrier on a motor entrance door with the motor driver circuit, on which the algorithm is executed, and the whole of the microcontroller Microcontroller ANPR system to control the hardware. Since the vehicle enters and sits in the sensor area, Infrared sensor understands the vehicle and signs the PC through Microcontroller 89C51 to capture the image of the vehicle. The camera attached to the PC through the USB port captures the image of the vehicle. The ANPR algorithm receives the image on a PC and processing it, which generates the vehicle number. After this the number is compared to the authorized number to confirm the validity and ultimately the system provides signals to the microcontroller to control the hardware. If there is an authorized number in the input plate, the obstruction on the entry will be raised using the motor, the green signal will be turned on the lights and will appear on the 'Access Approved' display, and if the input plate has unauthorized number then do not obstruct Will be red.

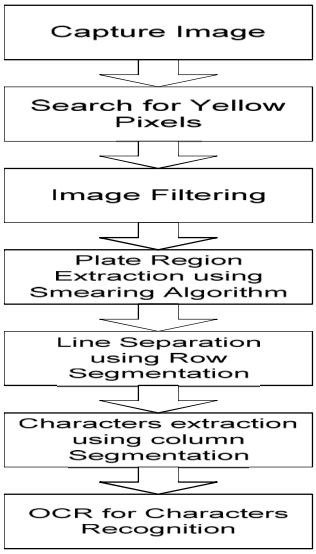


Figure 1 Steps of automatic number plate recognition software model

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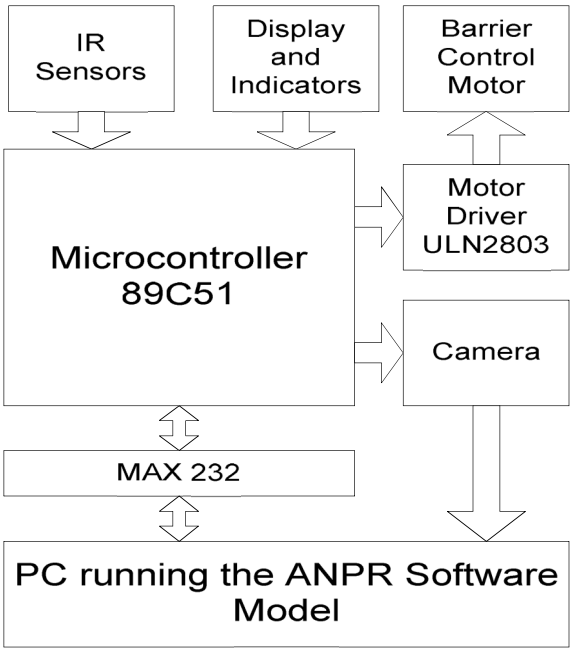


Figure 2 Hardware setup of ANPR system

III. SIMULATION RESULTS

This section provides the results of the simulation developed by ANPR system. First of all, the camera is interfaced with a PC using matlab. The camera is attached using the USB port. Various images of cars of different colors and structure types are taken and stored in PC. During processing, various effects of daylight are also considered. The images are in RGB format and the resolution is 800 x 600 pixels as shown in Fig. 3.The next step after capturing the image was the yellow search algorithm. Figure 4 shows the images after executing the yellow search algorithm. The white area represents the yellow or the color yellow in color. It can be seen that the yellow search algorithm successfully detects ROI in which only the vehicle number plate is. Blur algorithm is used to remove the vehicle number plate shown in Figure 5. After removing the vehicle vehicle plate, it is converted into binary format.Figure 6 and Figure 7 show binary and inverse binary formats, respectively. Row and column splitting methods are used next to removing individual letters in vehicle number plate. The results of row and column split are shown in figure 8 and figure 9, respectively. Finally OCR is used for character recognition and each alphabet character is shown in Figure 10.

IV. DISCUSSION

The system start works when the sensor detects the presence of car at the entrance. The micro-controller sends



Figure 3 Images taken using USB camera

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Figure 4 ROI detection using yellow search algorithm



Figure 5 Vehicle number plate extraction using smearing algorithm

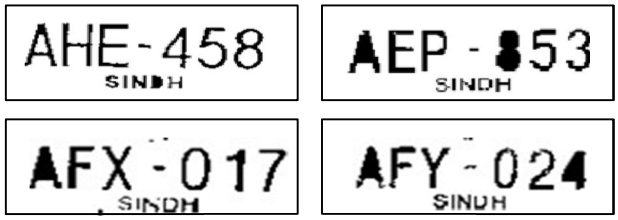


Figure 6 Binary image



Figure 7 Inverted binary image

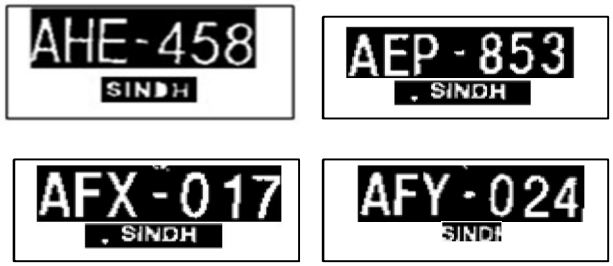


Figure 8 Line separation using row segmentation

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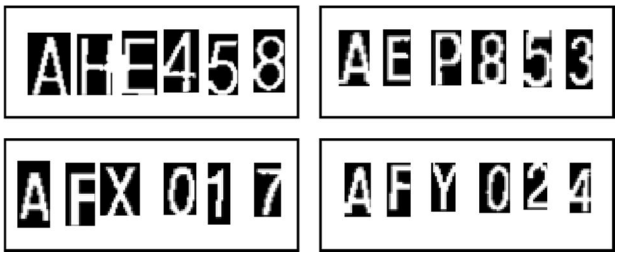


Figure 9 Character separation using column segmentation

AHE458	**AFX-017**
AEP-853	**AFY-024**

Figure 10 Recognize character using OCR

Signals to the PC to capture the image using a PC-connected USB camera The PC initiates the ANPR algorithm and identifies the vehicle authority. ANPR algorithm is tested on a large number of images with a resolution of 800 x 600 pixels. The results show that the developed ANPR algorithm successfully detects Sindh standard vehicle number plates and shows higher identification and identification rates in different days of situation. It can detect and detect vehicle plates from different distances. The size of the number plate in the image is affected by the distance of the vehicle. Once the vehicle number plate is detected, individual characters are identified using the OCR algorithm. OCR usage correlation method for character recognition and the possibility of identification can also be calculated. These system is computationally less cost and can also be used for real-time vehicle identification system.

V. CONCLUSION AND FUTURE WORK

In this paper, automatic vehicle identification system is presented using the vehicle license plate. The system uses a series of image processing techniques to identify the vehicle from the database stored in the PC. The system has been implemented in Matlab and it is tested on display on actual images. The results of simulation show that the system strongly identifies and recognizes the vehicle using a license plate against the status of different lighting conditions.

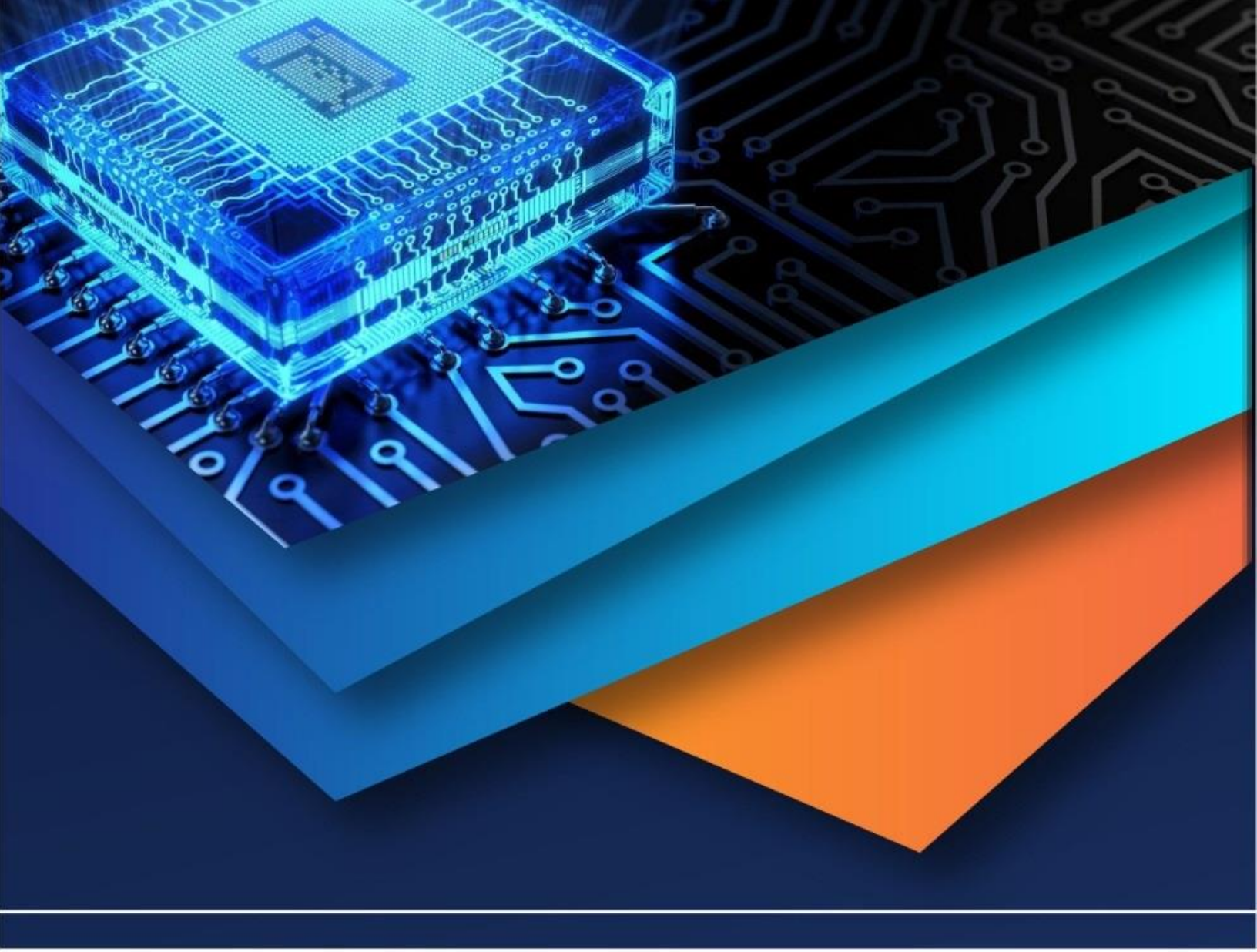
Implementation works quite well, yet there is room for improvement. The camera used in this project is sensitive to vibration and rapidly changing targets due to the long shutter time. If high-resolution camera is used, then the system can increase strength and speed. The OCR methods used in this project for identification are considered incorrectly and sensitive to different sizes,

If high-resolution camera is used, then the system can increase strength and speed. The OCR methods used in this project for identification are considered incorrectly and sensitive to various sizes, amphetameter conversion can be used to improve OCR recognition from different sizes and angles. Statistical analysis can also be used to define the probability of identification and identification of vehicle analysis plate.

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