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Automatic Number Plate Recognition System

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ABSTRACT

Automatic recognition of car number plate has become a very important in our daily life because of the unlimited increase of cars and transportation systems. Hence it is impossible to be fully managed and monitored by humans. There are so many examples like traffic monitoring, tracking stolen cars, managing parking toll, red-light violation enforcement and border and customs checkpoints. Our project will deals with problems related to artificial intelligence, neural network and machine vision in the construction of an automatic number plate recognition system. This is done using the mathematical principles and algorithms for image processing using MATLAB software. This Automatic Number Plate Recognition (ANPR) system will be based on Optical Character Recognition (OCR) system. OCR is a technique which is used for the character recognition of the characters on the number plate. In this project, we are going to design an application of ANPR which will be used on toll booth for car the theft issues and criminal monitoring.

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I. INTRODUCTION

Increasing number of vehicles in country have given the birth to the many real world based problem. The safety of common people is being compromised due to increasing in criminal activity in metro cities. To monitor and control vehicle traffic is getting difficult day by day. So to overcome this problem, help from computerized machine will be needed. To monitor vehicle traffic digital image processing will give an additional advantage of fast processing with negligible errors. The ANPR is a system designed to help in recognition of number plates of vehicles that will be helpful in controlling criminal activities. Automatic recognition of car number plate has become a very important in our daily life because of the unlimited increase of cars and transportation systems which make it impossible to be fully managed and monitored by humans. To overcome this problem ANPR system will be used on toll booth.In ANPR system which we will use on toll booth, captured images taken by using camera will send to the computer. By processing the image, computer will give licence number of vehicle by using of MATLAB software.

Then the number recognised by a computer will be compared with database. If the number is in black listed data base then computer will send command to microcontroller and the barricade remain locked. If it is not black listed then computer sends command to microcontroller to open barricades. The system is developed as a security system for TOLL BOOTH. The camera is fitted on the gate of TOLL BOOTH. When vehicle comes in front of it, trigger will be given to the system, which will send command to a camera to capture image, it detects and captures the image of vehicle along with the number plate. The computer installed with MATLAB software processes the image and saves the number plate in text file. Then it sends command on parallel port of the computer and with the help of external circuitry, barricades will be controlled. For blacklisted number plate barricades will remain close and for other it will open the barricades.

II. LITERATURE SURVEY

Authors in [1] have explained various solutions of relevant problems. The main issues in number plate recognition are climate conditions, environmental interference, and accuracy of number plate localization. One of the methods of recognizing the number plate is utilizing the color characteristics and probability distribution of the license plate between the two lights. Another popular method of number plate recognition algorithm is template matching. The License Plate Detection algorithm based on template matching was designed and written for managing the parking lot system by identifying the unregistered cars from off campus. At the same time vertical edges-based car license plate detection are popular too. However, other prefers to find the location number plate using horizontal and vertical projections of image. The Genetic Algorithm and Hough transform can be applied to detect the license plate area. At the same time, the combination of edge statistics and mathematical morphology showed good results and they use block based algorithm. Another algorithm, which is based on rows' distances counts the existent edges and if this number is more than some threshold value then number plate is recognized. Wavelet transform-based algorithm extract the important features to be used for number plate localization. The advantages of this algorithm, it will allow to find more than one number plates in the frame.

Authors in [2] have presented a new method of segmenting the characters of the license plate based on a majority pixel value data. They have also addressed the issue of building the databases as per user convenience so that the user has the option to train the neural network with the fonts those are more relevant and mostly used in any particular geographical location. This is totally optional i.e. the user can change the network if they want to for better results. This algorithm has been tested on 150 images and it is found that the accuracy of the system is about 91.59%. The major sources of error were the skewness of the number plate and extreme variation in illumination conditions, which can be aptly removed by enhancing the approach further.

Authors in [3] has proposed a feed-forward ANN-based OCR algorithm that meets the requirements of a real-time ANPR system. A parallel and pipelined architecture based on the proposed algorithm has also been presented and it has been successfully implemented and tested using the Mentor Graphics RC240 FPGA development board. The proposed architecture requires only 23% of the available on-chip resources of a Virtex-4 FPGA, runs with a maximum frequency of 65.7 MHz and is capable of processing one character image in 0.7 ms with a successful character recognition rate of 97.3% when using a database of 3570 UK character images. The 23% usage gives enough room for the entire ANPR system to be implemented on a single FPGA chip that can be placed within an ANPR camera housing to create a stand-alone unit that can drastically improve energy efficiency and remove the installation and cabling costs of bulky PCs situated in expensive, cooled and waterproof Road side cabinets.

III.EXPERIMENTAL PROCEDURE

A. Methodology:

We have built the Automatic Number plate recognition system for controlling the theft issues of cars with the help of MATLAB software, Arduino Uno kit. This system is going to be used on Toll Booth Plaza. There are two main sub parts of system after image is taken. 1st is ANPR system 2nd is Microcontroller. The Automatic Number Plate Recognition System (ANPR) provides us the exact License Plate number from image taken. This number will be sent to a comparator .Comparator will compare this number with numbers stored in memory. These numbers will be of stolen vehicles and blacklisted cars. If number is found in memory then command will be sent over parallel port to a microcontroller for controlling the barricades of Toll Booth.

B. Block diagram:

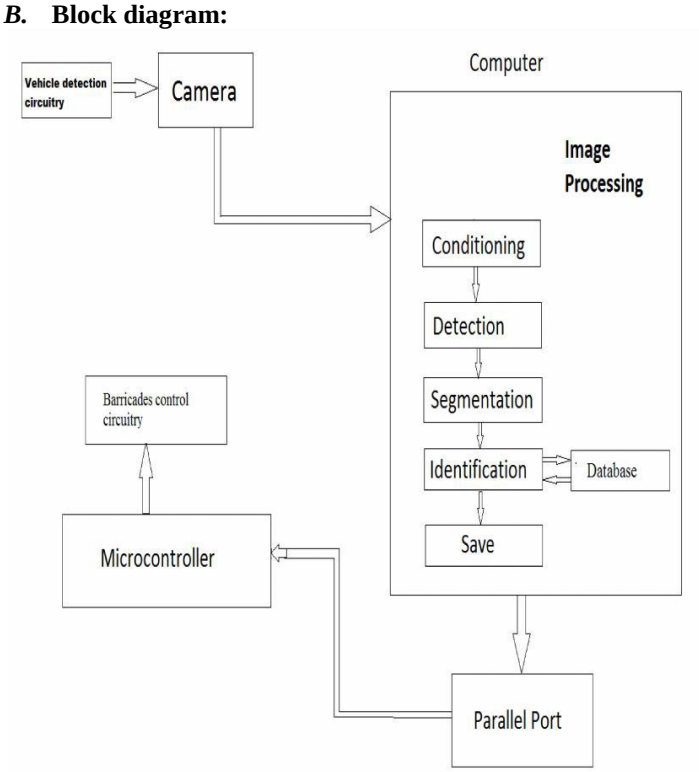

fig.1: Block diagram

The Fig.1 can be divided into three parts they are as follows:-

1) Vehicles detection circuitry and Camera
2) Microcontroller.
3) Image processing (Software flow)

1. Vehicle detection circuitry and camera

In vehicle detection circuitry we have used IR sensor that generates a signal when vehicle is in proper area where image is to be captured. We have used a camera for capturing image when vehicle is detected by the IR sensor.

2. Microcontroller

In this system we have used Arduino Uno microcontroller kit with controller ATMEGA328. This microcontroller is used as interface between image processing and hardware part (IR sensor, DC motor).

3. Image Processing

The figure no.2 shows the software flow of image processing part. Fig.3 and fig.4 shows the actual output of the software.

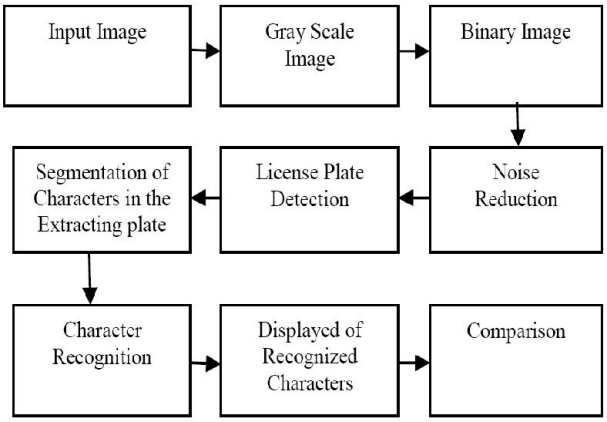

fig.2: Software Flow

1. Input image:

As Shown in fig.3.a, image captured from the camera is made suitable for the image processing by various operations like resizing, brightness adjusting and noise filtering.

2. Gray Scale:

As Shown in fig.3.b, the image captured is then gray scaled. This helps to perform binary conversion in next step.

3. Binary Image:

As Shown in fig.3.c, gray scaled image is then converted into Black and White Image and Further it converted into binary image which is in the 0's and 1's format.

4. Noise reduction:

As Shown in fig.3.d, the converted binary image is then filtered out for noise reduction. In this stage paper salt noise is removed.

5. License plate detection:

As Shown in fig.4.a, contours are detected and proper edges of number plate are filtered out from the whole image.

6. Segmentation:

As Shown in fig.4.a, after edge detection of the number plate horizontal segmentation is done. In this we segment out the each character on the number plate with the help of bounding boxes.

7. Character Recognition:

As Shown in fig.4.a, we compare the characters on the number plate with templates created in matlab software. These charters are then detected by the software.

8. Display of Number plate:

As Shown in fig.4.b, in this stage the detected characters which is the actual license number from the captured image.

9. Comparison:

The displayed number is the compared with the data base in which license numbers of theft vehicles are stored.

fig.3 (a, b, c, d): Internal stages of software outputs

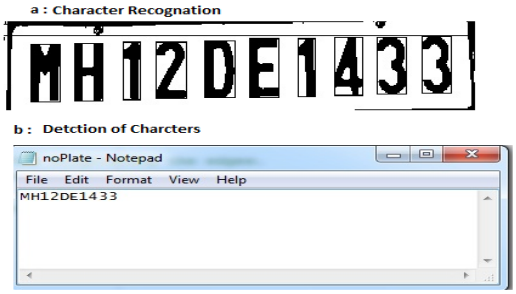

fig.4 (a, b): Character recognition & Detection

IV. CONCLUSION

Implementation of this project will surely help to law enforcement agencies for controlling theft of vehicle and blacklisted vehicle monitoring. The efficiency of the project is dependent on weather conditions and lighting conditions. System is adaptable for various fonts and number plate format used in various countries. The total time required for a system to recognise a number is less than 15sec.Time required for the image processing part is less than a second but most of the time is taken by hardware part like camera and sensor input. This system is useful for many application such as automatic parking, Real time tracking of vehicles in city and movement control over international borders.

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