

Arduino Based Vehicle Number Plate Recognition System

Poonam Dhankar¹

¹Assistant Professor
Maharaja Surajmal Institute of Technology
C-4, Janakpuri
New Delhi

Abstract - The advancement of technology is growing day by day and so is the need for them. An idea for number plate recognition is proposed in this paper. The paper aims towards building a system that uses OCR for vehicle identification. Though there are numerous systems that are available in today's world. Every system has its own methodologies like language of number plate, non-uniform vehicle number plate, background, limited routes that works in restricted conditions. The developed system first detects the vehicle and captures vehicle number plate. After the number plate is detected, it is digitized to its original characters. Next to digitization is preprocessing that enhances image quality. Security feature is also being introduced which can be improved to this system on extension.

Keywords: Arduino Uno, Image processing, Optical character recognition, Visual basic

I. INTRODUCTION

Number plate recognition is a technology that uses OCR on image to read vehicle registration to create vehicle location data. This can be achieved through the concept of image processing. Image processing is an approach to convert an image into digital form and perform some operations on it in order to get an enhanced image. It's distinguishes objects in an image which is called image recognition. NPR has 3 major parts: - Vehicle number plate extraction, character segmentation and Optical Character Recognition.

The paper is used to design an OCR system for camera based handheld devices to capture images, graphics and textual documents. The input is converted into binary form and segmented into characters after the text extraction and skew correction. This system is computationally efficient for low computational devices like mobiles, PDA, etc.[1]Arduino is an open source platform used for constructing and programming of electronics. Arduino makes things easier, due to it's simplified version of C++. It provides ease in programming, erasing and reprogramming at any given time. In this paper, it is concluded how to combine both software (IDE) and hardware to construct a new project.[2]

It has been found that some accuracy tests of dedicated hardware have shown that Arduino boards may be an inexpensive tool for psychological and neuro-psychological labs. Arduino offers hardware add-ons and free scripts for different projects. One of the key advantages of Arduinos is the possibility they afford to load the experimental script on the board's memory and let it run without interfacing with computers or external software, thus granting complete independence, portability, and accuracy. [3]

Rest of the paper is divided into various sections. Section II discusses the work related to the project. Section III derives the new system for number plate recognition and explains its procedure and related applications. Section IV gives a short procedure for applying the method for real time usage and thus discusses the results of the experiments performed on various data sets, The conclusion and the scope of the criteria involved and its advantages over conventional methods is illustrated in Section V.

II. RELATED WORK

The system is implemented through neural network and sliding concentric windows for converting pixel image to binary image. License plate recognition which is introduced in the paper can be further extended to vehicle model identification as well as under vehicle surveillance. The one license plate acquired during real time vehicle inspection is compared to the other vehicle details stored in database. [4].The system designed has many real time applications like parking accounting systems, traffic monitoring and a few in security concerns. No specific boundary constraints like size ,color or nationality of vehicle license plate taken. Threshold computation, multi resolution techniques, skew angle correction techniques are being introduced in it. [5] The paper describes an approach on how to detect a license plate in still image or video stream. The operator used to extract characters from plate background is Top hat morphological operator and Yule dissimilarity measure is used for character recognition. The system can work fine with car plates and not with scooters.[6]

The paper introduced as few constraints as possible on working environment of license plate recognition. The system is optimized for a single country and can be extended further accordingly for other countries. It consists of license plate locating module and license number identification module. The system is implemented by soft computing rooted in fuzzy disciplines and neural disciplines to prevent uncertainties caused by noise and imperfect processing.[7]

The purpose of the paper is to present an algorithm based on edge statistics and morphology for monitoring highway ticketing system. The algorithm can efficiently detect the region of vehicle license plates. The system is robust to variation of lighting conditions and different kinds of vehicles. The algorithm consists of four sections which are edge detection, edge statistical analysis, hierarchical based license plate location and morphology based license plate extraction.[8]

The paper proposed four algorithms for OCR stage of VNPR system. The proposed algorithm is based on feature extraction and template matching techniques. The algorithm is implemented using MATLAB and selected hardware is Xilinx zynq-7000 All programmable Soc which consists of PL and ARM processor (PS). Both PL and PS are used to implement template matching based algorithm.[9]

The purpose of this paper is to navigate self driving vehicles smoothly and avoiding obstacles. In contrast, the idea of intelligent car system that requires an accurate understanding of human behavior as well as modelling of human vehicle interaction. The important aspects like safety, reliability and robustness of these highly complex systems can be assured. These challenges should be addressed securely within very tight time constraints to avoid collisions or unstable operations.[10]

In this paper, different parameters like image size, success rate and processing time are considered to process output but factors like high speed of vehicle, non-uniform vehicle number plate, language of vehicle number plate, different lighting conditions can affect the overall recognition rate of the system[11]

III. PROPOSED SYSTEM

The system is designed to eliminate manual work of recognition of vehicle numbers by providing a mechanics that is fast enough to process the number of vehicle's number plate within a span of few seconds. It may ease the manual work of traffic policemen by providing an efficient system to recognize vehicle number plate.

The system provides a surveillance mechanism that can be used for controlling automobile thefts and traces the thieves at the city borders lying at the outskirts of the city. Only genuine and registered vehicles would be allowed to cross those toll booths. It additionally provides a delivery management system through the use of a self-driving car. The car uses OCR to detect the house numbers and deliver the products according to the data provided to it. It operates on a laptop or computer system with a webcam and interacts with the outside world through the webcam/surveillance camera. It then searches for number plates. After getting its clear image, it performs OCR using image processing to read it.

Once the connection has been set up with reference to Fig.2. The program starts with a login page; it is added to protect the user data. Upon successful login, home page opens as shown in, and the webcam starts capturing the video. For additional security, the program stops asking for username and password after three incorrect inputs.

As the program starts capturing the video via webcam, an image of number plate is displayed in front of it.

Corresponding to which, the system tries to read it using OCR technology. After reading it, the system looks for a match in the database where information of registered vehicles is stored. When an unregistered number plate is detected, the toll booth personnel have to check whether the vehicle is genuine or not. If it is genuine, the manual

button can be clicked in order to open the toll bar. A voice feature has been added which speaks – “Not a registered vehicle. No name found. DO NOT ALLOW TO PASS”. On the other hand, when a registered vehicle is detected the toll bar opens and the vehicle is allowed to cross. And the voice speaks – “Registered Vehicle” and model of the vehicle. For the delivery management system, the self-driving car starts moving towards the houses. When address plate is in front of the webcam and kept still, it reads it. Within a few seconds the system depicts whether it is the address where the delivery has to be done or not. If the house address plate is not as per the database, the car moves forward to scan the next address. On the other hand, if the houses address plate is the one where the product has to be delivered, the LED placed on the car will turn ON

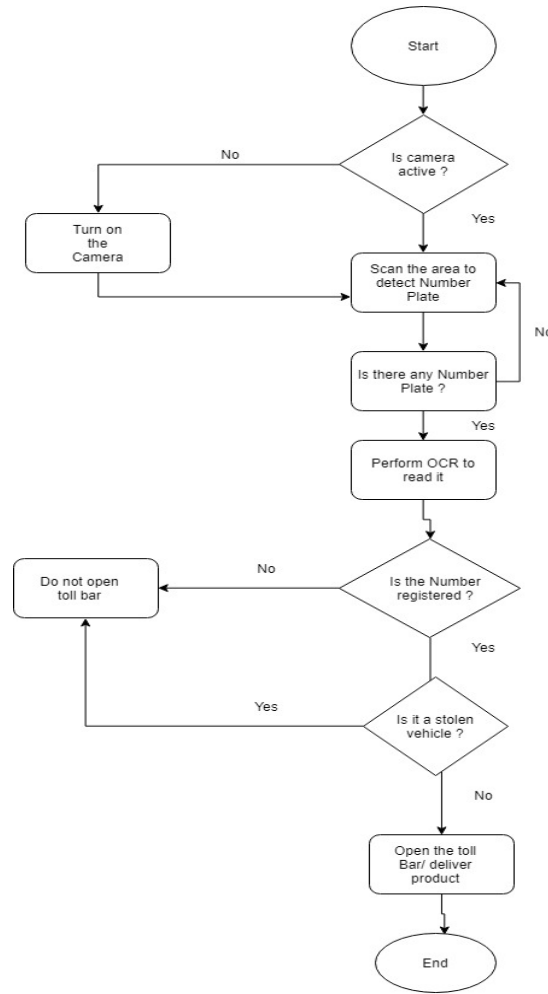


Fig.1. Flowchart

Indicating it as the intended address. It can perform theft management of automobiles as well as a self-driving car for the delivery of non-perishable and non-breakable items.

Arduino UNO acts as an interface for performing two applications through OCR. At the toll booth, Arduino controls Servo motor (toll bar) according to the genuineness of the vehicle after analyzing its number plate.

For the second application, Arduino is connected to Bluetooth module present on the self-driving vehicle (car). After analyzing the house addresses, the car moves accordingly for delivery.

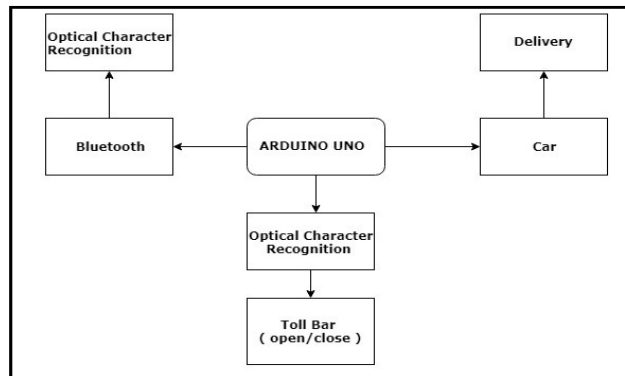


Fig.2. Block diagram of system

IV. EXPERIMENTS & RESULTS

4.1 Technology used

This system uses Visual basic software to implement OCR. It is implemented using Emgu CV files. The Arduino is programmed in Arduino IDE to perform various functionalities. Image processing is used to digitize text in an image.

4.2 Datasets

HDR dataset of 100 vehicle number plate is used to gather information about the time taken by the system to read them. X-axis denotes 100 vehicle number plates whereas Y-axis shows the time taken in seconds to read them.

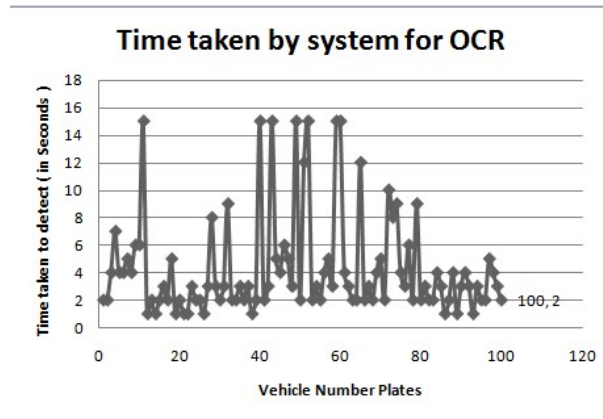


Fig.3.

By considering threshold of 10 seconds, the system depicted the accuracy of 91%. The system could not process blur, tampered and broken number plates.

4.3 Hardware

The hardware consists of mainly Arduino UNO, servo motor and DC motor. Arduino is a micro-controller used to provide interfacing and control mechanisms. Servo motor acts as a signaling element used as a Tollbar. DC motor provides rotation and synchronization between the wheels of the self-driving cars.

V. CONCLUSION AND FUTURE SCOPE

The system use series of image processing techniques for identifying the vehicle from the database and PC. The system robustness and speed can be increased if high resolution camera is used.

This system plays an important role in detecting security threat and for surveillance. The system can be improvised to make delivery of non-perishable and non-breakable items. It can also be modified into a drone based system which can be a great tool in surveillance. To evaluate the accuracy of the system, it has been tested with different images which are address plate of house which contained address of the house. If the address was not the desired address, the vehicle moved forward to other address as per system. If the desired address is recognized, the green LED glows which indicated that the car has reached to the right address.

REFERENCES

- [1] Mollah, Ayatullah & Majumder, Nabamita & Basu, Subhadip & Nasipuri, Mita. (2011). Design of an Optical Character Recognition System for Camera-based Handheld Devices. *International Journal of Computer Science Issues*.8.
- [2] Y. A. Badamasi, "The working principle of an Arduino," *2014 11th International Conference on Electronics, Computer and Computation (ICECCO), Abuja, 2014*, pp. 1-4.
- [3] Schubert, T. W., D'Ausilio, A. & Canto, R. *Behav Res* (2013) 45: 1332. <https://doi.org/10.3758/s13428-013-0336-z>
- [4] [C. N. E. Anagnostopoulos, I. E. Anagnostopoulos, V. Loumos and E. Kayafas, "A License Plate-Recognition Algorithm for Intelligent Transportation System Applications," in *IEEE Transactions on Intelligent Transportation Systems*, vol. 7, no. 3, pp. 377-392, Sept. 2006.
- [5] Hermida X.F., Rodríguez F.M., Fernández Lijó J.L., Sande F.P., Iglesias M.P. (1997) A system for the automatic and real time recognition of V.L.P.'s (Vehicle License Plate).. In: Del Bimbo A. (eds) *Image Analysis and Processing*. ICIAP 1997. Lecture Notes in Computer Science, vol 1311. Springer, Berlin, Heidelberg.

- [6] Caccia F., Marmo R., Lombardi L. (2009) License Plate Detection and Character Recognition. In: Foggia P., Sansone C., Vento M. (eds) Image Analysis and Processing – ICIAP 2009. ICIAP 2009. Lecture Notes in Computer Science, vol 5716. Springer, Berlin, Heidelberg
- [7] Chang, Shyang-Lih & Chen, Li-Shien & Chung, Yun-Chung & Chen, Sei-Wang. (2004). Automatic License Plate Recognition. Intelligent Transportation Systems, IEEE Transactions on. 5. 42 - 53. 10.1109/TITS.2004.825086.
- [8] Bai Hongliang and Liu Changping, "A hybrid license plate extraction method based on edge statistics and morphology," *Proceedings of the 17th International Conference on Pattern Recognition, 2004. ICPR 2004.*, Cambridge, 2004, pp. 831-834 Vol.2.
- [9] Farhat, A., Hommos, O., Al-Zawqari, A. et al. J Image Video Proc. (2018) 2018: 58. <https://doi.org/10.1186/s13640-018-0298-2>
- [10] M. Daily, S. Medasani, R. Behringer and M. Trivedi, "Self-Driving Cars," in *Computer*, vol. 50, no. 12, pp. 18-23, December 2017.
- [11] Chirag Patel, Dipti Shah and Atul Patel. Article: Automatic Number Plate Recognition System (ANPR): A Survey. International Journal of Computer Applications 69(9):21-33, May 2013.