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HIGH SECURITY LICENSE PLATE RECOGNITION ALONG WITH SMART AUTOMATIC PARKING MANAGEMENT SYSTEM & PARKING FEE COLLECTION

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ABSTRACT

In last decade, there has been explosive growth in vehicular sector and the number of vehicles flying on the road. For the better management of vehicular traffic, it is necessary to keep track of vehicles on the basis of their number plates. This research paper proposed automated way of parking management by License plate recognition as well as High security, tracking trespass, vehicle Traffic Flow Management & also retrieval of vehicle owner details. In this paper, Vehicle License Plate Recognition system is proposed which uses image processing and character recognition approaches to identify vehicles by automatically reading their license plates. High Security represent automatically detects number plate and collect necessary information and processes it as If a vehicle is stolen & passed with camera, it could be marked via plate recognition system & an alarm is set off to alert a guard & also If any vehicle violates that speed limit & traffic rules then automatic captured image and processed. This paper deals with Automated Parking Management System for efficient management of parking and also calculates the billing based on the duration the vehicle is in the campus. In this paper we propose a system which consists of a digital camera interfaced with the software module. The software module extracts the license plate. This module is interfaced with the database which is thereby used to manage the parking system. The algorithms are implemented using MATLAB

Keywords: Image processing, License plate recognition, Toll Collection, Automatic parking system, MATLAB.

INTRODUCTION

Today, more than billion vehicles are running on the roads that make the roads very busy. Due to this controlling of the transportation is very difficult [9]. A High Security Number Plate Recognition System (HSNPRS) is one of the parts of the Intelligent Transport System (ITS) that spot the vehicles by using their number plate [7]. Automatic Vehicle number plate recognition system is designed to identifying number and obtaining owner information from a large database of registration details. Recognition process includes, submitting a query, and extracting characters of the image that best matches with template if matched, obtain the owner details. Vehicle number plate recognition systems are used as core modules for intelligent infrastructure systems like electronic payment systems (toll payment and parking fee payment) and freeway and arterial management systems for traffic surveillance. License plate number is a numeric or alphanumeric code which is used to uniquely identify vehicles. Automatic license/number plate recognition is a specific application of optical character recognition. As Vehicle number plates extraction from the car plate images. Before extracting the number plate, the captured vehicle image should have been converted into binary format [14]. After extracting the number plate, the characters are segmented using vertical and localization on the binary image. Optical Character Recognition (OCR) algorithm is used to recognize the character with condition, the background of the image has no or very little noise [15] Automatic license plate recognition may be used to cite individuals who violate traffic signals or drive in excess of the speed limit, as a method of electronic toll collection, to place a suspect at a scene, or identify uninsured motorist (when combined with a database search).

The car license plate recognition identification is an important application in the field of Intelligent Transport System (ITS) and Electronic toll collection (ETC). The objective is to extract and recognize vehicle registration numbers from car images, process the image data finally utilize for access record and prepare electronic bill. Electronic toll collection (ETC) or Electronic Car parking payment is one of the major research topics in intelligent transportation system (ITS) [7] Moreover, monitoring the vehicle traffic and the management of parking areas are the most labor -intensive job. Therefore the research on systematic full automatic parking system is proposed. It differs from conventional parking system, no magnetic card is used to record the entry and exit time of. Also, it is designed in such a way that it has the ability of giving out the information regarding parking free spaces to users before entering the parking spaces.

LITERATURE REVIEW

In the literature, several license number plate detection algorithms are projected. . A quick description of a number of previous works is incontestable in section of literature introduction. Literature survey recommended various types of different methods techniques, to recover the problem in our paper

In [1], for faster detection of region of interest (ROI) a technique called sliding concentric window (SCW) is developed. It is a two-step method having two concentric windows moving from upper left corner of the image. Then the statistical measurements in both windows were calculated based on the segmentation rule which tells that if the ratio of the mean or median.

Another SCW based system is presented in [2] for locating Korean number plate. After applying SCW on vehicle image authors used HSI color model for color verification and then tilt was corrected by using least square fitting with perpendicular offsets (LSFPO).

To locate Chinese number plate Hui Wu and Bing Li [3] proposed a method to find horizontal and vertical difference to find exact rectangle with vehicle number. The Authors converted vehicle image into gray scale and then applied automatic binarization using MATLAB. Any further detail regarding number plate detection algorithm is not mentioned in this paper. The authors claim to have average recognition rate of 0.8s.

In [4], canny edge detector operator was applied to find out the transition points. As per H.Erdinc Kocer et al a license plate contains white background and black character normally. The Canny edge detector uses a filter, which is then based on Gaussian smoothing's first derivative to eliminate the noise. Then in the next step, the edge

In [5], global edge features and local Haar-like features are proposed for real-time traffic video. License plate detection is accomplished by moving a scanning window around the vehicle image. The scanning windows is categorized a license plate region and non license plate region based on the pre-defined classifier.

In [6], a fuzzy discipline based approach is proposed for number plate segmentation. In license plate locating module, the authors considered number plates having colors white, black, red and green. The edge detector algorithm is sensitive to only black-white, red-white and green-white edges.

LICENCE PLATE RECOGNITION

The major steps to accomplish the proposed work can be given as

- A. Image acquisition
- B. Image pre-processing
- C. LPR Localization
- E. License plate sizing and orientation
- F. Characters Segmentation
- G. Normalization
- H. Optical character recognition (OCR)

These are explained below

A. Image Acquisition

Image Acquisition is the first step in an LPR system and there are a number of ways to acquire images The input image for pre-processing is a gray-scale image taken from an Infra-Red (IR) camera. The main feature CCD device is that it covers wide illumination conditions from twilight to noon under sunshine, and this system is capable of capturing images of fast moving vehicles without blurring.

B. Image Pre-processing

Pre-processing has to be performed by taking into account the background illumination conditions and the number plate localization algorithms. It is important to eliminate as much background noise as possible, contrast enhancement and de-blurring in the pre-processing step itself to optimize the localization algorithm and also save the processing time. For pre-processing we are going to use some MATLAB function which will help in pre-processing of the image.
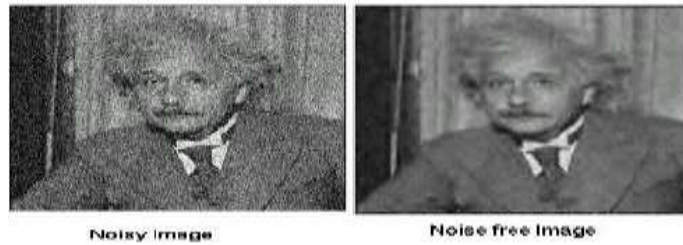
Fig. 1 reduction of noise using image pre-processing.

C. License Plate Localization

Recognizing the number plate from the image of the vehicle taken in previous step using appropriate algorithm is term as number plate localization or simply finding out ROI i.e. Region of Interest. This step recognizes the location of number plate in captured image so that it will be easier to recognize the number by using only that part of the captured image. The output after localizing the number plate is than inputted to the edge detection algorithm which improvises the edges of characters in the image.

D. License Plate Size & Orientation

Components of algorithms that adjust for the angular skew of the license plate image to accurately sample, correct, and proportionally recalculate to an optimal size.

Fig. 2 License plate sizing sequence

E. Character Segmentation

Character segmentation is an important step in license plate recognition system. The segmentation of characters in a license plate is performed by using the following steps. It is very important for the good performance of character segmentation. The preprocessing consists of the determination of plate kind. There are two kinds of license plate in India. One is black characters in yellow background and the other is black characters in white background. The color image is transformed into gray scale image.

Fig. 3. Character segmentation

One of the study use Red color algorithm approach [5]. The techniques will search yellow pixel or some that closer to yellow in value from the image. Red pixel is set to 1 and others will be 0. Then, the recognized image will be converted in binary format for further template matching approach. Commonly partial differential equations (PDE) based technique, Neural network and fuzzy logic were adopted in for segmentation into individual characters.

F. Normalization

The algorithm in regulating the contrast and brightness of the captured license plate image is shown below in Fig. 4.

Fig. 4 Character normalization

G. Optical Character recognition

T

Fig.5 Optical character recognition process

This is the process that identifies individual alpha numeric characters on a license plate. Algorithms also look for characters of equal color and equidistance, with similar font structures to break apart each individual character. This sequential congruency of the characters embodies a characteristic set that is typically uniform, regardless of the type of license plate. Character Segmentation separates each letter or number where it is subsequently processed by optical character recognition (OCR) algorithms. It translates the captured image into an alpha numeric text entry.

RETRIEVING VEHICLES INFORMATION

By using number plate recognition techniques, the captured image of the license plate will process and at the output we received the license plate number in the computer system. That number is converted into notepad.

a. Input image   b. Conversion to notepad text

Fig. 6. Conversion of image into notepad text

The data of notepad is processed for checking the data base of RTO, ones the text is matched, we can retrieve the vehicle owner details. Here the database consists of all the information like name, address, telephone number, place of registration etc. the detailed is shown in the computer system..

AUTOMATIC TOLL COLLECTION SYSTEM MANAGEMENT & HIGH SECURITY AT ROADS

Automatic Toll Collection or highway ticketing system [11] [14] is other one main application in which camera captures the vehicle, get the number of the license plate and feed all input detail in system automatically and calculate the toll fee. After paid the toll fee toll gate automatically open and close for next vehicle.

High security at road represent that, If a vehicle is stolen, it could be marked in the Number Plate Recognition System as so if any point the stolen vehicle happens to pass a camera on the road side that belongs to the license plate recognition system an alarm is set off to alert a guard [7] [8] [9] [10]. To control the Traffic Flow Management automatically Number Plate Recognition is very popular in tracking trespass vehicles, which are breach the speed rule on highway or use illegal bus lane. Each highway follows the specific speed. If any vehicle violates that speed limit the camera capture the image of that vehicle with license plate. And then get the number plate registration. According to that the specified billing or action taken by traffic department.

PARKING SYSTEM MANAGEMENT & AUTOMATIC BILLING

As our composite system will provide the number plate recognition and electron parking bill. At the entry, the vehicle will stop before the entry barrier and its presence is detected by loop sensor. The loop sensor will initiate the camera to capture a picture of the vehicle and the LPR module will analyse the captured picture to recognize the number. The captured picture together with the recognized number and entry record (entry date & time) will be stored for parking fee calculation later. Once this is completed, the entry barrier will open to allow the vehicle to enter and park. Another loop sensor after the barrier will close the barrier. The entry station is used to interface with the loop sensors and automatic barriers. When the leaving vehicle reach the exit booth, it will stop before the barrier and its presence is detected by a loop sensor. This sensor will initiate a picture to be taken and the license plate to be read by the LPR module. The LPR module will match the recognized vehicle number with its own file for the entry time for this particular vehicle. Once the exit and entry record are matched, the system will calculate and display the parking fee is due. When the transaction is complete, the exit barrier will open and the vehicle will leave. For barrier control there is another barrier another loop sensor is implemented.

Smart parking system architecture using ultrasonic detector system can be implemented the system assists the vehicle users to find a parking spot on a building. Kianpisheh et al. (2012) has developed Smart parking system uses sensor-based detector, it is ultrasonic detector. In our paper we jst implement that for security system. Ultrasonic detector is used to determine whether a parking location on a building has been occupied or not. This sensor will work by releasing sound waves at a frequency of 25-50 KHz. The sound waves will then be in contact with the floor on the parking location so that the reflection of the results will be known whether the parking location can be filled or not. If the vehicle is moving out from the parking location illegally the ultrasonic sensor detect, and triggered the alarm. Architecture is shown in figure below.
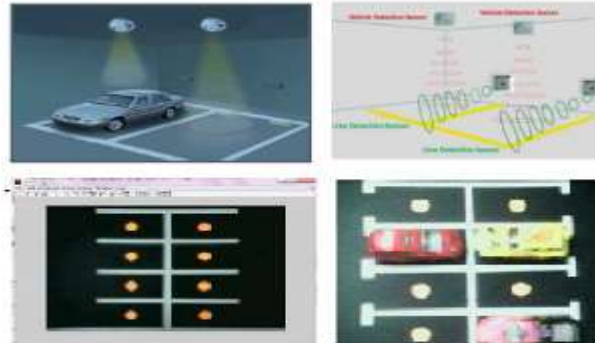

Fig. 7 Smart parking system architecture using ultrasonic detector

METHODOLOGY & SOFTWARE APPROACH

To complete the process action successfully need perfect image of the vehicle [4] [5]. When the vehicle enters in the secured area, sensor senses the vehicle and active the illuminator for proper lighting. In some areas ITS use infrared light are invisible for human beings. Our digital camera place on secured. After capturing process image is feed into the number plat recognition system for further processing as input image [6] where image is enhanced and further processed. Further process includes finding the plate position, segment the plate, segments the characters placed on plate and recognize the segmented characters. Then system checks that vehicle number is legal or illegal by comparing with the predefined list of authorised vehicle. If the vehicle is authorised than it generate the green signal and open the gate by activating the relay. When the vehicle passed away or exit from secured area again red signal generated and gate is closed automatically for next vehicle [8]. The same process is again started for next upcoming vehicle.

Graphical user interface, Software is developed with the help of various software as MATLAB, JAVA, Visual basic and other software, for verify vehicle the database will be attached in software. ins calculation is used so we design GUI at MATLAB. Instead of software we will implement a website.
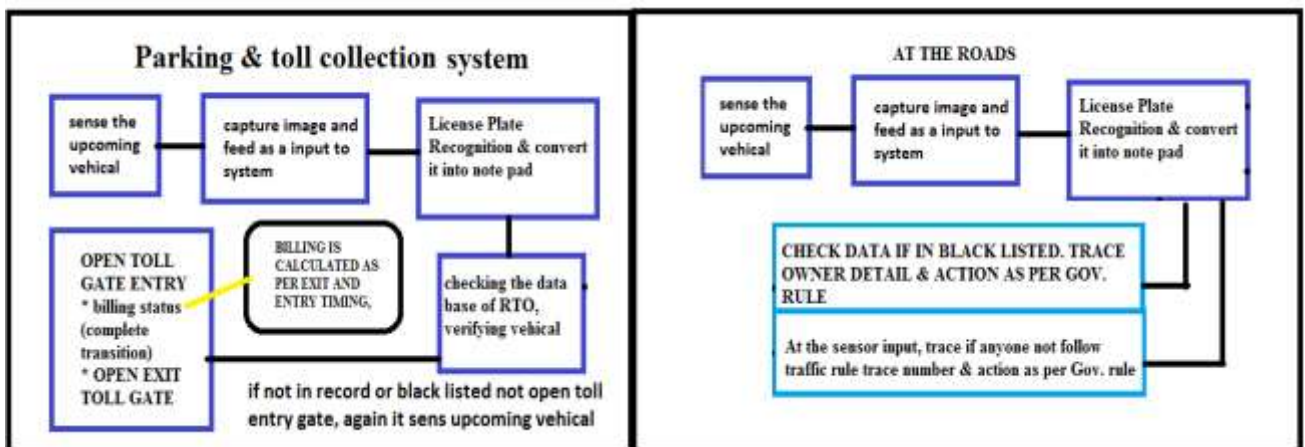

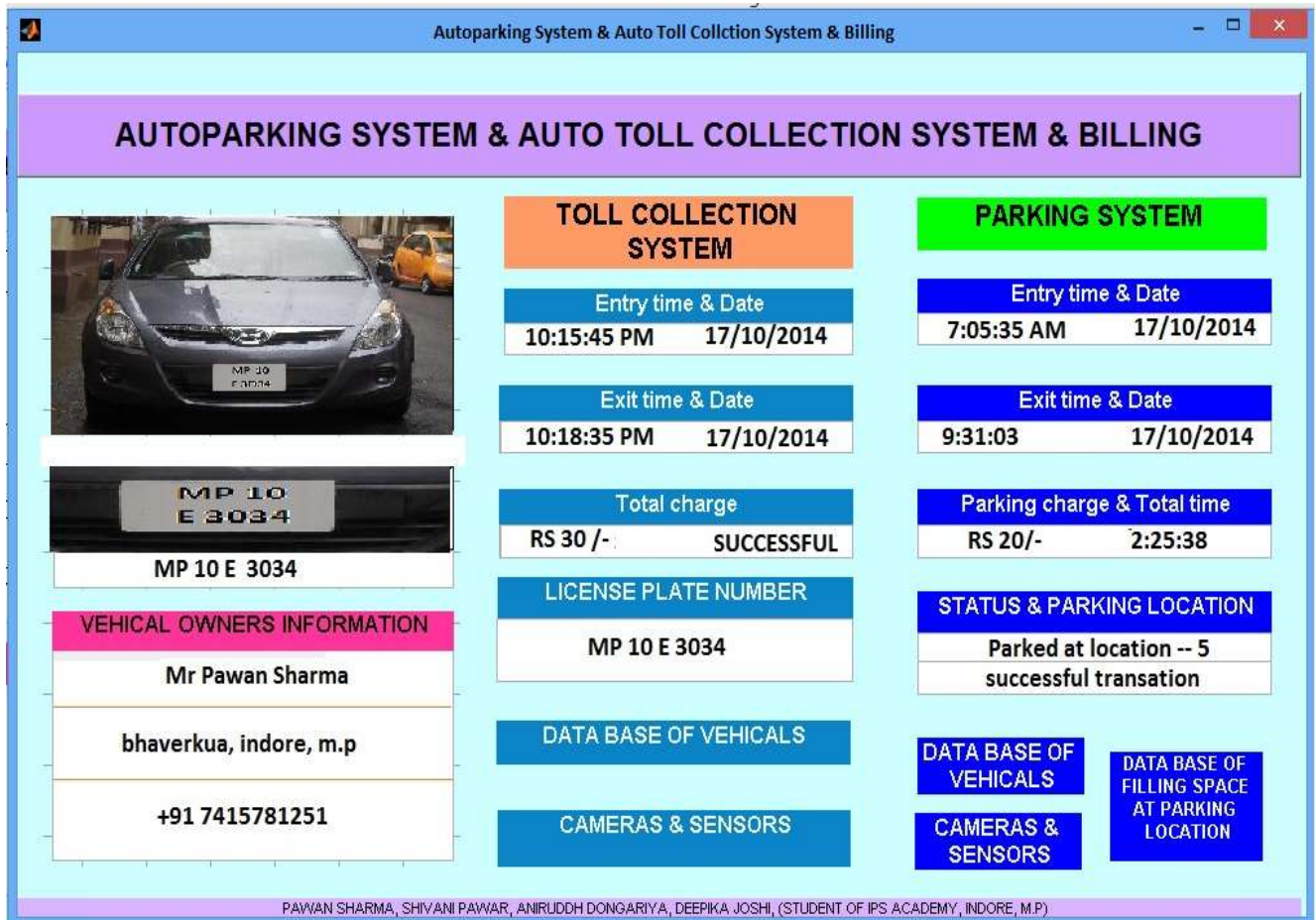*Fig. 8 Flowchart of parking and toll collection system*

RESULT

Fig. 9 MATLAB GUI based auto parking system and auto toll collection system and billing

AUTOMATED PARKING MANAGEMENT SYSTEM

	AVAILABLE SLOTS:	14		0-30 mins = ₹ 0 , 30-60 mins = ₹ 10 , 1 hr onwards ₹10/hr	
LPN	**ENTRY TIME (hh:mm)**	**EXIT TIME(hh:mm)**	**CHARGED TIME**	**PARKING FEE (₹)**	
MH02BF3678	16:15	16:23	0:08	0	
MH48BD9870	16:21	16:44	0:23	0	
MH48BG2376	16:23				
MH01CC4528	16:24	17:48	1:24	20	
MH02AB7628	16:31				
MH15CT7623	16:34				
MH02CB7542	16:40	17:12	0:32	10	
MH02CC3562	16:42				
MH48R1	16:45				
MH04AB99	16:50	17:23	0:33	10	
MH05H7022	16:56				

Fig. 10 Database of vehicles

As a result, auto parking system is able to recognize plate number, display free parking spaces and guidance parking system. This study output is a MATLAB GUI which is an interface for users and drivers. In the GUI of MATLAB firstly it can be converted into package of software via deployment tool or can be implement it on the website. Firstly when any vehicle is in the front of camera then camera detect the vehicle trace its number/license plate and convert into editable format. After processing match data from the RTO database. If matched then retrieving vehicle owner information and display. Now in the GUI there are two section the data is process according to toll collection or parking section. If it is for toll collection system it automatically generate the

charge as per timing and some highway rules, if it is for the parking system firstly it trace license plate and if information is valid the parking gate is open and entry time show in the software as well as it auto generate parking location at which number the vehicle is parked it is in the form of number. Which is detected by sensors and for see the data base and how much vehicle in the parking location or how much vehicle is parked and clear there transaction shown by click the option in software. When the leave the parking location it auto generate parking charge after pay payment by user automatically open parking exit gate and time and date is trace at the database

CONCLUSION

Vehicle license plate intelligent system, as the core of traffic management system, will play an important role in the future traffic control. This paper the development of an automatic parking system with license plate recognition, The goal of the project was to recognize the license plate, store it in the database along with the time in and time out of the vehicle and calculate the tariff fee & parking fee. Parking lots status and guidance parking system and electronic billing system is successfully implanted. Thus at the conclusion we can say that via this paper we implement and use

- license/number plate recognition
- Auto toll collection system & security at road
- Auto Smart parking system management

REFERENCES

[1] Christos Nikolaos E. Anagnostopoulos, Ioannis E. Anagnostopoulos, Vassili Loumos, and Eleftherios Kayafas, "A License Plate-Recognition Algorithm for Intelligent Transportation System Applications," pp. 377- 392, 2006.

[2] H. Erdinc Kocer and K. Kursat Cevik, "Artificial neural netwokrs based vehicle license plate recognition," Procedia Computer Science, vol. 3, pp. 1033-1037, 2011

[3] Kaushik Deb, Ibrahim Kahn, Anik Saha, and Kang-Hyun Jo, "An Efficeint Method of Vehicle License Plate Recognition Based on Sliding Concentric Windows and Artificial Neural Network," Procedia Technology, vol. 4, pp. 812-819, 2012.

[4] Lihong Zheng, Xiangjian He, Bijan Samali, and Laurence T. Yang, "An algorithm for accuracy enhancement of license recognition," Journal of Computer and System Sciences, , 2012.

[5] Hui Wu and Bing Li, "License Plate Recognition System," in International Conference on Multimedia Technology (ICMT), 2011, pp. 5425-5427.

[6] Shyang-Lih Chang, Li-Shien Chen, Yun-Chung Chung, and Sei-Wan Chen, "Automatic license plate recogniton," IEEE Transactions on Intelligent Transportation Systems, vol. 5, no. 1, pp. 42-53, 2004.

[7] Ch. Jaya Lakshmi, Dr. A. Jhansi Rani, Dr. K. Sri Ramakrishna and M. KantiKiran, "A Novel Approach for Indian License Plate Recognition System", (IJAEST) International Journal of Advanced Engineering Sciences And Technologies, Vol. - 6, Issue No. 1, 010-014.

[8] Saleh, Marwan D.; Mellah, H.; Mueen, Ahmed; Salih, N. D.; , "An efficient method for vehicle license plate xtraction," International Symposium on Information Technology, 2008. ITSim 2008, vol.2, no.pp.1-5, 26-28 Aug. 2008.

[9] B. Fröba, and A. Ernst, "Face Detection with the Modified Census Transform", in *proc. Sixth International Conference on Automatic Face and Gesture Recognition (FGR'04),* pp. 91-96, Seoul, Korea, May 17-19, 2004.

[10] Babu, C.N.K.; Nallaperumal, K., "A license plate localization using morphology and recognition," India Conference, 2008. *INDICON 2008. Annual IEEE*, vol.1, no., pp.34-39, 11-13 Dec. 2008.

[11] Wei-Hsun Lee, Shian-Shyong Tseng, Ching-Hung Wang, "Design and implementation of electronic toll collection system based on vehicle positioning system techniques" in *Journal on Computer Communications,* Elsevier Science Publishers B. V. Amsterdam, The Netherlands, Vol. 31/12, pp 2925–2933 July 2008.