International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 4 ǁ 2022 ǁ PP. 10-17

An Affordable Solution for Automatic Number Plate Recognition(ANPR) System for Indian License Plates.

Meet Parihar, Abhishek Shukla, Sahil Joharle, Ashwini Jaiswal

Abstract— *The Automatic Number Plate Recognition (ANPR) system is an approach for recognizing thevehicle number plate. This approach is useful for various scenarios like business complexes, residential society administrations, tolls and parking spaces where there is a lack of an automated system for vehicle monitoring. This issue is not bound to just parking, but also adds to the security concerns inside those establishments. This problem can hence be automated using a system that can read the number plates and maintain this information in a consistent, secured way which can be easily retrieved. Rather than keeping a manual book, all the data entry can be done using web-forms which would drastically reduce errors and can maintain the data in it is correct form.*

Index Terms— *Automation Number Plate Recognition, Block Diagram, Colour Space Conversion, License Plate, Moving Objects, Parking, Resident Page, Visitor Page,*

Date of Submission: 13-04-2022 Date of acceptance: 29-04-2022

I. INTRODUCTION

The major purpose behind this project is to develop an automated system that can be deployed at residential societies to ensure the security of residents. Further purpose is to understand the problem solving, software development cycle and getting acquainted with computer vision techniques. Detection of moving bodies in video Background subtraction is one of the most prominent methods for detecting moving objects in video. It basically involves subtraction of the background image from the current image frame. In this method, three frames are captured by the video camera and the frame difference between these frames will yield the moving object of concern. Let these frames be F1, F2, and F3 respectively, so after performing the frame difference between these, the object will be obtained. Further, let Ct be the current frame and but be the background frame. The final image frame (let say Ft at any time t) comprising the moving object is obtained by performing the "AND" operation. The results showed that due to the influence factor such as illumination of lights, unequal and different absorption of light may occur on the object. Due to this background noise is created which may hamper the subsequent processing of the images. Further, to reduce background noise histogram of the image, mean and variance is taken into consideration. Yet, a certain degree of noise still remains in the image frame. Noise is in the form of randomness and superposition which interferes with the quality of the image. For this median filtering technique is used. Next part unfolds a novel data fusion algorithm for detecting objects in motion. The Moving Object Detection (MOD) terminology has been widely used in areas such as security which is a challenging requirement to fulfil, with factors such as environmental noise, variation in illumination and background complexity. The part introduces an efficient data fusion approach for model this problem.

II. PROCEDURE FOR PAPER SUBMISSION

2.1 Review Stage

The results of the MOD method conclude that optical flow methods have shortcomings, even if no movement is observed between two frames. On other hand, the EC-LGOF achieves magnificent anti-noise execution after mixing time and space gradient. For the systems with weaker computation power, a dual mode (SGM) model is used for modeling the background with its age. This method uses the age of the pixel as a factor to model other grids (consisting of pixels), thus defining a varying 3 learning rate over a sequence of grid models. Advantage of this method is it allows motion compensation errors to be learned in the model based on the age of the model (previous one). Also the number of SGMs is less than or equal to the number of pixels which results in reduction in computation load. Novel dual mode SGM is different from other SGM. With two models providing a bi modular approach because in our case the background models need to be updated rapidly without the interference of foreground particles with background ones, thus our SGM supports this functionality error proneness. There are two models, Apparent background model and Candidate background model, now when the age of candidate model surpasses the age of the background model, they are interchanged. The candidate model is valued after interchanging. Finally, we prefer to use the apparent model, which is currently a safe model for deciding foreground pixels(object) through the dual-mode SGM. Hence foreground pixels determine the object in motion (our concerned part).

2.2 Final Stage

2.2.0 Hog And Svm

It is one of the traditional methods used for object/vehicle detection. HOG is used for feature extraction and SVM is used for classification. It is a high computation and time-consuming method. It is easy to detect multiple objects given the condition that the objects are present in different grids. It is difficult to detect multiple objects if they exist within the same detecting window. SVM is a time-consuming method but we can improve the classification time by sending only the high probable grid cells for classification. The high probable grid cells are cells that have the maximum probability of the target object being in that cell. For finding high probable grid cells we have to train positive (consisting target object) and negative images. After training, we get data related to the theta values of that targeted object brief process of detecting the object. The features that we want to extract are thetas, gradient, and pixel values. Before detection, training is performed on positive images to get an idea about the theta values of the target object.

Process:

1. Divide the image into N X N grid cells and define the detecting window
2. Calculate gradient and theta for that particular cell and generate a modified histogram between pixel values and bin values. (9 bins, each bin representing 20 degrees)
3. If the theta/bin values are close to the values obtained during training then pass the image for classification. The generated histogram will be the features based on which the classification will be done.
4. If the values of theta are not in the desired range then move to the next grid cell and repeat the step3.

2.2.1 Fast RCNN:

It is a stronger method compared to RCNN, as RCNN takes approximately 40 – 50 seconds per image for vehicle/object detection which isn't suitable for real-time processing. Its previous version is slow because it uses three different modules to perform different functions. Functions included feature extraction using CNN, classification using SVM, linear regression, and selective look for evaluating bounding boxes and ROI. Fast RCNN may be a region-based method, approximately 2000 ROI are evaluated per image using selective search methodology. These 2000 * N(images) are sent to CNN for feature extraction which could be a heavy computing procedure and so to SVM for classification. Fast RCNN is healthier because it uses CNN for feature extraction, softmax within CNN for classification There are two output layers. The First layer performs softmax probability estimates for all classes. The second layer outputs the four coordinates (center, height, and width) of the bounding box. ROI pooling is employed to reshape the regions of various dimensions obtained from the feature map. Stochastic gradient descent is employed for backward propagation.

2.2.2 Faster RCNN

Faster RCNN is healthier than the previous versions because it uses RPN over the selective search method. Selective search is slow because it must first perform sub-segmentation so combine the common classes, these common classes are the ROI. By using various filters in CNN we obtain a feature map and this feature map is given as input to Figure 1: Faster RCNN flow the RPN, with the assistance of various anchors it evaluates the probability of the item within the detected window and evaluates the box coordinates. Background propagation and Stochastic Gradient descent are wont to train RPN. The ROI pooling layer is employed to reshape the proposals and sends proposals to the softmax for classification.

2.2.3 YOLO

The algorithm can predict bounding boxes likewise as class predictions in a single evaluation. It is in no time as compared to other object detection algorithms. It makes fewer background errors as compared to other algorithms. What YOLO does differently as compared to other algorithms is that it uses logistic regression to perform object detection, this is the first reason it outperforms other methods for predicting classes.

2.3 Figures

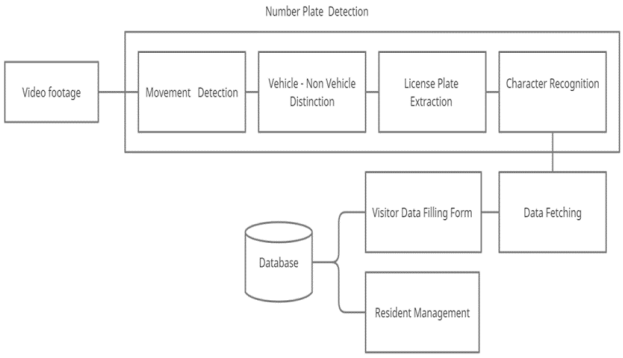


Figure 4.1: Block Diagram

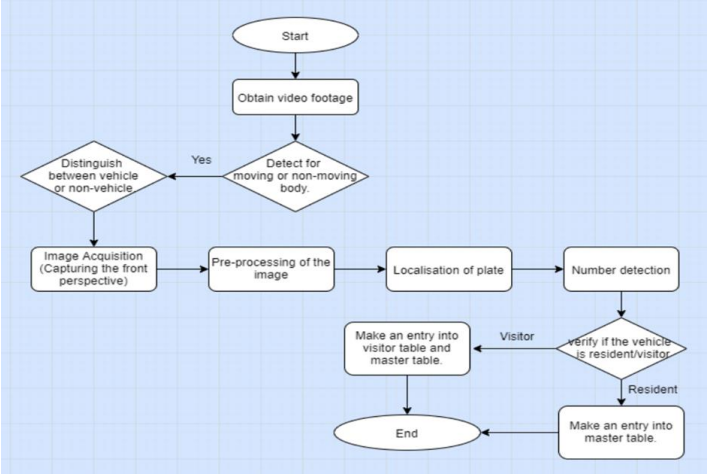


Figure 4.2: Process Flow Diagram

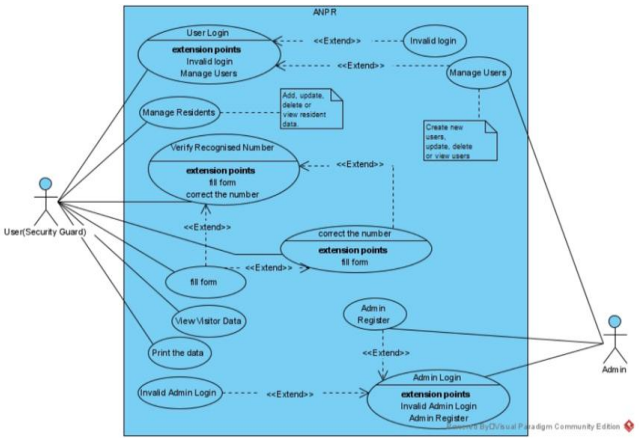


Figure 4.3: UML Diagram

III. SECTIONS

2.0 Colour Space Conversion:

Input image for this step is an RGB image. Majority of the techniques deal with converting RGB to grayscale for further processing, while in use HSI colour space to decouple the colour carrying information and intensities. The number plate is extracted based on rear light position by converting the RGB image to YUV image, as the V component gives the red channel information, it is used to detect rear lights of the vehicles.

3.1 Image Enhancement:

Two techniques proposed to enhance images based on intensity variance and edge density. Intensity Variance increases contrast based on standard deviation of the image and Edge density which uses Sobel mask and com-

pares it with each pixel with predefined threshold, Vertical edges are obtained. These techniques are used to improve contrast at locations where there is possibility of license plate.

3.2 Edge Detection:

Two common techniques are Canny (computationally expensive) and Sobel edge detection. In order to work with Sobel edge detection, prior pre-processing filtering needs to be done to remove noise. Region based filtering algorithm prior to sobel edge detection.

3.3 Thresholding:

The purpose of thresholding is to create a binary image from a grayscale image. In simple thresholding methods using a single global threshold value, this method is not suitable where illumination is non uniform. Otsu thresholding is a special type of thresholding, which calculates the optimum threshold value from a histogram formed in a bimodal image. In Adaptive thresholding a window of predefined size is taken and a weighted sum of

neighbourhood pixels is formed.

3.4 Candidate Extraction:

Morphological operation processes images based on shapes. In a morphological operation, each pixel in the image is adjusted based on the value of other pixels in its neighbourhood. Two basic operations are dilation and erosion. Dilation is used for expanding a binary image by using rectangular structuring elements. The number plate portion is extracted using row-pixel histogram, column-pixel histogram techniques and further applying statistical analysis based on area, aspect ratio of this histogram. Montane chain algorithms get candidate regions, the next step is validation based on angle, and the number plate is extracted.

IV. CITATIONS

The ultimate step in the process is to recognise the characters from the plate localized in the previous step. This part is a step-by-step study of processes required to recognise characters. Initial work is just an overview of the recognition process as a whole followed by a skew detection and correction algorithm. Further work explains the segmentation process followed by an explanation of convolutional neural networks which is necessary to understand the final paper which is about OCR developed by Facebook.

The work at [15], depicts the overall process to recognize the characters starting from pre-processing, followed by segmentation, training and recognition. Pre-processing module does the grey scale conversion followed by binary image conversion. The images are grey scaled as all channels contain the same data. Binarization helps to reduce computational requirements by converting pixels only into white and black. Next step is segmentation where every single character is individually obtained from the image. Segmentation consists of line detection followed by character detection. In line detection, every row is checked for its pixel value and lines are constructed based on the values stored in the vector. For each line found above, here the values are checked column by column. Based on the values stored in the vector, the position of lines around the character is obtained. After segmentation, the next step is to train a module so as to recognise the characters obtained in the previous step. The characters are typed by the user and converted into an image which is trained. The next module is to recognise the characters which is done using feature extraction, wherein the important data is obtained from the image and further stored in various classes. Every character has a different feature which helps to recognize the characters. Along with feature extraction, classification is used in order to recognize each character and assign it to the corresponding class. The work uses the Kohonen Network. This neural network consists of only input and output layers and no hidden layers. The input is a floating point value ranging between -1 to 1 which is the normalised value of the original value. Output of the network is seen over only one output neuron, hence making it the output is generally the index value of the neuron.

V. FIGURES AND TABLES

Login Page

Every security person have to login during his shift timing

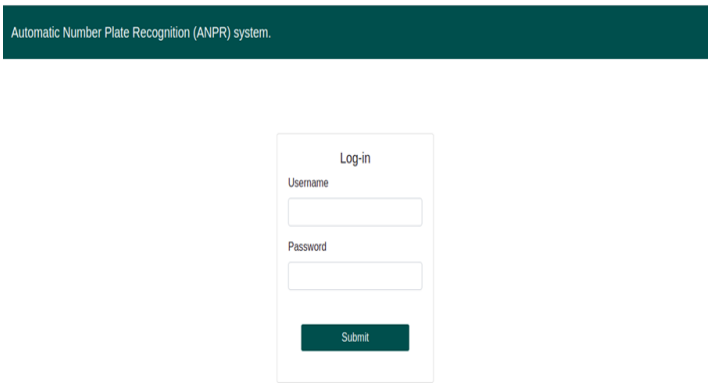


Figure 5.1: Login Page

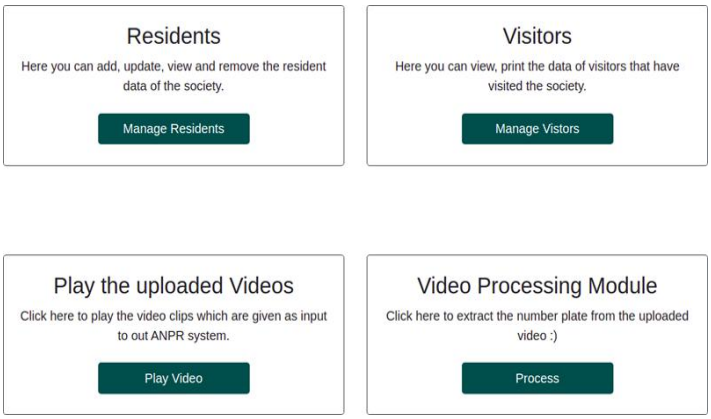


Figure 5.2: Dashboard

Manage Visitor Page

Security person can view visitors details and can generate log files for a**ll** records.

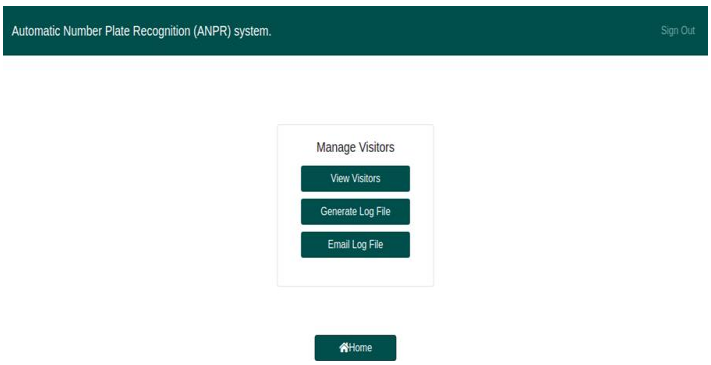


Figure 5.3: Manage Visitor Page

Visitor Information

A**l**l visitors information like his name and person to whom visitor is visiting can be viewed

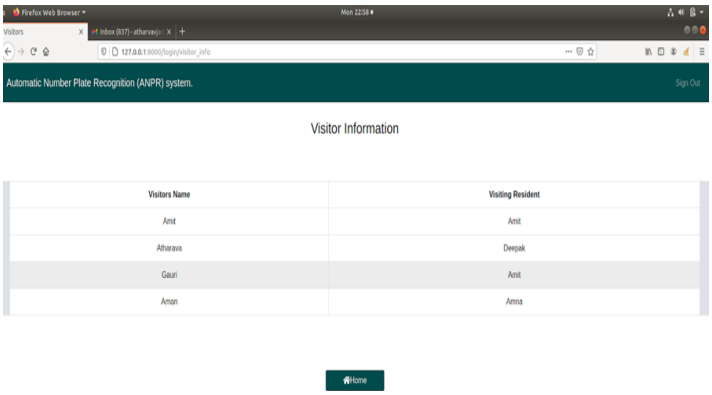
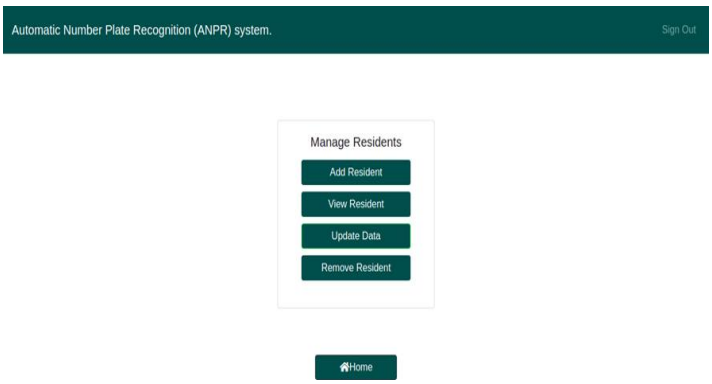


Figure 5.4: Visitor Information

Manage Resident Page

Security person can add new resident, view residents data, update data of residents and remove residents



Resident Information

Al residents information like name, mobile number, vehicle number can be viewed

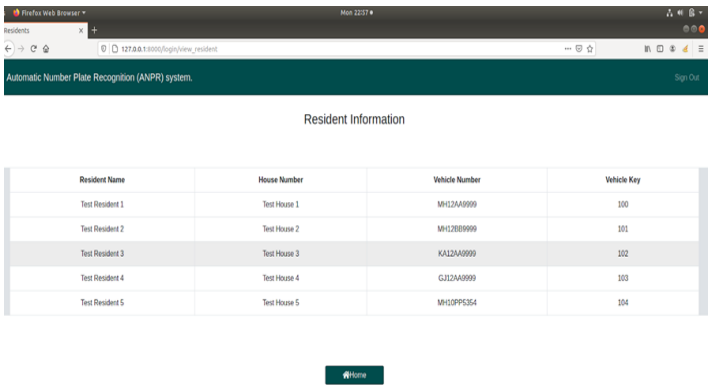


Figure 5.6: Resident Information

VI. END SECTIONS

The system was tested on around 10 videos collected from residential society having various background conditions, light conditions and image quality. The performance was measured on computer having an i3 processor with 4 GB RAM , the system took around 3.8 seconds with accuracy around 90%.

Figure6.1 :Original Frame And Non Moving Object Detection

Figure 6.2 : Moving Object From Video

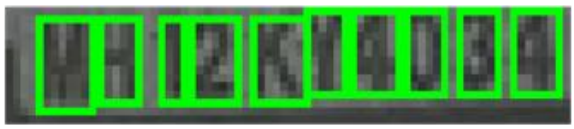


Figure 6.2 : Character Segmentation

MH12KY4034
Figure 6.3 : Final Output String

VII. CONCLUSION

The Automatic number plate recognition plays an important role in detecting security threats which were earlier done manually. The system uses series of image processing, first detecting moving object from video and then detecting it vehicle/non vehicle. If vehicle is found then extracting number plate region and performing character segmentation followed by character recognition. The system is implemented in python , and its performance is tested on real video. Further optimization can be done in order to increase accuracy of the system. In order to increase security, recognizing the face of person driving.

ACKNOWLEDGMENT

I would like to express my gratitude and appreciation to al those who gave me the opportunity to complete this report. It gives us great pleasure in presenting the preliminary project report on "**An Affordable Solution for Automatic Number Plate Recognition (ANPR) System forIndian License Plates.**"

We would like to take this opportunity to thank my internal guide "**Mrs. Priyanka P. Pawar"** for giving us help and guidance needed, especial y for the useful stimulating suggestions given duringthe course of the project.

We would like to thank "**Mrs. Priyanka P. Pawar**", for her assistance and support and for constantly pushing us to think creatively and helped bring the best out of us. We would also like to thank our Head of Information Technology Department, **"Mr. Subhash Nalawade "**, for his unwavering support for this project work.

Last but not least, I would appreciate the guidance given by other supervisors as well as thepanels especial y in our project presentation that has improved our project quality by their feedback. It also helped us to improve the complexity of the project and make it more challenging.

REFERENCES

[1]. Huang, D.-Y., Chen, C.-H., Hu, W.-C., Yi, S.-C., Lin, Y.-F.: Feature-based Vehicle Flow Analysis and Counting for a Real-Time Traffic Surveillance System. Journal of Information Hiding and Multimedia Signal Processing 3(3), 282–296 (2012)

[2]. Dupuis, Y., Savatier, X., Ertaud, J.-Y., Vasseur, P.: Robust Radial Face Detection for Omnidirectional Vision. IEEE Transactions on Image Processing 22(5), 1808–1821 (2013)

[3]. Sugandi, B., Kim, H., Tan, J.K., Ishikawa, S.: Real Time Tracking and Identification of Moving Persons by Using a Camera in an Outdoor Environment. International Journal of Innovative Computing, Information and Control 5(5), 1179–1188 (2009)

[4]. Huang, D.-Y., Lin, T.-W., Hu, W.-C., Cheng, C.-H.: Gait Recognition based on Gabor Wavelets and Modified Gait Energy Image for Human Identification. Journal of Electronic Imaging 22(4), 043039(1)–043039(11) (2013)

[5]. Hu, W.-C., Yang, C.-Y., Huang, D.-Y.: Robust Real-time Ship Detection and Tracking for Visual Surveillance of Cage Aquaculture. Journal of Visual Communication and Image Representation 22(6), 543–556 (2011)

[6]. Tian, Y.L., Feris, R.S., Haowei, L., Hampapur, A., Sun, M.-T.: Robust Detection of Abandoned and Removed Objects in Complex Surveillance Videos. IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews 41(5), 565–576 (2011)

[7]. Lee, D.-S.: Effective Gaussian Mixture Learning for Video Background Subtraction. IEEE Transactions on Pattern Analysis and Machine Intelligence 27(5), 827–832 (2005)

[8]. Wang, L., Yung, N.H.C.: Extraction of Moving Objects from their Background based on Multiple Adaptive Thresholds and Boundary Evaluation. IEEE Transactions on Intelligent Transportation Systems 11, 40–51 (2010) 9. Zhu, S., Guo, Z.: An Overview of Video Object Segmentation. In: Proceedings of International Conference on Industrial Control and Electronics Engineering, pp. 1019–1021 (2012) 10. Carmona, E.J., Martínez-Cantos, J., Mira, J.: A New Video

[9]. Joseph Redmon, Santosh Divvala, Ross Girshick, and Ali Farhadi. You only look once: Unified, real-time object detection, 2016.