IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 11, November 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0911033 |

Automated Traffic Violation Detection System For India Traffic Scenario

Saranjit Kaur Flora, Sumit Nema

M.Tech Student, Department of Computer Science and Engineering, Global Nature Care Sangathan's Group of Institutions, Jabalpur, India[1]

Associate Professor, Department of Computer Science and Engineering, Global Nature Care Sangathan's Group of Institutions, Jabalpur, India[2]

ABSTRACT-This paper addresses the issues in the Indian scenario of traffic violation detection system. Violations in traffic laws are very common in a highly populated country like India. The conditions are even worse in metro cities like Delhi, Mumbai Bangalore and Chennai. The accidents associated with these violations cause a huge loss to life and property. There are plenty of traffic rules that one should follow before getting his or her vehicle on the road. It becomes the biggest challenge to make people abide by traffic rules. Much different automation has been proposed to automate and to make it happens in India. In this paper, we proposed a smart traffic violation detection system as a solution for the traffic violation issues in the Indian scenario. The advanced and intelligent form of visual computing will assist in detection of name plate which will be integrated with Aadhaar Card and Registration certificate for automatic generation of E-challans. E-challan alerts will sent to owner of violating vehicle immediately through sms and email according to classification of violations. The evidence of footage will be sent to online E-challan portal where owner can have a check.

KEYWORDS: Image processing, Vehicle detection, Violation detection, YOLOv3

I. INTRODUCTION

Violations in traffic laws are very common in a highly populated country like India. The conditions are even worse in metro cities like Delhi, Mumbai Bangalore and Chennai. The accidents associated with these violations cause a huge loss to life and property. Same is the case in Chennai. Being a metro city and a highly populated one also, has a lot of road accidents every year. Despite this the violations in traffic laws do not reduce. A lot of people disobey the rules every day sometimes willingly and sometimes because they are forced to do so because of others.

While lack of good infrastructures like quality pothole-free roads, bridges and underpasses are some of the reasons for traffic jams and vehicular accidents in the country, disobeying of traffic rules is another reason why the state of affairs associated with the traffic management in India is in a pathetic condition. Traffic signal is automated or sometimes manual signal at a junction or crossroad in a high traffic area designed for a smooth flow of traffic without jams. This sounds great in theory, but the only problem here is that even if one person doesn't follow the rules of a traffic signal, then it can cause traffic jams at such junctions. The three traffic signals are color coded, which are red, yellow and green. Traffic signal poles will display these signs in front of the vehicle.

When the signal is red in front of a road, then the vehicles have to stop behind the zebra crossing. When the signal is yellow, it indicates that the vehicles need to get ready to move. And at the turn of the green signal, traffic can move. This cycle keeps repeating every once or twice in a minute depending on the traffic density. Such signals are present even for pedestrians. To guard and catch hold of traffic violators, the traffic police will be present to manage the situation properly.

The smart violation detection and alert system will assist the human guard without getting tired. Vision computing has also been a matter of curiosity and challenge among researchers and AI practitioners to make AI vision as efficient as a human being. Machine learning, especially deep learning, has proven as a great methodology to make it happened up to an extent. If we want to make a machine as efficient as a human being, which is the prime target of Artificial Intelligence methodology, then the machine must have eyes to look and feel the situation in real-time. The new form of visual computing as stated above is a key to the same. Hence Deep-Learning based AI vision computing environment really making this happened in present time.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0911033 |

In this paper we mention a human-based traffic control system in a similar fashion with similar feel like a human being, smart vision computing-based system. The system helps in detecting vehicle who violated law as well as sending sms email alerts immediately to the owner and traffic control room with evidence of video recording .

II. LITERATURE SURVEY

Ullman et al. in [1,2016] hypothesizes that a congestion management system capable of detecting and speedily alerting response teams about the inception of congestion events can save both drivers and pedestrians' lives, diminish traffic queue lengths and overall improve movement through congestion bottlenecks. In order to detect and track road congestion events, some deep learning-based approaches are applied by several researchers. However, the first and foremost step in doing so would be to understand how traffic flows and what would be the short and long-term effects of congestion at certain road networks under varied conditions. Since, traffic monitoring happens on a larger scale, it is equally important to have a scalable, decentralized system that would provide a real-time feedback on traffic parameters for all road networks being surveyed.

Fouladgar et al. in [2,2017] proposed a decentralized deep learning-built system wherein, every node precisely predicted each of its congestion state based on their adjacent stations in real-time conditions. The main contributions of their approach were that it was easy to scale across different road networks and could be completely decentralized to predict the nature of traffic flows. For the first time, a neural network was used to model the flow of traffic and that's when congestion prediction came into existence using this approach in the early 90's.In their work,theauthorsintroducedanetworkthatconsistedof1inputlayer,1outputlayer and 1 hidden layer respectively. This design proved to achieve higher accuracy in predicting the nature of traffic flows and for estimating accurate travel times. However, its basic structure was inefficient for other traffic applications especially for the ones that contained a large dataset. With the advent of deep learning, basic single layered neural networks are not typically used for studying traffic flow and congestionparameters.

Maetal.in[3,2015] proposed an entirely automated deep neural network-based model for analyzing spatio chronological traffic data. Their model first uses Convolutional Neural Network to learn the spatio-temporal features. Later, a recurrent neural network is trained by utilizing the output of their first step model that helps to categorize the complete sequence. Their model can have a possible application in studying traffic flows and predicting congestion. Some recent studies have investigated using predicted traffic speeds for detecting congestion. When the predicted speed on a road segment is lower than there al-time speed by a certain margin, it is flagged for congestion.

Wangetal.in[4,2016]proposed a deep learning-based model that uses a recurrent convolution neural network structure to continuously predict traffic speeds. Using their model and integrating the spatio-temporal traffic information, they were able to identify the sources of congestion on city's ring-roads. In general, most congestion detection systems obtain real-time traffic data from loop detectors or microwave radarsensors. These streams of data are then conceded through algorithms that perceives the start of congestion based on speed-volume and occupancy relationships and unceasingly tracks them as they grow and disperse.

III. YOLOv3(You only look once Version 3)

YOLOV3 is a Convolutional Neural Network (CNN) for performing object detection in real-time. CNNs are classifier-based systems that can process input images as structured arrays of data and identify patterns between them
YOLOV3 has the advantage of being much faster than other networks and still maintains accuracy.
It allows the model to look at the whole image at test time, so its predictions are informed by the global context in the image. YOLO and other convolutional neural network algorithms "score" regions based on their similarities to predefined classes.
High-scoring regions are noted as positive detections of whatever class they most closely identify with.
For example, in a live feed of traffic, YOLOV3 can be used to detect different kinds of vehicles depending on which regions of the video score highly in comparison to predefined classes of vehicles.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0911033 |

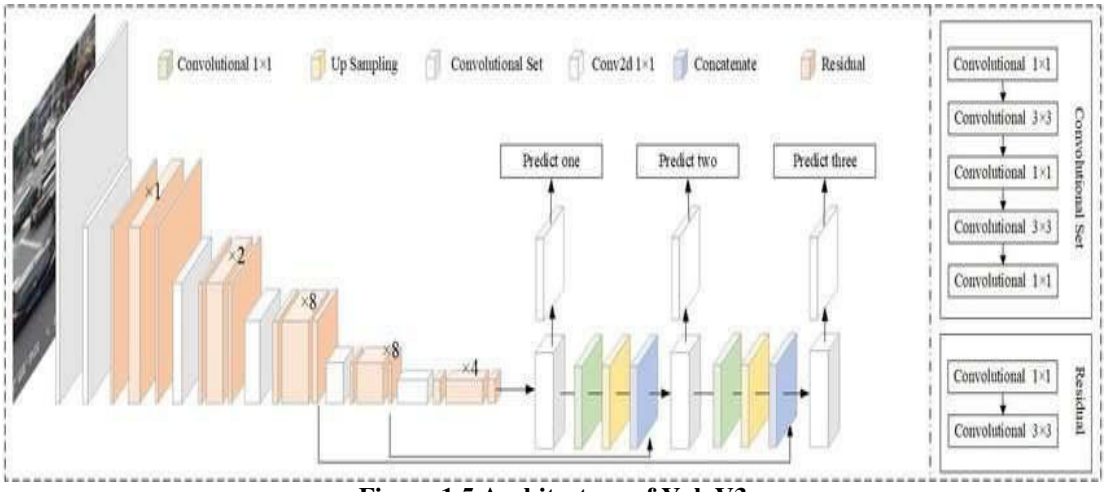


Figure 1.5 Architecture of YoloV3

IV. PROPOSED METHODOLOGY

AI-enabled system is the development and training of several deep convolutional neural network models that are capable of detecting and classifying different objects or segmenting a traffic scene into its constituent objects. The AI-enabled traffic monitoring system is capable of tracking different classes of vehicles, tabulating their count, spotting and detecting congestion and tracking traffic anomalies in real-time.

Proposed Algorithm

1) License Plate Detection (YOLOv3)

You Only Look Once or more popularly known as YOLO is one of the fastest real-time object detection algorithm (45 frames per seconds) as compared to R-CNN family (R-CNN, Fast R-CNN, Faster R-CNN, etc.) The R-CNN family of algorithms uses regions to localise the objects in images which means the model is applied to multiple regions and high scoring regions of the image are considered as object detected. But YOLO follows a completely differentapproach. Instead of selecting some regions, it applies a neural network to the entire image to predict bounding boxes and their probabilities

a) In our system ,the traffic signal lights will be equipped with high definition cameras to feed live video chunks.

b) The owner who violated the law our API which runs the object detection model in the background detects the license plate and draws a bounding box around those plates and returns the coordinates of the bounding box.

c) YOLOv3 offered us a good balance between speed and accuracy without the use of any GPU.YOLO v3 performs at par with other state of art detectors like RetinaNet, while being considerablyfaster,atCOCOmAP50benchmark.

2) Character Segmentation

a) Once the license plate is localised, then the system further performs character segmentation on the license plate. Character segmentation is an operation that seeks to decompose an image of a sequence of characters into subimages of individual symbols.

b) Character Segmentation finally returns an image in which there is a bounding box around individual characters. We have again used YOLOv3 for the segmentation process because it offered better accuracy over the other models that we tested. The results of this are shown in fig 4.1

3) Character Recognition(Darknet-53)

a) Finally Character Recognition also known as Optical Character Recognition recognizes the characters on the segmented license plate[17][18]19].

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

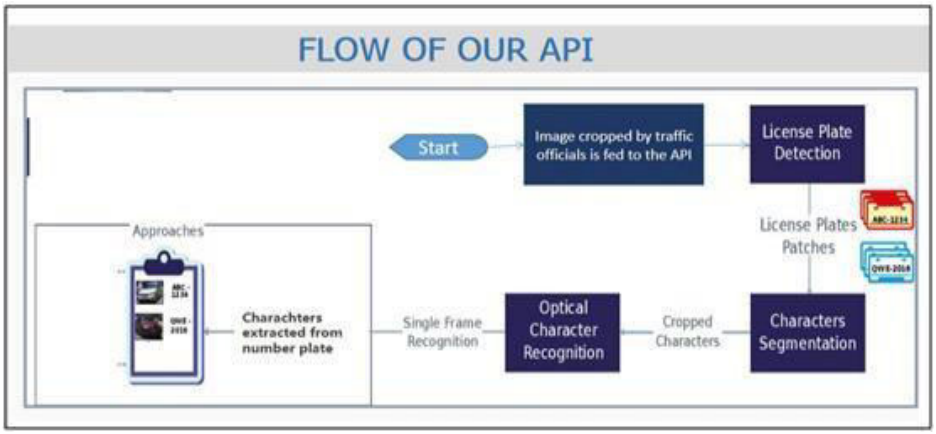
| DOI: 10.15680/IJIRCCE.2021.0911033 |

b) In our system the recognized characters are returned as an object which are then displayed in the GUI of our system along with other details.

c) We have here used an assembled model that combines three individual models to improve the overall accuracy and performance of the system

4) Immediate E-Challan alert

Oncethesystemgetsthecharactersofthelicenseplate,itcan be then used to generate the electronic challan by cross referencing the license plate with the RTO Database (our database in the prototype) and getting the information about the owner of the vehicles.



V. EXPERIMENT RESULTS

Tool Used- Python

Data set used – MSCOCO

5.1 License plate Detection Results

Python has become one of the most popular programming languages in the world in recent years. It's used in everything from machine learning to building websites and software testing. It can be used by developers and non-developers alike.

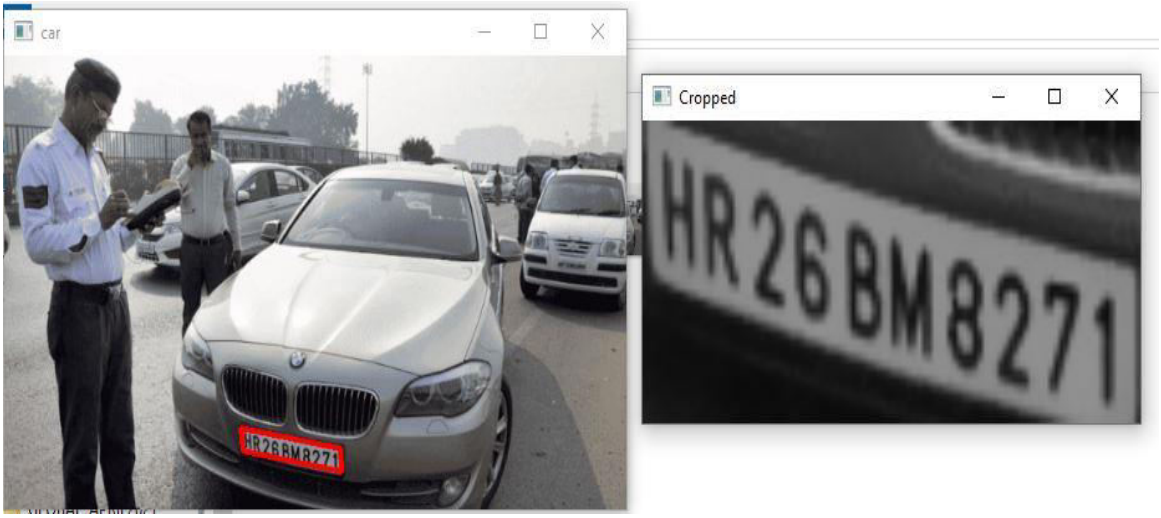


Figure 5.2 Result of License plate detection

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0911033 |

Figure 5.3 Results of License Plate Segmentation

5.2 MS COCO Results

COCO is large-scale object detection, segmentation, and captioning dataset. COCO has several features: Object segmentation, Recognition in context, superpixe l stuff segmentation, 330K images (>200K labeled), 1.5 million object instances, 80 object categories, 91 stuff categories, 5 captions per image, 250,000 people with key points.

```
[ { "segmentation":
[[204.01,306.23,...206.53,307.95]],
"num_keypoints": 15,
"area": 5463.6864,
"iscrowd": 0,
"keypoints": [229,256,2,...,223,369,2],
"image_id": 289343,
"bbox": [204.01,235.08,60.84,177.36],
"category_id": 1, "id": 201376 } ]
```

Fig 5.4 Dataset Specifications

5.3 E-Challan Results

Figure 5.5 E-Challan Execution

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0911033 |

5.4 Performance Analysis

S No	Module	Model Name	Accuracy After 1000 iterations	Accuracy After 2000 iterations	Accuracy After3000 iterations	Accuracy After 4000 iterations	Accuracy After 5000 iterations	Accuracy After 6000 iterations	Final Accuracy
1	License Plate Detection	Yolov3	63.48%	90.33%	92.94%	93.84%	92.99%	93.86%	93.86%
2	Character Segmentation	Yolov3	92.77%	98.08%	98.27%	97.45%	97.42%	97.38%	97.38%
3	Character Recognition	Darknet-53	67.52%	70.43%	74.67%	79.19%	90.32%	90.11%	90.11%

V1. CONCLUSION

After studying different approaches we observe that some of the approach provides good techniques for automated traffic detection system, but still there is need of an approach which will provide more accuracy in stopping accidents and make owner abide by rules. Indian traffic is highly unorganized as far as the local city traffic is concerned. Monitoring, Modeling, and Management of traffic violations have always been a curious topic for researchers to discover new solutions. In name of smart automation different systems have been proposed and implemented. The existing model focuses on detection of vehicle but there is delay in sending E-challan to owner who violated law. The deploy model focuses on detection of vehicle using YOLOv3 algorithm. The prototype & experimental setup demonstrated with a satisfactory accuracy of classification and immediate real-time alerts based on classification of violation without any delay. This work will lead us to be smarter in recognition of the owner or current driver to make them abide by-laws

REFERENCES

1. Ullman, G. L., V. Iragavarapu, and R.E. Brydia. Safety Effects of Portable End-of-Queue Warning System Deployments at Texas Work Zones. Transportation Research Record: Journal of the Transportation Research Board, No. 2555, 2016, pp. 46-52.
2. https://doi.org/10.3141/2555-06.
3. Fouladgar, M., Parchami, M., Elmasri, R., &Ghaderi, A. (2017, May). Scalable deep traffic flow neural networks for urban traffic congestion prediction. In 2017 International Joint Conference on Neural Networks (IJCNN) (pp. 2251-2258). IEEE.
4. Ma, X., Dai, Z., He, Z., Ma, J., Wang, Y., & Wang, Y. (2017). Learning traffic as images: a deep convolutional neural network for large-scale transportation network speed prediction. Sensors, 17(4), 818
5. J. Wangetal.,"Real-TimeNon-MotorVehicleViolationDetectionin Traffic Scenes", IEEE International Conference on Industrial Cyber PhysicalSystems(ICPS),Taipei,Taiwan,2019.
6. Mayank Singh Chauhan, Arshdeep Singh, MansiKhemka, ArneishPrateek, and Rijurekha Sen. 2019. Embedded CNN based vehicle classification and counting in non-laned road traffic. In Proceedings of the Tenth International Conference on Information and Communication Technologies and Development (ICTD '19). Association for Computing Machinery, New York, NY, USA, Article 5, 1–11. DOI: https://doi.org/10.1145/3287098.3287118
7. Arnaud Prouzeau, Anastasia Bezerianos, and Olivier Chapuis. 2015. Road traffic monitoring on a wall display. In Proceedings of the 27th Conference on l'InteractionHomme-Machine (IHM '15). Association for Computing Machinery, New York, NY, USA, Article 29, 1–6.DOI:https://doi.org/10.1145/2820619.2825009
8. Pengfei Zhou, Zhiyuan Chen, and Mo Li. 2013. Smart traffic monitoring with participatory sensing. In Proceedings of the 11th ACM Conference on Embedded Networked Sensor Systems (SenSys '13). Association for Computing Machinery, New York, NY, USA, Article 26, 1–2. DOI:https://doi.org/10.1145/2517351.2517379

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 11, November 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0911033 |

9. Hao, C., &Yongyi, L. (2011). Research on Queue Detection Technology Based on Video for City Road Section. In ICTIS 2011: Multimodal Approach to Sustained Transportation System Development: Information, Technology, Implementation (pp. 652-661).
10. Salvi, G., 2014, March. An automated nighttime vehicle counting and detection system for traffic surveillance. In *2014* International Conference on Computational Science and Computational Intelligence (Vol. 1, pp. 131-136).IEEE.
11. Lai, A. H. S., and Yung, N. H. C., "A video-based system methodology for detecting red light runners," in Proc. IAPR Workshop on MVA '98, pp. 23–26.
12. Mundhenk, T. N., Konjevod, G., Sakla, W. A., &Boakye, K. (2016, October). A large contextual dataset for classification, detection and counting of cars with deep learning. In European Conference on Computer Vision (pp. 785-800). Springer, Cham. Automatic challan System using RFID Technolog Manish Kumar, Niranjan Kumar, Mizan Faisal, Nizamuddin, NiranjanKumarJournal of Network Communicationsand Emerging Technologies (JNCET) Volume 6, Issue 5, May(2016)
13. Zhou, J., Gao, D., & Zhang, D. (2007). Moving vehicle detection for automatic traffic monitoring. IEEE transactions on vehicular technology, 56(1), 51-59.
14. A Review-Recognition of License Number Plate using Character Segmentation and OCR with Template Matching by Mr A. N. Shah1, Ms A.S. Gaikwad2 International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 2, February 2016.
15. Critical Study of License plate Detection Method in LPR System Satellite Conference ICST SD 2016 International Conference on Science and Technology for Sustainable Development,KualaLumpur,MALAYSIA,May 24-26,2016.
16. Ikeda, H., Kaneko, Y., Matsuo, T., & Tsuji, K. (1999, October). Abnormal incident detection system employing image processing technology. In Proceedings 1999
17. IEEE/IEEJ/JSAI International Conference on Intelligent Transportation Systems (Cat. No. 99TH8383) (pp. 748-752). IEEE.
18. Michalopoulos, P., Jacobson, R., "Field Implementation and Testing of Machine Vision Based Incident Detection System," In Transportation Research Record: Journal of the Transportation Research Board, No. 1394, TRB, National Research Council, Washington, D.C., pp. 1-7, 1993.
19. Automatic Number Plate Recognition System for Vehicle Identification Using Optical Character Recognition, Muhammad TahirQadri ; Muhammad Asif, 2009 International Conference on Education Technology and Computer, Year: 2009 | Conference Paper | Publisher: IEEE
20. Effective algorithms and methods for automatic number plate recognition, AmirgaliyevBeibut ;KairanbayMagzhan ;Paper ID: SR21222190144 DOI: 10.21275/SR21222190144 1161 International Journal of Science and Research (IJSR) ISSN: 2319-7064 SJIF (2019): 7.583 Volume 10 Issue 3, March 2021 www.ijsr.net Licensed Under Creative Commons Attribution CC BY KenshimovChingiz, 2014 IEEE 8th International Conference on Application of Information and Communication Technologies (AICT),Year: 2014 |
21. Conference Paper | Publisher: IEEE
22. Improved OCR based automatic vehicle number plate recognition using features trained neural network, Bhavin V. Kakani ;Divyang Gandhi ; Sagar Jani,2017 8th International Conference on Computing, Communication and Networking Technologies (ICCCNT),Year: 2017 | Conference Paper | Publisher: IEEE

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details