SurveyPaperon Traffic RulesViolationDetection

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Abstract

The detection of traffic rule violators is a highly desired but tough task because of several challenges including occlusion, illumination, etc., which make it difficult to enforce safety measures on Indian roadways. The sophisticated technology known asthetraffic rules violationdetection system usesdifferenttechniques to detect and evaluate traffic offenses.The systemrecords pictures and videos ofcars breakingtraffic laws usingcameras positioned at intersections.Artificialintelligencealgorithms are thenused to evaluate these photos and videosin order to identifyandcategorize the specific infraction,such aslaneviolations,speeding, or red lightjumping. In orderforlawenforcementtotakeactionagainst the violators,the systemcanalsoautomaticallycreatealertsand notifications. Through the enforcement of traffic laws and regulations, the system contributes to a decrease in accidents and an improvement in overall road safety.

***IndexTerms*—**trafficrulesviolationdetection,Artificialintelligenceetc

I. INTRODUCTION

Two-wheelers are a verypopular form of transportation, but theycarrya high danger because theyhavelessprotection.Bicyclistsarestronglyencouragedtowearhelmetsinordertolower the risk. Because governments recognize the importance of helmets, they have made it illegal to ride a bike without one and ordered that anyone who do so face legal action. But the technology used for video surveillance today are passive and heavily rely on human intervention. Because human intervention tends to reduce efficiency over time due to human weariness,thesesystemsaretypicallyinefficient.Furthermore,humaninterventionforhelmet violationsisineffectivesinceonlyoneriderfromalargenumberoftwo-wheelerridersmaybe apprehended at a time. Riders on two-wheelers and four-wheelers disregard crosswalks at signals. When crossing violations are detected manually, it is ineffective and would cause traffic jams since it would disrupt the flow of traffic. Since traffic movement would not be disrupted and several violations could be detected at once, using CCTV cameras to detect crossing violations would be very advantageous.

India currently uses a manual approach for identifying infractions and prosecuting offenders. ThetrafficiscontinuouslyrecordedbytheCCTVsatthesignals.Thetrafficpolicecrewkeeps aneyeonthesereal-timevideosinthecontrolroom,andwhentheyspotaviolation,theyrecord the license plate and capture a screenshot as evidence. The offender is then notified of the infraction and charged with the fine after the infraction is recorded in the database. The staff findsitexhaustingtoconstantlywatchthescreensandmakesurenoinfractiongoesunnoticed in the midst of the nation's heavy traffic because this process is manual.

II.LITERATUREREVIEW

Prem Kumar Bhaskar, et al, "Image Processing Based Vehicle Detection and Tracking Method" [1], In the field of traffic surveillance systems, where effective traffic management andsafetyaretheprimaryconcerns,vehicledetectionandtrackingareimportantandeffective. The problem of identifying car and traffic information from video frames is covered in this work.Thereisstillopportunityfordevelopmentin thisfielddespitethenumerousstudiesthat have been conducted and the several approaches that have been used. It is suggested that a novelalgorithmforvehicledatatrackingandrecognitionbedevelopedutilizingblobdetection techniques and the Gaussian mixture model in order to make improvements. We start by learningthebackdropinordertodistinguishtheforegroundfromthebackgroundinframes.In thiscase,theobjectisidentifiedbytheforegrounddetector,andrectangularzonessurrounding each detected object are defined by a binary computation. Some morphological procedures havebeenusedtoeliminatenoiseandaccuratelydetectmovingobjects.Afterthen,thedetected items and their territories are tracked in order to complete the final counting. Using the GaussianMixtureModelandBlobDetectiontechniques,weachievedanaveragedetectionand tracking accuracy of over 91%, which is encouraging.

Kunal Dahiya, Dinesh Singh, and C. Krishna Mohan, "Automatic Detection of Bike-riders withoutHelmetusingSurveillanceVideosinReal-time"[2],Thearchitectureforautomatically identifying bikers without helmets using real-time surveillance footage is presented in this paper. The suggested method uses object segmentation and backdrop subtraction to first identifybike riders from surveillance footage. Next, it uses a binaryclassifier and visual cues to assess whether or not the biker is wearing a helmet. Additionally, we offer a violation reportingconsolidation method that enhances the suggested method's dependability. We have presentedaperformancecomparisonofthreedifferentfeaturerepresentationsforclassification in order to assess our methodology. According to the experimental results, the detection accuracyonreal-worldsurveillancedatais93.80%.Additionally,ithasbeendemonstratedthat the suggested method works in real-time with a processing time of 11.58 ms per frame and is computationally less expensive.

Abdullah Asım, et al, "A Vehicle Detection Approach using Deep Learning Methodologies" [3],Inordertomaximizethesuccessrateofthetraineddetectorbydeliveringeffectiveresults forvehicledetection,thetrainedvehicledetectorwillbetestedontestdata.Thestudy'sgoalis to successfully train our vehicle detector using R-CNN and Faster R-CNN deep learning techniques on sample vehicle data sets. There are six major phases to the working procedure. In that order, they are loading the data set, convolutional neural network design, training options configuration,FasterR-CNNobjectdetectortraining, andtraineddetectorevaluation. Furthermore,thestudy'sscopeincludedreferencestoFasterR-CNNandR-CNNdeeplearning techniques, as well as comparisons between experimental analysis and vehicle detection findings.

J. Chiverton, "Helmet presence classification with motorcycle detection and tracking" [4], Althoughhelmetsarenecessaryformotorcycleriders'safety,enforcinghelmetuseisalabour-intensive and time-consuming task. Therefore, a method for automatically classifying and monitoringmotorcycleriderswearingandnotwearinghelmetsisexplainedandputtothetest. Themethodmakesuseofsupportvectormachinesthathavebeentrainedonhistogramscreated frommotorbikeriders'headregionimagedatautilizingbothstill photos andindividualimage framesfromvideofootage.Thelearnedclassifierisintegratedintoatrackingsystemthatuses background removal to automaticallysegment motorcycleriders from video data. Thetrained classifier is used to classify the riders' heads after they have been segregated. Every motorcyclistcreatesaseriesofareasinneighbouringtimeperiodsknownastracks.Themean of the individual classifier findings is then used to classify these tracks collectively. Experiments demonstrate that the classifier can correctly identify whether or not riders are wearing helmets in still images. Additionally, tests on the tracking system show that the classification approach is valid and useful.

Gomathi, et al, “Automatic Detection of Motorcycle without helmet using IOT” [5], India’s large population, growing commuter population, poor traffic signal management, and rider behaviorhaveallcontributedtothecountry'sgrowingtrafficviolationmonitoringandcontrol problems.Ithasprovenineffectivetohandlesuchhightrafficvolumesandtrackviolationsby relying only on physical traffic police for monitoring. India's large population, growing commuterpopulation,poortrafficsignalmanagement,andriderbehaviorhaveallcontributed to the country's growing traffic violation monitoring and control problems. It has proven ineffectivetohandlesuchhightrafficvolumesandtrackviolationsbyrelyingonlyonphysical traffic police for monitoring.

Aaron Christian P. Uy, et al, “Automated Traffic Violation Apprehension System Using Genetic Algorithm and Artificial Neural Network” [6], The issue of packed and congested roadways is a concern in developing nations due to ineffective traffic law enforcement. Because they can simply escape and are not caught, drivers disregard the law. An intelligent traffic system that can automatically identify and stop traffic infractions specifically, drivers thatswerveorobstructthepedestrianlaneisproposedinthisstudy.Threeprocessesviolation detection,platelocalization,andplaterecognitionareincludedintothesystem'sdesign.While anartificialneuralnetworkwasusedfortheplaterecognitionprocess,geneticalgorithmswere used for violation detection and plate positioning. The position of the identified vehicle in relation to the camera is crucial for the plate number recognition. Therefore, the physical characteristicsofthe vehiclethat are recordedbytheviolationdetectionprocedurewillbe the primaryinformationabouttheoffender;therecognizedplatenumberwillonlybesupplemental information.Withanaverageaccuracyof90.67%andaprogramdurationof1.34seconds,the system asawholewas ableto identifytheplatenumberofthevehicles that wereidentifiedas trafficoffendersanddetecttheaforementionedoffensesbasedonthefindingsof48photosthat were tested.

Samir Ibadov, et al, “Algorithm for detecting violations of traffic rules based on computer visionapproaches”[7],Inordertoincreasepublic safetyatuncontrolledpedestriancrossings, we suggest a novel technique for automatically detecting traffic law breaches. There are multiple steps in the algorithm. They are the detection of autos, pedestrians, and zebras. We employthe quicker R-CNN deep learning algorithm forautomobile detection. Whenit comes to identifying traffic law infractions, the algorithm performs admirably.

Amey Narkhede, et al, “Automatic Traffic Rule Violation Detection and Number Plate Recognition”[8],Theglobalpopulationisbecomemoreurbanized.As aresult,therearenow much more cars on municipal roads, which has led to a sharp rise in traffic violations. People are more critical these days. In addition to causing more accidents that could endanger lives, thiscausesseriousharmtotheenvironment.Thepeople.Thedetectionoftrafficviolationsand their unthinkable consequences are necessary to address the concerning situation and stop similar incidents in the future. System implementation is essential.

PooyaSagharichiHa,MojtabaShakeri,“LicensePlateAutomaticRecognitionbasedonEdge Detection” [9], In this research, we offer an image processing program for identifying license plates: theAutomatic LicensePlateRecognition System (ALPRS). Therearefoursteps in the ALPRSprimaryprocess:TheFMHfiltereliminatestheimage'snoise.Backgroundsubtraction is done using a straightforward approach. The location of the license plate is localized using Cannyedgedetection.Lastly,thetemplatematchingtechniqueisusedtoextracttheletters and numbers. There are two benefits to the suggested algorithms: First, the approach is very resilienttonoise.Secondly,itis capableofhandlinglicenseplateswithvaryingcolors.A live video stream is used to test the algorithm's performance. Our algorithm's results indicate that, out of 70 car photos, the missing rate is nearly 16%.

KaimingHe,GeorgiaGkioxari,PiotrDoll´ar,RossGirshick,“MaskR-CNN”[10],Weoffera generic,adaptable,andconceptuallystraightforwardframeworkforobjectinstance segmentation. Our method concurrently creates a high-quality segmentation mask for each instance and effectively recognizes items in an image. By incorporating a branch for object mask prediction alongside the current branch for bounding box identification, the technique, knownasMaskR-CNN,expandsonFasterR-CNN.MaskR-CNNrunsat5framespersecond, iseasytotrain,andaddsonlyaminoroverheadtoFasterR-CNN.Furthermore,itissimpleto adapt Mask R-CNN to other applications, such as estimating human poses using the same framework. In the three tracks of the COCO suite of challenges—person keypoint detection, bounding-boxobjectdetection,andinstancesegmentation—weprovidethebestresults.Onall tasks, including the COCO 2016 competition winners, Mask R-CNN surpasses all current, single-model entrants without anyextras. We anticipate that our straightforward and efficient method will provide a strong foundation and facilitate further instance-level recognition research.

JosephRedmon,SantoshDivvala,RossGirshick,AliFarhadi,“YouOnlyLookOnce:Unified, Real-Time Object Detection” [11], We introduce a novel method for object detection called YOLO.Classifiersarerepurposedtocarryoutdetection inearlierobjectdetectionoperations. Rather, we formulate object detection as a regression issue to bounding boxes that are geographicallyseparated and the class probabilities that go along with them. Bounding boxes andclass probabilities aredirectlypredicted from completeimagesinasingleevaluationbya singleneuralnetwork.Thedetectionpipelinemaybedirectlyadjustedend-to-endondetection performancebecauseitisasinglenetwork.Thespeedofourunifiedarchitectureisreallyhigh. At 45 frames per second, our fundamental YOLO model processes images in real time. Fast YOLO, a scaled-down variant of the network, achieves double the mAP of other real-time detectorswhileprocessinganincredible155 framespersecond. While YOLOis less likelyto forecast false positives on background, it makes more localization errors than state-of-the-art detectionalgorithms. Lastly,YOLOpicksupextremelybroadobjectrepresentations.Whenit comestogeneralizingfromnaturalimagestootherdomains,suchasartwork,itperformsbetter than other detection techniques like DPM and R-CNN.

Dr. Praveen Blessington Thummalakunta, Manav More, Rhutuja Kakade, Omkar Nagare, Rutuja Sawant, “Traffic Offender Detection System Using Deep Learning Approach” [12], India's large population, growing commuter population, poor traffic signal management, and rider behavior have all contributed to the country'sgrowingtrafficviolationmonitoringandcontrolproblems.Ithasprovenineffectivetohandlesuchhigh traffic volumes and track offenses by relying just on physical traffic police for surveillance. India's large population, growing commuter population, poor traffic signal management, and rider behavior have all contributed to the country's growing traffic violation monitoring and control problems. It has proven ineffective to handle such high traffic volumes and track offenses by relying just on physical traffic police for surveillance.

III.PROPOSED SYSTEM

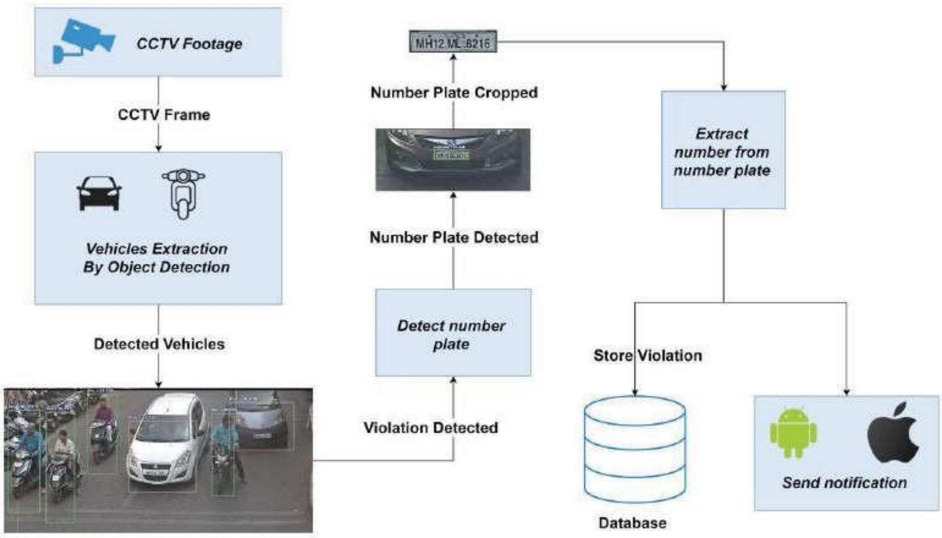

Figure1-SystemArchitecture

In the proposed system, we use Object Detection to recognize vehicles after initially feeding the machine an image frame from CCTVfootage.YOLO, or "you look only once," is used in object detection to find cars in an image frame. Following vehicle detection, each vehicle is croppedout usingthecoordinatesthattheobject detection algorithms haveprovidedfrom the bounding boxes. Every car is now inspected for various infractions. This suggested system includesthefollowingviolations:CrosswalkViolation(ViolatingZebraCrossing)andHelmet Violation (Two-Wheeler Rider Not Wearing a Helmet). Vehicles with two wheels will be inspectedforhelmetandcrosswalkviolations,andvehicleswithfourwheelswillbeexamined for crosswalk violations. A CNN (Convolutional Neural Network) based classifier, which performs well on visual data,is used to detect helmet violations. ByemployingMaskRCNN, whichusesinstancesegmentationto comparethecoordinatesofthevehicle'sbottom tirewith those of the detected crosswalk, crosswalk violations can be identified. Following the detection ofa vehicle violation orviolations,object detection is usedto findthe relevant car's license plate.Once more, YOLO is utilized to identify a vehicle's license plate. The license number is extracted from the license plate using optical character recognition, or OCR. Violations are added to the database and associated violations are communicated to vehicle users. Statistical analysis ofpast infractions oftrafficlaws can beobtained from the database.

IV. CONCLUSION

This research examines various approaches for a Traffic Rules Violation Detection. The suggested methodusesideaslikeCNN,MaskR-CNN,OCR,andYolotoautomaticallydetectinfractionsoftraffic laws. It easily and precisely accomplishes the intended result, but because it uses ideas like object detection and image segmentation, it demands a lot of processing power. The benefit of the suggested system is that, in comparison to the human-intervened system, it can detect a greater number of infractions. Furthermore,whenput into practice,thesuggestedmethodology's end-to-endautonomous system would provide it an advantage in identifying infractions. As a result, stringent laws against breakingtrafficlawscanbeputintoplace,improvingroadsafetyandraisingawarenessamongdrivers.

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