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Research

Design and Implementation of Algorithm for Traffic control using Deep learning

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Abstract:- With the increasing population in the world, the problem of traffic control is also growing. To solve this problem, computer science provides subsets of artificial intelligence such as machine learning, and within ML, deep learning offers various algorithms, models, and components. These can be used to solve traffic control problems using ML or DL. For example: 1. Supervised learning algorithms

2.Unsupervisedlearningalgorithms3.Reinforcementlearningalgorithms(RL)4.Deeplearningalgorithms.Amongthealgorithmsmentionedabove,theYOLOalgorithmis considered the most suitable modern deep learning-based algorithm for traffic control. In a 2012 study, Joseph and Farhadi regarded YOLO algorithms as better, faster, stronger algorithms for object detection and traffic control. Joseph Redman and Ali Farhadi used a combination of YOLO and YOLO9000 versions for traffic/object detection. The YOLO algorithm plays an important role in real-time vehicle detection in smart cities and urban areas for accurately identifying vehicles and classifying them. In complex smart cities and urban areas, to make traffic control and vehicle detection more efficient, the data-driven deep learning YOLO algorithm is rapidly gaining popularity. Its capacity is better than DRL, SIMULATION models, RL, and DQN. It extracts frames from videos to give priority to emergency vehicles, track vehicles, and calculate the speed of points, so that vehicles moving at high speed can be counted and identified. In the future, the YOLO algorithm provides a good balance for high-speed traffic monitoring.

Keywords:- YOLO algorithm, RL, ML, DQN, YOLO9000, YOLO version, Computer vision LSTM, Simulation, CNN, sensor, bounding box, sigmentation.

Introduction of Traffic control Algorithm /traffic detection Algorithm:-

Introduction of Traffic control Algorithm /traffic detection algorithms are a group of instructions. They are mathematical and computer programs that work to identify the speed, position, and density of vehicles on the road. This mathematical technology is essentially an element of ITS (Intelligent Transport System).Their operation happens in the following way:

Thesealsanalzedata receivedfromCCTV,sensors,andradar.

Theyidentifyobjects and map thedistancebetween themto analyzethe crowd.

These modern algorithms use AI subsets like machine learning, deep learning, and computer vision toobtain accurate information in real time.

These algorithmsareusedfor trafficsignalcontrol,detectingaccidents,andorganizing tools efficiently. there is following type:-

S.No	Algorithmtype	Example	Work
1.	sensorbased algorithm	YOLOV3,YOLOV4,YOLOV7,YOLO V8	This activates datareceived frominductive loops orpiezoelectricsensorsinstalled under the road.
2.	Radar/Lidarbased Algorithms	YOLOWORD,VOXELR-CNN	**This uses a laserlight to map thedistance and speedof objects. It uses a3Dspatialmappingmodel.**
3.	AI/ML/DLBASED ALGORITHMS	YOLOV3,YOLOALLversion,LSTM	**ModernalgorithmsusingAI/ML/DL/CNN accurately identifypoor weather andlow-lightconditions.**

Note-YOLOalgorithmisadeeplearning-basedalgorithm, whichisusedintrafficcontrol.Thisalgorithmisthebestoptioncompared to other algorithms.

LiteratureSurvey:-

S.No.	Year	Author	Description
Survey1 Batter,faster,andstronger	2017	J.Redmanand A.FARHAD	Deep learningconvolutional network,colorpointpixcelcount
Survey2. A Computer vision based vehicle detectionandcounting system	2019	Nilakornseenouvongulerit,Wachareerueta	ReferencelinemodewithGaussian mixergrey scale counting
Survey3.YOLO(YOU ONLY LOOK ONCE)Unfied,realtime object detection	2018	J.Redman,S.Divvale	MajortypeCountcolorandhidden mark yolo model
Survey4.yolov3 (DL BASEDALGORITHM)	2017	Prof.Godakeg.k	Dynamictraffichighcontrol
Survey5.yolov7	2022	Avinashpadmaker rangari, Ashwiniravindra	Trafficlightsystemusingimage processing with YOLOV7
Survey6.yolo 9000(yolov2+yolov3)	2016	JesephRadman,Ali farhadi	Yolo9000BATTER,FASTER,AND STRONGER

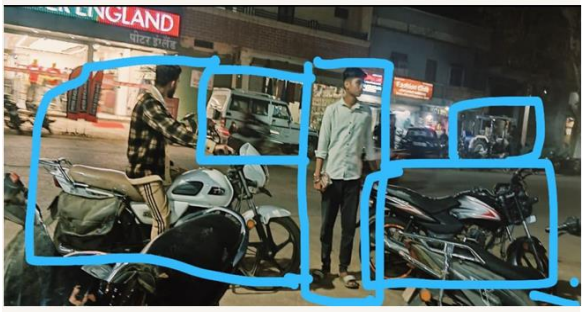
Introductionof YOLO:-

ThefullnameofYOLOis"YouOnlyLookOnce".

Itisatypeofdeeplearning/machinelearningalgorithmthat makes traffic control smart and solves traffic control problems. YOLO is a hierarchical or optimal-based network algorithm. After the development of YOLO, its popularity increased even more. Based onits applications, extended versions of it were also developed, such as: YOLOv2, YOLO9000, YOLOv3,YOLOv5, YOLOv7, YOLOv8, YOLOv11, YOLOv12, YOLO word.

YOLO is used for traffic control or anomaly traffic detection using CNN. If any vehicle in trafficstops in a batch for any reason, the YOLO AI immediately alerts the AI control room and it uses CNN andRL (Reinforcement Learning) to adjust the traffic waiting time, either increasing or decreasing it. Amongthe YOLO versions mentioned above, YOLOv3 is a powerful real-time object detection and smart trafficcontrol algorithm. It is used to recognize traffic signals, identify pedestrians, reduce congestion, predicttraffic flow, show the speed of moving vehicles, and more. Among the YOLO versions mentioned above,YOLOv3 is a powerful real-time object detection and smart traffic control algorithm. It is used forrecognizing

traffic signals, identifying pedestrians, reducing crowding, predicting traffic flow, showing thespeed of moving vehicles, etc. YOLO uses various technologies for traffic control as follows: computervision for detecting any kind of image, SSD method for single shot detection, vehicle tracking method todetermine the direction of moving vehicles, traffic flow prediction method to estimate future trafficconditions, and Random Forest and XGBoost for detecting weather-related problems, etc.



Thestructureof YOLOv3hasbeendividedinto3layers:-

S.No	Layer name	Layer'sFeatures
1.	BackboneDarknetlayer	YOLOv3usestheDarknet-53network for its featureextraction, which is made upof 53 CNN layers that use residualblocks,anditcapturesall the features of traffic.
2.	NeckLayer	**Inthis,thepyramidnetworkperforms detection atdifferent scales.**
3.	HeadLayer	**The head phase is alsoknownbythenameYOLOlayer. It primarily defineslocalization andclassification.**

KeyconceptsforunderStandingYOLOV3:-
Residualblockskeyconcept:-
Whenthemodelprocessestheimage,itdividestheimageintogrid cells (sxs). The grid cells can be any dimensional as 3x3 or 13x13, depending on the size of the image. Each gridcell is responsible for predicting the bounding box.

Localizationkeyconcept:-
Theconceptoflocalizationdefinesthepositionoftheobjectunderthe image in the video.

Boundingboxeskeyconcept:-
Boundingboxisatypeofrectangle.Whichdefinesthesizeand position ofthe object underthe image? In other words, it is the frame. Which shows wherethe object is in the image? It has some parameters with the help of which the object is detected.

Targetvectoryolov3keyconcept:-

Theconcept oftarget vectoris processedin several steps.

Targetlable Yfor thissupervisedlearningtaskisexplained as:

Yisavector containingPc,Bx,By,Bh,Cl…..Cn

Pc is the probability of presence of particuler class in the grid cellPc>=0 and<=1(i.e,Pc=0 means that object is notfound.Pc>1 means 100% probability that object is present.

Next if there is an object then our next concern is the defination of bounding box by 4 parameters i.e.,Bx,By,Bh,Bw where (Bx,By) defines the mid-point of object and ((Bw,Bh) defines the height and width of bounding box.

Aloso if Pc>0 then there will be n number of C which represents the classes of objects present inthe image.

AnchorBoxeskeyconcepts:-
Anchorboxesaredifferenttypesofpredefinedshapes.Theysupport whatever type of prediction is assigned to the shape.

Nonmaximumsupressionkeyconcept:-
Whenthemodelprocessestheimage,itcreatesmany bonding boxes, in which the NMS technique is used.

IOU(interactionoverunion)keyconcept:-
Thesetwoboxesoverlapeachother.Theskewnessisbetween0 and 1. The best prediction is considered to be union scrapes=>0.5.

LossFunctionofYOLOV3:-
Combinationofclassificationloss,localizationloss,confidencelossfunction is described.

Advantages**of YOLOv3**algoriths:-

TheYOLOV3algorithmpredictsbadroadsorfortificationsinadvance.

Thetimingofthesignallightchangesautomaticallydependingontheintensityoftraffic.AS:-
Showing green light to a road with heavy traffic.

Thereis lesspollution dueto less traffic.

Fuelconsumptionisless.

Yolov3'slearningcapabilitiesoraccuracyare high.

Yolov3hashigh speedforextraordinaryreal-time object detection.

Yolov3canbeused veryeasilyforreal-timeanomalytraffic control.

Disadvantages\LimitationofYOLOV3algorithm:-

Therewould beproblemindetectingsmall objects.

Localizationerrorsaremore common.

Futureuse/possibilities/conclusionoftheYOLOv3 algorithm:-

The YOLO algorithm will play a revolutionary role in the field of traffic control after 2026. Due to its high speed, YOLOv3 can usecomputer vision technologyto immediatelydetect pedestrians, cyclists,vehicles, their high speed, and their numbers on the road, which can help control traffic jams. The YOLOalgorithm will immediately help in generating e-challans for those who don't wear helmets, walk in thewrong direction, or don't follow road rules. **Emergency excuses will be given first priority.** It means thatthe studies conducted indicate that all YOLO versions could provide a good balance for high-speed trafficcontrolling and monitoring in the future.

References:-

JesephRedman,AliFarhadi(yolo9000Better,Faster,andStronge)arxiv:

1612.08242v1(CS.CV)25DEC2016

AvinashPadmakarRangori,AshwaniRavindra(DeeplearningbasedsmarttrafficLightsystemusing imageprocessing)Internationalconferenceoncircuits,commmnicationandcomputing(14C)/ 979-8-3503- 9747-5/22/83/.00@2022 IEEE/Do.101109/14c57141.2022.10057696.

.S.Bell,C.L.zitrick,K.balaandRGirshick.Insideoutsidenet:detectingobjectincontextwithskip pooling and recurrent Neural networks.arxil preprin arriv1512.04143,2015

S.Ren,K.H,RgirshickandJ.sunfaster-rcnn:TO-WardsREALTimeobjectdetectionwithregion proposal net works arxiv preprint:1506.104972015

5.C.szegedy,S.loffeandv.varhoukeinceptionv4,inception-renetandtheimpactofresidualconnectionson learning CORR,abs/160.07261,2016

.Prof.GodakeG.K.(DynamictraffichighcontrolyoIov3)

J.Redman,S.divvale(yolomodel)

8.NilakomSeen Ouvongulerit,Wachareta

9.Tazzainamalik(yoloalgorithmofobjectDetection)