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Traffic Sign Recognition and Accident Prone Zone Indication in Autonomous Car

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***Abstract*- The overarching goal of the automotive industry is to improve the safety of driving machinery and to prevent accidents. Traffic laws and regulations written by law are not followed by many citizens. Many citizens do not follow the rules and regulations of the road written by the law. This is another reason for the accident. Sometimes accidents are unintentional. Other serious actions such as drunkenness and driving, ignoring, or misinterpreting signposts, and speeding can cause serious accidents. To avoid such situations, we need an Advanced Driver Assistance System (ADAS) in private cars. An Autonomous vehicle (AV) also known as a selfdriving vehicle, non-motor vehicle or robot vehicle is a ground vehicle that can sense its location and drive safely without user interference. ADAS has the potential to increase safety and provide comfortable driving. Driving conditions are electrically controlled and decisions are made easier for the driver. Older people can also get many benefits from this technology. ADAS is built with a personal communication device that often improves road safety slightly. Accidents caused by human error can also be minimized. ADAS helps drivers to automate, adapt and improve the car's safe driving system. Fixed safety technologies such as installing seat belts and airbags cannot prevent road deaths. ADAS also informs the driver of potential problems and helps maintain the stability of the vehicle under critical conditions. Safety features are designed to control the car during a crash. ADAS relies on input from road signidentification, etc. Additional features can be customized based on the needs of the driver. In this project measures to prevent speeding, collisions between vehicles,and driver warning systems. Mathematical models such as image processing techniques and neural networks are used to sense the speed limit onsignal boards. Vehicle speed is controlled based on readings obtained from Signs. Drivers will receive a warning message as they approach an increasingly dangerous area, and the vehicle will maintain a steady speed. The proposed system is designed to achieve maximum accuracy and real-time limits.**

Keywords: Advanced Driver Assistance System (ADAS), neural networks.

I. INTRODUCTION

In this technology era, the CNN's performance has drastically changed the approach towards image and pattern recognition by exceeding the performance of human on standard datasets. The great feature of CNNs is that they automatically extract and learn high level features from training datasets which can be used intensively in image recognition tasks and hence surpass the human need to only select easy to use and understandable features for the model. Another benefit of CNNs is that they have a higher accuracy than traditional flattened neural networks by considering 2D structure of images. Convolutional neural networks (CNNs) are models based on machine learning techniques designed exclusively for accomplishing various tasks such as computer vision, decision making and image/visual recognition. In most cases, they override standard feature extraction-based systems and has shown remarkable performance in tasks such as, image captioning, image classification, object detection or semantic segmentation. the convolution kernels are used to scan a whole image with relatively few parameters need to be learned compared to the total number of operations. Hence traffic sign recognition system is designed using CNN to combat real time constraints. The alert system is implemented to notify the driver of accident prone zones and the speed of the vehicle is maintained below the maximum limit. Thismethodology reduces the accidents in an effective manner.The neural network is a hardware and / or software system patterned similar to the operation of neurons in the human brain.Traditional neural networks are not suitable for image processing and should be fed images with fragmented fragments.CNN have their "neurons" arranged more like those of the frontal lobe of the human brain, the area responsible for processing visual stimuli in human beings and other animals. The layers of neurons are arranged in such a way that they cover the entire viewing field to avoid the problem related to image processing of traditional neural networks. CNN uses amultilayer perceptron like system design to reduce processing needs. CNN layers contain input layer, output layer and hidden layer that include multiple convolutional layers, pooling layers, fully connected layers, and normalization layers. Removal of limitations and increased efficiency of image processing results in a more efficient, easy-to-use training system that is limited image processing and natural language processing. CNNs are useful for finding patterns in images in order to recognize objects,faces, and scenes and it is quite effective for classifying non-image data such as time series, audio, and signal data. CNN is widely used in applications like medical imaging, synthetic data generation, audio processing, stop sign

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detection.Applications that predominantly use object recognition and computer vision such as self-driving vehicles and face-recognition applications heavily rely on CNNs.Of particular concern are conversion networks in segmentation operations, where image output is a single-phase label that requires segmentation. Unlike other neural networks, the input to CNN is an image. Convolution is a function based on two functions provided by a combination that describes how the shape of one istransformed into another. The convolution layer consists of a set of independent filters. The filter slides over the full image and dot output is taken between the filter and parts of the input image. Each filter is individually integrated with the image that leads to feature maps. Another great use we find in the feature map is that reducing image size by storing its semantic information is one of them.

II.PROPOSED SYSTEM

A new system to automatically recognize the traffic signs based on raspberry pi with the help of pi cam, DC motor and GPS isproposed.Theobjectiveoftheproposedsystem is to recognize various types of traffic signs automatically in order to considerablyreducetheaccidents.Inthisconnection,detailsofthenewproposedsystem are elaborated in the following section.

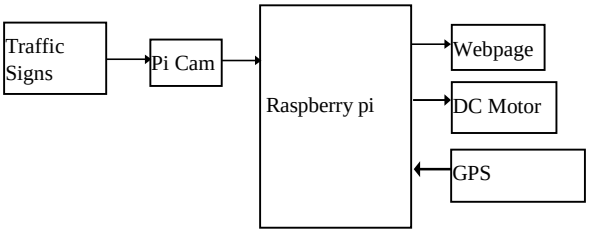

Fig.1.Block diagram integrating traffic sign recognition in real time and alert systemin Autonomou scar

The whole system has to be installed on front end of the vehicle so that camera will face the direction of the road. The images captured by the camera is given as input to raspberry pi with the help of camera module connected with raspberry pi which isused to detect the traffic sign on the road. It captures the sequence of frames to detect and analyses the traffic sign in order to match with the images in the dataset.
Raspberry Pi has been used as a processing unit which takes the input through the raspberry pi camera and drives the car by sending control signals to the L293d driver module, which in turn controls the car. Raspberry pi is dumped with python code relevant to the application which is used to make communication between different sensors in the network and CNN network. Python integrated with OpenCV library is the programming environment used for implementing CNN algorithm related to the Traffic Sign Detection and Recognition. The entire system is implemented using open-source hardware platform and open-source software environment. Unlike some of the related work which considers static images, our system works on real time images. The data (images) will be used to train the neural network model.
The major core of the project is that the Convolutional Neural Network which maps the raw image pixels into features that enabledetectingtheroadsignsandnavigatesthecar.Aconvolutionalneuralnetwork(CNN)isatypeofartificialneuralnetworkusedforimagedetectionandprocessingdesignedtoprocesspixeldata.Aconvolutional neural network (CNN or ConvNet), is a network architecture designed for deep learning which learns directly from data (image, video, etc.) eliminating the need for external manual feature extraction. One of the recent advanced neural networks called Convolution Neural Network (CNN) is exploited for real time image/video analysis using an IOT device. This project makes use of a raspberry pi which is responsible for controlling the car and performing inference using CNN based on its current input. For Building a Neural network model we need lots of data. All the possible datas are collected during the training process. During initial phase, the car has to be controlled wirelessly. In order to achieve so, we need to use VNC viewer which enables us to control Raspberry Pi wirelessly through Wi-fi in devices such as smart phones and laptop. Different types of traffic signs are trained using the CNN algorithm and the camera monitors the traffic sign in real time. If traffic signs are identified with the help of training examples, the signal will be sent to the output by the controller.
Through raspberry pi, entire data regarding the driver location and the traffic sign detected will be displayed on the web page. The detected symbol is shown on the webpage. The database of accident-prone zone is created. The location of the car will be

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tracked continuously with the help of Global Positioning System (GPS). If the vehicle enters the accident-prone zone, the base station sends an alert notification to the driver. The steady speed of the DC motor is maintained.
Next is to build a track so that we can train the car. Finally, by collecting the image data through the raspberry pi camera, the motor speed is controlled according to traffic sign and location of the car.

III.HARDWARE SETUP

The objective of the proposedsystemistorecognizevarioustypesoftrafficsignsautomaticallyinordertoconsiderably reduce the accidents. This criteria is satisfied by making necessary hardware setup for effective functioning of the system.

The Building blocks of the proposed system are as follows

1)trafficsigns –datasetinputs
2)pi camera – capture the traffic signs
3)raspberry pi – processor that process the pi camera output and send the controls/actuate the webpages, dc motor & GPS.
4)DC motor – controls the speed of the vehicle.
5) GPS – monitors the location of the car.

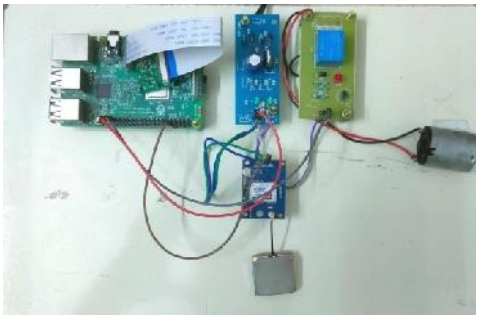

Fig.2.Hardware Setup of the proposed system

The working of the hardware setup is as follows:

1) The real time traffic road signs are captured by raspberry pi camera fixed onboard in the vehicle.
2) Different types of traffic signs are trained using the CNN algorithm and when the input image matches with the trained traffic signs, the signal will be sent to the output by thecontroller.
3) The speed and direction of the DC motor is changed according to the traffic sign detected.
4) The location of car is continuously monitored with the help of GPS system.
5) Database is created by collecting the location oftheaccident-prone areas. If the vehicle enters that zone, an alert notification will be sent to the driver.

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IV.SIMULATION RESULTS

The simulation of the proposed system is done using Raspberry Pi OS.Thetraffic signslike “NOLEFTTURN”, ”HOSPITAL ZONE”, “SPEED LIMIT”,“STOP”,”SCHOOLZONE”arethesampletrafficsignstakenasinputandfeaturesareextractedusingCNN.

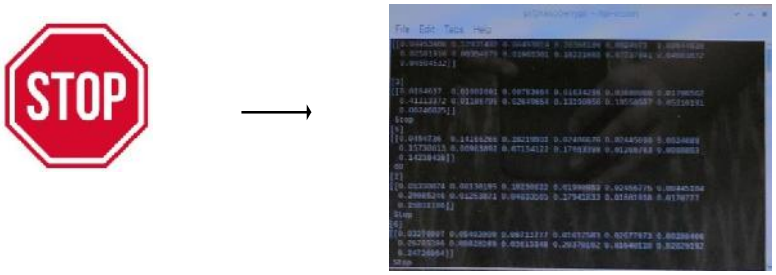

Fig.3.SimulationoutputforSTOPsignal

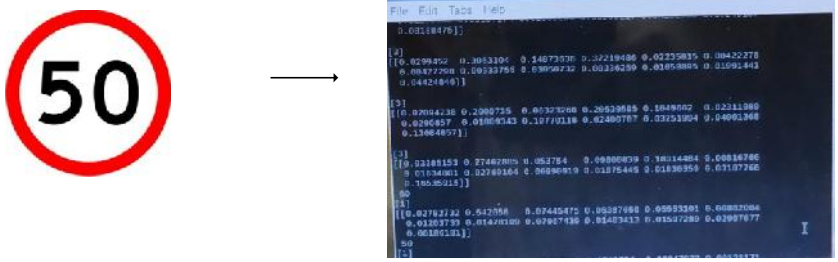

Fig.4.SimulationoutputforSPEEDLIMIT50signal

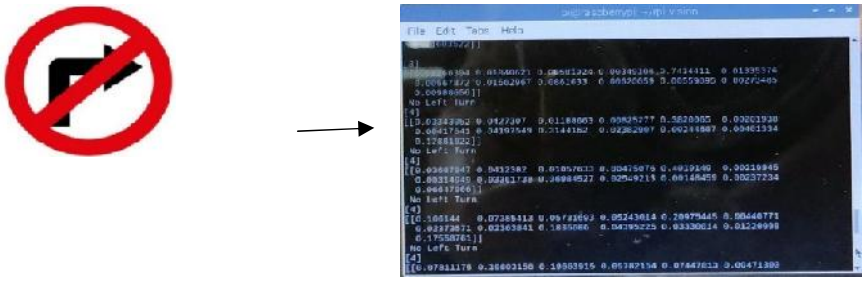

Fig.5.SimulationoutputforNOLEFT TURNsignal

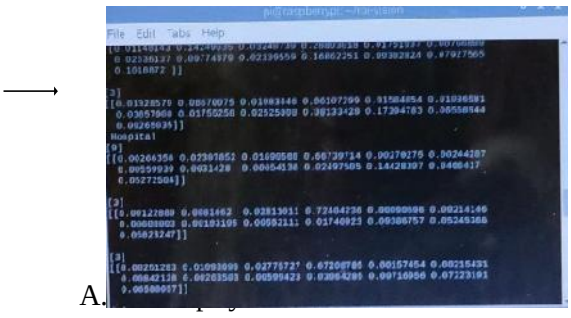

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Fig.6.SimulationoutputforHOSPITALsignal

V.CONCLUSION

Traffic Sign Imagerecognition using CNN is implemented. Hardware setup hasbeen designed and python code is written to extract the features and recognize varioustraffic signs.Severalexperimentsrelated to thespecified study areas have beenmade to completely understand the working mechanism and real time problemsfacedinthe field. A tedious process of creating a databaseconsistingofaccident-pronezonesisimplemented.The alert notification system, to sendalert signal to the driver whenever the car reaches the accident-prone zone isimplemented. Thus, effective system has been proposed for reducing the number ofaccidents withlesshuman intervention.

VI.REFERENCE

[1]Ameer Rasouliand John Tsotos K. (2020),'A Survey of Theory and Practice Autonomous Vehicle that Interact with Pedestrians',IEEETransactiononIntelligentTransportationSystems,Volume21,Issue3.

[2]Ching-Hao Lai and Chia-Chen Yu (2010),'AnEfficient Real-Time Traffic Sign Recognition System for Intelligent Vehicles with SmartPhones',IEEEInternationalConferenceonTechnologiesandApplicationsofArtificialIntelligence.

[3]Dinesh M. and Bhaskar K.B. (2020),' Smart Highway Accident Alert Using Raspberry Pi Camera', Journal of Digital Integrated Circuits in Electrical Devices, Volume-5,Issue-1.

[4]Irfan Ahmad and Karunakar Pothuganti (2020),'Design &implementation of realtime autonomous car by using image processing & IoT', Proceedings of the Third International Conference on Smart Systems and InventiveTechnology IEEEXplore PartNumber:CFP20P17-ART;ISBN:978-1-7281-5821-1,978-1-7281-5821-1/20/$31.00.

[5]Li Li, Ding Wen, Nan-Ning Zheng and Lin-Cheng Shen (2012),' Cognitive Cars: A New Frontier of ADAS Research', IEEE Transaction on Intelligent Transportation System,Volume 13, Issue 1

[6]Padmaja B.,Narasimha RaoP.V.,MadhuBala M.and Krishna Rao PatroE.(2018),'ANovel Design of Autonomous Carsusing IoT and Visual Features', International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)IEEEXplorePartNumber:CFP18OZV-ART; ISBN:978-1-5386-1442-6.

[7]Paolo Bosetti, Mauro Da Lio, Andrea and Saroldi (2015), 'On Curve Negotiation from Driver Support to Automation',IEEE Transaction on Intelligent Transportation Systems,Volume 16, Issue 4.

[8]PatilD.Y.(2015),'ARoadSignDetectionandtheRecognitionforDriverAssistanceSystems',InternationalConferenceonEnergy SystemsandApplications.

[9]PrachiGawande(2017),'TrafficSignDetectionandRecognitionUsingOpenCV',InternationalResearchJournalofEngineeringandTechnology(IRJET),eISSN:2395-0056,p-ISSN:2395-0072.

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[10]Radhakrishnan N. and Maruthi S. (2017),' Real-time Indian traffic sign detectionusing Raspberry pi and Open CV', International Journal of Advanced Research inScienceandEngineering,VolumeNo.06,IssueNo.11.

[11]Saurav Agrawal and Varade S.W. (2017), 'Collision Detection and AvoidanceSystem For Vehicle',Proceedings of the 2nd International Conference onCommunication and Electronics Systems (ICCES) IEEE Xplore Compliant – PartNumber:CFP17AWO-ART.

[12]Selvathi D., Pavithra P. and Preethi T. (2017), "Intelligent Transportation System for Accident Prevention and Detection," International Conference on Intelligent Computing and Control Systems.

[13]SharmaS.andShahD.(2016),'APracticalAnimalDetectionandCollisionAvoidanceSystemUsingComputerVisionTechnique' ,IEEE.

[14]Shopa P.,Sumitha N. and Patra P.S.K (2014),'Traffic Sign Detection and Recognition Using Open CV',International Conference on ICICES2014–S.A.Engineeringcollege.

[15]Vaibhavi Golgire (2021),'Traffic Sign Recognition using Machine Learning: A Review',International Journal of Engineering Research &Technology (IJERT),Vol. 10 Issue 05.