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Incidences of Fatal Pedestrial Collisions and Vehicle Speed Control with Tsod Algorithm

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Abstract:

Many Applications use Agent-based approach and reinforcement algorithms in machine learning, but it is not much suitable for current advancement in traffic systems. Here we use Artificial Intelligence (AI) the technique to train machines to act like human. This paper proposes automatic speed control for fatal pedestrian areas and restricted zones through traffic sign recognition. It undergoes four main phases. In the first phase of image processing by the use of camera the external environment is captured and converted into frames. The frames forms the neural network through deep learning Traffic Signs Object Detection(TSOD) algorithm, on phase two the image are analysis and compared for accurate outcome by using Open CV. Proper indication is displayed through LCD display and if speed is not reduced accordingly automatic speed reduction takes place with the help of Pulse Width Modulation (PWM) algorithm. TSOD algorithm is more accurate and efficient for image processing. The main advantage is automatic reduction of vehicle speed and it reduces Ignorance of traffic rules and collisions.

Keywords: *artificial intelligence (AI), Traffic Signs Object Detection(TSOD), image processing, pulse width modulation (PWM).*

INTRODUCTION **N**ow-a-days, due to our ignorance of traffic rules it leads to unnecessary accidents and loss in many important zones especially in school zones and pedestrian areas. Thus we provide automatic speed control in vehicles at those sensitive areas by using Artificial Intelligence (AI).

Artificial Intelligence (AI) is an area of computer science where we train machines to think and act like humans using various techniques like Machine learning and Deep learning. In deep learning technique it uses Unsupervised and supervised data so we train our machine to think and perform like humans when important zones occur. AI research include reasoning, knowledge representation, planning ,learning, natural language processing, perception and etc.

Our essential task is to develop machines to think like humans with the help of deep learning. In deep learning we use Traffic Signs Object Detection algorithm (TSOD) for image processing because Image processing is a main process in our project through which only traffic signs are captured and fed to machines with the help of TSOD algorithm the frames form a neural network.

Image processing is of processing for which the input is an image or a series of image or videos such as photographs or frames of videos. The output of image processing is either set of image or characteristics of image. It analyzing and manipulating the image.

TSOD algorithm is a specialized Kind of linear operation. It has many hidden layers. It is mainly used for image recognition and classification. It provides

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more accurate and efficient outcome in Image processing.

Before that the machines are trained with the help of data sets collected and stored in tensor flow records which creates unique identification code for all datasets. Once the images are captured and forms a neural network the Neural Network checks the dataset for similarities. If the dataset and the input matches then it communicates with the driver through LCD display thus if fail to reduce the speed of the vehicle automatic speed reduction system gets activated using Pulse Width Modulation algorithm (PWM).

Pulse Width Modulation (PWM) is used for controlling the amplitude of digital signals in order to control devices and application requiring power or electricity. It is also called Pulse Duration Modulation (PDM).

RELEVANT STUDIES

We proposed automatic PWM to control vehicle speed automatically in the restricted and pedestrian areas through the traffic sign recognition. The algorithm used in this process is TSOD with open CV software for labeling and comparing the images through image processing.

Among the studies about agent modeling approaches we get architecture and frame work aspects for traffic control applications [1]proposed by Jin.

By using the support vector machine we can acquire most efficient algorithm to recognize the traffic sign. The accuracy achieved through the detection is high it is proposed by Ivona matos [2]. The detection, transformation along with guass , filter for removing the noise from the detected images.

The freeway congestion is to optimize the freeway traffic mobility and safety by using the approach of distributed reinforcement learning. the traffic control is more applicable in large network by using the DQL algorithm which is proposed by wang [3].

Traffic jam are controlled by speed limit controller for recurrent traffic jams with efficient variable speed limit VSL control stratergy. It increases the robustness and eliminating online computational cost. This paper was proposed by bart de schutter.[4]

For road safety concerns the speed limits are controlled by arduino with ultrasonic sensor.the accidents and deaths are reduced it is more cheaper and efficient way the idea was introduced by rakan basher. [5]

Automatic traffic violation recording and reporting system is used to reduce the number of road accidents which is proposed by samir Elsageer Mohammed [6] to improve the efficiency and for ease of use image processing ideology is implemented.

By using plane-based approach the speed limit violation is reduced the camera is used to capture the violation and with 3D position in license plate which is implemented by mahmoud Famouri [7].

By using the speed harmonization of automated vehicle to reduce the speed control and optimize it which is comparatively complex to implement in real time and is introduced by andreas A malikopoulos [8].

By using the deep learning algorithm with high dimensional range is used to detect the traffic light recognition and using the multi user TSOD based algorithm it can be seen in [9]-[10].

By using double-Q learning and RL algorithm controlling of vehicle speed it gives high accuracy and policy quality can be seen in [1] - [11].

In deep neural network algorithm for machine learning image processing technique is used in medical fields but not in other fields which is proposed by Chitan parmar seen in [12].

Analysis of unsupervised data using deep learning, machine learning and tensor flow technique is used but largely depends upon data sets which is proposed by Arshiya begum seen in [13].

For efficient vehicle classification transfer learning technique is used through TSOD algorithm introduced by so yeon jo in [14].

For more advanced driver perception based decision making ability and reduces accidents through Artificial Intelligence (AI) and using VANET technique which use high computational resources [15]. so simple methodology like labeling and comparison based on Open CV with nominal amount of resources is carried out in proposed system.

PROPOSED SYSTEM

The proposed work explains about the ideology of automatically controlling the speed of the vehicles in restricted and pedestrian areas through traffic signs recognition using the Traffic Signs Object Detection(TSOD) and Pulse Width Modulation (PWM) algorithms.

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The domain focused here is Artificial Intelligence (AI) which involves training the machines to perform decisions like human when there is need to react over the restricted and pedestrian areas on traffic.

ARCHITECTURE: the architecture used in this system describes the flow for automatically controlling the speed of the vehicles.

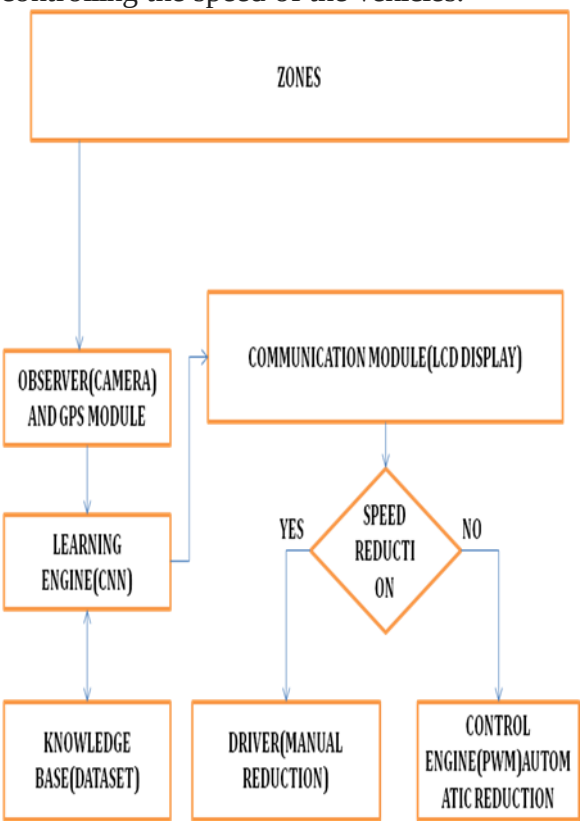

Fig (1)

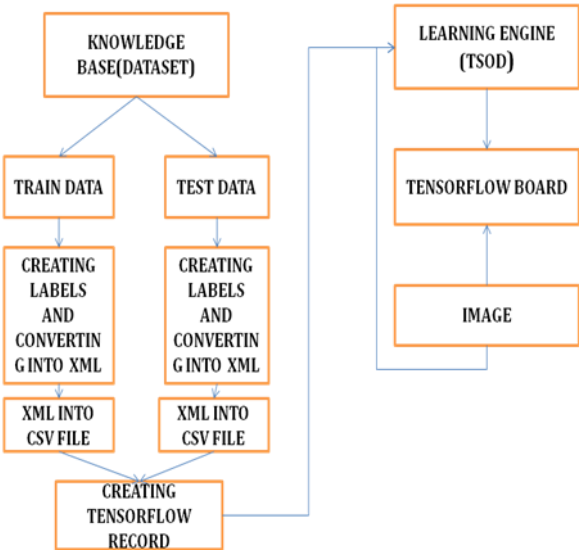

Fig (2)

In fig(1) the observer (Camera) captures the traffic signs like pedestrian cross, school zone etc.. present in the road is processed using image processing technique.

The processed image enters into the learning engine which is then compared with the knowledge base or data set. If the data in the learning engine and the data set satisfies then the learning engine communicates with the communication module (LCD display) which displays the notification to the driver in the vehicle and send a buzzer alert

If the driver fails to reduce the speed of the vehicle then the speed of the vehicle is automatically reduced.

In fig (2) the description of interactions between the knowledge base and the Learning engine is explained, In knowledge base there will be two kind of data classified i) train data and ii) test data the both data are labeled with the help of windows_v1.8.0 application and the labeled data are converted into XML files and the XML files are converted into CSV file then, the files are stored in tensor flow record.

Tensor board is used to run tensor flow records and also checks the accuracy of the object detection .

DETAILED PROCESS:

CAPTURING THE IMAGES:

Image processing is an essential technique for the success of capturing the images. Here, in our system the camera is placed inside the vehicle (car) which is the more convenient way to view the external environment and process the input.

The camera gets the input as video which is converted into frames and by using the image processing technique the frames are labelled and forms a neural network with the help of TSOD algorithm

TRAFFIC SIGN OBJECT DETECTION:

Traffic Sign Object Detection is more essential and advanced technique in deep learning t gives accurate output compared to other techniques. TSOD algorithm mostly used in image processing because it gives more accuracy in image detection so in our project the neural network is used in image detection. The cause for forming the neural network is that for the purpose of training the AI related to the decisions and the need of the desired output. The neural network helps the AI to relate the external environment and provide the output which is more accurate.

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The neural networks are the input to the tensor like size*width*height, the parameters are passed to the convolutional layer.
In the convolutional layer the neural network have three attributes:

1) Width and height of the parameters
2) Number of input channels and output channels.
3) Depth of the convolutional filter must be equal to the number of the channels.

There will be more neural networks on the images which will be more complex and cannot produce accurate output. and it is not possible to directly form the network based on the images thus, Forward Traffic Sign Object Detection process is used to provide better featuring and it reduces the parameters of the images which helps in forming the neural networks accurately.
Pooling is used t reduce the dimension for combing the neural network. The convolutional network contains two types of pooling:
1) Local pooling
2) Global pooling
the local pooling is used to combine the smaller cluster of the neurons. All the neurons are combined in the global pooling the pooling may give max or an average pooling based on the neural network the max and the average pooling is placed.

TENSOR FLOW RECORD:
The Traffic Sign Object Detections are the input to the tensor flow record. The labelled images are converted into XML and CSV file. The tensor flow record records and stores the CSV file.
The main need of the tensor flow record is that the image cannot be directly provided as the input for object detection hence it should be converted into machine readable format which is the comma separated vale (CSV). The tensor flow record has the tensor flow board which provides the accuracy of the detection.

ALGORITHM: TSODTRAIN

Input:TSOD.zones{'i','c','s','c','s'};
Output:TSOD.zones{'i','c','s','c','s'};
1:Calculate the number of training samples
Numimages=m/opts.imagesize;
2:if rem(numimages,1)=0
Error(numimages not integer);
end
Loss ← $\sum_{i=1}^{n}(y_i - \beta_0 - \sum_{j=0}^{p}\beta_j x_{ij})^2 + \lambda\sum_{j=0}^{p}\beta_j^2$
3:initialize net.rL net.rL=[];
4:foreach i=1:
5:do model Selection kk=randperm(m);
6: For l=1: numimages
images_x=x(:,:,kk(l-1)*opts.imagesize+1:1*opts.imagesize));
Image_y=y(:,kk((l1)*opts.imagesize+1:1*opts.imagesize));
Net=TSODET(net,image_x);
Net=TSODTRAIN(net,image_y);
Net=TSODAPLYGRADS(net,opts):
ENDnet.rL(end+1)=0.99*net.rL(end)+0.01*net.;
END Return net.zones.

TENSOR BOARD:
Tensor flow board is mainly used for the need of finding the accuracy of the object which is detected. The accuracy of the image plays the main role in the success of the system and thus the tensor flow board will show the accuracy of the detection through comparing then images in the dataset and the input images and thus provides accurate output.
SPEED REDUCTION:
The main cause of the proposed system is to reduce the speed of the vehicle in restricted pedestrian and hospital areas where the vehicle speed should be limited and thus through detected the particular zone now the main work is reduce the speed of the vehicle which is done through Pulse Width Modulation (PWM).
PULSE WIDTH MODULATION:
The algorithm is mainly for reducing the speed of the vehicle based on the command from the AI , Here Arduino board is used for the purpose of command line and thus based on the id visualized in the system the reduction of the speed is carried out . each zone is framed with the id number for example, if the zone is School zone and thus the framed id is 1. Now, the pulse width modulation which is used for reduction of the speed is used thus, PWM is the method of reducing the speed of the vehicle by efficiently chopping the speed into discrete parts the voltage feed into the load is controlled by switching it on and off and thus the electrical supply will be reduced so, the speed of the vehicle is controlled.
The rate at which speed can be switched based on the load on the application the pins are set high for the

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purpose of alert buzzer and thus the zone is displayed in the LCD display and based on the id the speed of the vehicle is reduced until it passes the zone which is specified for reduction of speed.

The hardware has about 16 pins in which is of 8 data pins and 2 on and off pins and RS, enable, read, write and ground, contrast etc The process of the system is that when the restricted zone is been observed by the camera and sensed as an restricted zone by the object detection mechanism the unique id which is framed for the particular zone is been sent to the arduino controller where it makes the enable pin high and thus result in the buzzer notification and then the zone is been displayed in the LCD display and meanwhile the speed of the vehicle is reduced accordingly.

TRAINING DATABASE:

The proposed system consist of various images related to the traffic sign recognition needed for restricted and pedestrian areas and also supports various other traffic signs if trained. The proposed system contains,

RESULT AND DISCUSSION

By TSOD algorithm, the datasets are trained identifies the traffic signs gives indications to tensor flow board which alerts the driver through command about the upcoming restricted zones through buzzer and LCD display and reduces the speed of the vehicles automatically. The accuracy of the proposed system is above 97%.

In future the frameworks shall be further extended for other traffic signs recognition and implemented in more furnished and better optimal conditions for sensing and detecting the signals and signs for more traffic safety.

CONCLUSION

This study proposed the object detection with the help of the TSOD algorithm to avoid the collision and thus reduces the speed of the vehicle using the PWM algorithm thus the speed of the vehicle in the restricted and pedestrian areas will be controlled using the proposed AI system.

The paper applies in Artificial Intelligence approach in the case study of Smart Vehicle operation. The performance of the Intelligence control approach was evaluated by detection and using other control methods.

The deep learning method is to improve the learning efficiency and accuracy for the object detection representation.

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