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SURVEY ON TRAFFIC SIGN RECOGNITION, CNN AND SVM

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Abstract: Nowadays there is a huge increase in the number of road accident. Using this to will help pedestrians, drivers, occupants the traffic sign recognition play an important role. Traffic sign recognition reduce the risk of drivers and it is also benefits for the both drivers and pedestrians. So by adding more feature we can implement more accurate autonomous traffic sign recognition system.

Keywords: Traffic sign Recognition, Convolutional Neural Networks (CNN), Support Vector Machine (SVM)

I. INTRODUCTION

The main goal of survey is to make the drivers more awareness about the traffic sign. About 400 road accidents occur in India every day. This huge increase in the road accident and it became a paving for increasing study and research on traffic sign recognition. Traffic sign recognition will help the drivers and can also reduce the number of road accident and get awareness about the traffic law and also reduce traffic violation .CNN and SVM also help to classify and detect the traffic sign.

II. THEORY

A. Traffic Sign Recognition

Traffic-sign recognition (TSR) it is a technology that is used in the vehicle for recognising the traffic sign present on the road. Traffic sign include speed limit, no horn, turn left, turn right, stop etc. These sets of features are collectively called ADAS. In 1980's large number of traffic sign recognition systems have been developed. The detection of signs are mainly done through the image processing. It mainly identifies which class each traffic sign belong. It mainly used in autonomous vehicle and self-diving vehicles.

Fig.1.Traffic Sign Recognition

B. Convolutional Neural Network

It is a deep learning algorithm basically for image classification. CNN are made up of neurons with learnable weight and biases .It basically follow linearly and accept some input. Neural network accept some input and convert into hidden layer. The hidden layer is made up of number of neurons. CNNs are a class of neural network that allow greater extraction of features from captured images .CNN consist of basically three layers ,convolutional layer pooling layer

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and fully connected layer. Convolution layer consist of convolutional filter. There is activation function ReLu present in CNN followed by the pooling layer. A dropout layer is present which actually reduce over fitting.

C. Support Vector Machine

Support vector machine is a supervised machine learning model with associated learning algorithms. It mainly analyse data for classification and regression. It mainly used in Machine learning for classification. Best line or decision boundary creations that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future are the goals of SVM. This best decision boundary is called a hyper plane. There are manly two types of SVM, linear SVM and non-linear SVM. Linear SVM is mainly used for linearly separable data. If the dataset can be classified into two classes by using a single straight line, then such data is termed as linearly separable data, and classifier used is called as Linear SVM classifier. If the dataset cannot be classified using straight line such data is termed as non-linearly separable data, and classifier used is called as Non-linear SVM classifier.

III.RELATED WORK

Here we are introducing some paper that are related to our survey.

In this paper [1] they show that deep neural network perform better than traditional algorithm for object detection. For this the problem of object detection has been compared with traditional algorithms (traditional computer vision) and deep neural network. Computer visions now become the integral part of robotic applications. There is arising in the feature descriptors in 90's as primary technique to solve a host of computer vision problems. SVM and K-Nearest Neighbours to solve mentioned computer vision problem. In this paper problem of object detection are considers as mobile robot, then we compare with the two approaches. The traditional computer vision used features such as (SIFT,SURF,BRIEF).In this paper faced some running object detection on a moving robot .Here the performance of algorithm increase dynamically using the modified exploration procedure .To extend the project add an additional feature of object localization which encourage the robot to move closer to the object when it see it. And it guarantee that we will get close to the object to achieve the result. Smaller object detection was very difficult such as keyboard and balls. The traditional vision algorithm represents the quick and dirty method for computer vision. They are limited by the accuracy and the object they are detected.

In paper [2] a robust end-to-end convolutional neural network that can simultaneously detect and classify traffic signs is demonstrated. A large proportion of image occupy object are target by CNN image processing solutions. The bounding box occupies about a 20% of the image. Benchmark source code is also introduced in this paper. This paper is about image detection and classification in the wild. Object classification and detection is very important task in the scene. There are many deep learning method that show good performance in image classification and recognition. Mainly two benchmark are widely used to evaluate the detection performance, PASCAL VOC and Image Net ILSVRC. The target object normally occupies a large portion of the image on these dataset. The traffic sign divided into many categories and each category divided into subclasses with similar generic shape and appearance but have different in detail. The traffic sign classification is done mainly by two phases, classification and detection. CNN achieve a precision rate of 99.65 which is better than human performance. A more realistic traffic sign bench mark is created, it contain 111 times as many images and 32 times image resolution. The CNN I used here for evaluate the performance of vehicle detection and lane. For this they use an Over Fit framework with a bounding box regression. In this work they create a benchmark simultaneous detecting and classification. The benchmark contains more data than the previous benchmark.

The aim of the paper [[3] propose a Multi-Scale DE convolution Networks (MDN) which flexibly combine the multi-scale convolutional network with the DE convolution sub-network; It is an effective traffic sign modelling training. It is developed to solve the issue of amount of time taken to compute the complicate algorithm and also low rate of detecting blurred image of localized traffic sign. Object recognition is one of the critical step for object collectors. Object recognition has been recently increased in the recent years. CNN is widely used for object recognition. Classification and detection are the two important task for autonomous driving system.MDN consist of three stages, In the first stage using CNN and German Traffic Sign Benchmark (GTSRB) we train the classification stage. Follow by this, take an example on localized traffic sign recognition, by adding redundant DE convolution networks refine and make decision on recognising dataset on Chinese Traffic Sign Dataset. Images derived from upper level are detected, and integrate the multi-way detector. In this proposed paper traffic sign in long distance are detected, and German and Chinese dataset traffic sign are trained and compared.

In this paper [4] an efficient way to set the hyper parameters that significantly reduces training time and improve performance. This paper also discussed about the how to increase/decrease the learning rate/momentum to speed up training. In case of deep learning it already show and create significant improvement in computer vision, speech recognition etc. Years of experience are needed to choose the optimal hyper –parameter, network architecture. Random search or grid search for hyper-parameter space is expensive and time consuming. There is no simple way to set hyper-

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parameter. Several methodologies are proposed in this paper for finding optimal settings for hyper-parameters. Approach on hyper-parameter is valuable interdependence of all those factors. It examine about the learning rate, batch size, momentum, architecture and dataset.

The aim of the paper [5] to introduce a technique for MR image denoising using Deep Convolutional Networks and anisotropic diffusion (AD) and refer as Deep CNN-AD. The method is tested on the BraTS MRI datasets. Magnetic Resonance is one of the effective and non-invasive image methods that help physicians to diagnosis and cure diseases. MRI technique is one of common method to use by the doctors for the treatment of tumors.MR imaging technology generates the images of the brain internal structure and tissues. During transmission phase and image acquisition noise are generated. Thermal noise, salt and pepper noise are included in noise of MR images. In this paper a multi-step for MR demonising and smoothing with an enhanced brain tumour segmentation is proposed.in pre-processing the input MR denoisd using deep CNN method. Anisotropic diffusion method is applied to reduce the noise in the image. The image is converted to frequency domain when Dimensional Fast Fourier Transform (2F FFT0 is applied to it. Gaussian low pass filter smooths the input MR image and remove the irreverent details, Fast Fourier Transform is applied to covert back the image to its domain representation. Segmentation function is performed by the gradient magnitude, and also watershed transform is applied to it for tumour segmentation. The proposed method maintains the quality of image and key feature in demonising process.

In the paper [6] Traffic sign recognition is used to reduce the risk of pedestrians, occupants, and drivers. The additional level of driver assistance is provided by traffic sign recognition. Each method has its own advantages and disadvantages or limitations. In real time environment the visibility of traffic sign is difficult task with several reasons. Because of weather conditions, rain, fog etc. Sign recognition can face more than one problems .The ELM classification framework is using with HOG, CLBP, and Gabor. The major 3 steps involved in these are pre-processing, Feature extraction and classification. In pre-processing step the normalization of the image occurs. The size and contrast of images are different so the GTSRB and BTSC datasets are used. By increasing the pixel intensities. The image is divided into overlapping blocks is the basic feature of HOG. In the field of computer vision and image processing Gabor filter extraction technique is used. Combination of the most successful features like CLBP, Gabor and HOG with ELM classifier used for Traffic sign recognition.

The aim of the paper [7] is using Deep network image classification and object detection. Support Vector Machines (SVMs) learning algorithm is used in it. There is a large amount of data without training. The data getting training with models. This is called “UNSUPERVISED PRETRAINING “stage. These pre-trained models have good initialization such as supervised tasks, image classification. Convolutional neural network (CNN) it is not new concept. The CNN has different layers Max-pooling, Non-linearity etc. In traditional scenes the convolution operations are not applicable. So the CNN is used to train the networks on RBG images. The size, dimension of the image adjust with RGB channels. The algorithms are used for the computer vision of CNN and deep learning networks. In this paper mainly focus on the image of computer vision using the algorithms.

The main of the paper [8] discussed about low technical knowledge or high level domain knowledge to achieve the CNN baseline. The challenging situations like re-identification of person with different postures or human body pose variation, camera view, camera variation etc...Using the deep convolutional neural network (CNN) the features are leveraged. The main advantage OF the CNN is extract the features of visuals, learning of metric and end to end learning by classification jointly. Image giving as input and observed by colour, dress etc. The advantages of deep convolutional models are taken. The pre-trained images and re-identification using the datasets. With pre-trained data it performs better performance so the backbone network is used as leverage for the identification. The pooling layer represent the image using batch normalization feature directly identify the person identity using the fully-connected layer. Finally the Adam optimizer to train the CNN model or architectures and the supervision signal as softmax loss is used. In these the pooling layer and the fully-connected layer is used. For the re-identification of persons with effective CNN baseline model.

In paper [9] author introduced traffic sign recognition system based on convolutional neural network (CNN) and Support Vector Machines (SVM).The model used both Support Vector Machines (SVM) and convolutional neural network (CNN) individually for the detection and recognition of traffic sign. The model captures the image using a video camera. The captured images are preprocessed and then the signs are detected and recognized using classification algorithm. To reduce the error that happens during car driving a driver alert system is used in the final state. The main goal of the system is to recognize traffic signs and directions and to direct the driver into a safe drive.

In this paper [10] the author proposes a traffic signal recognition system that recognize traffic signs from collected images of different sizes in a fast and accurate manner. The model is designed in such a way that it uses two CNNs one for classification of each region and other one for region proposals of traffic signs. In order to achieve scale variant detection a fully convolutional network with dual multi scale architecture is proposed. To suppress the false positives the model adopts a scheme called OHEM scheme and the model also have adopted a inception module for efficiency. The system includes two output branches one for small scale objects and other one for large scale objects. The output from the dual multi scale network are inputted to classification network which is designed to be capable of fusing multi

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scale feature. The system is faster and more light weight than the state of the art deep learning network for traffic sign reorganization. The system obtained 99.88 percent in precision and 96.61 percent recall STSD.

In this paper [11] author suggested a traffic sign recognition system using CNN. The model uses a computer vision technique which is based on colour segmentation technique, CNN and fast CNN. Using CNN method a region of interest will be selected search space is reduced by applying thresholding to the input image. By using a trained CNN model RoI can be classified to check whether it contains traffic sign or not. Then another CNN with same architecture recognise the detected sign. System uses Fast RCNN methods in order to improve the training and testing speed. It also increase detection accuracy, finally a German traffic sign dataset is used to check the performance.

In this paper [12] author proposed a system that recognise traffic signs efficiently by extracting variants HOG features of traffic sign. According to the proposed model there are two modules one is feature extraction module and the other one is ELM module and it consists of two levels a training level and recognition level. Training is achieved using an ELM algorithm that estimates the output weight of SFNN giving all training image in a batch learning model. The ELM module outputs the class label giving the HOGv features of R test image during recognition stage. The model include image pre-processing, gradient accumulation, normalisation, dimensionality reduction and concatenation. The main objective is to achieve an optimal and generalized solution for multicladd traffic sign recognition in system ELM based classifier. It also balance the accuracy and cost of computation.

In paper [13] discussed about three techniques that successfully employ CNNs to medical image classification. In deep convolutional neural network (CNN) the availability of large scale dataset the method is recent and relevant. In computer vision the previous image dataset are used. The backbone of the object detection and image segmentation the CNN is used. The image classification applicable and very useful in other areas like medical etc. “CNN from scratch”and“off-the-shelf CNN” and “curse-of-dimensionality “are the techniques used here. The CNN architecture explains the CifarNet, AlexNet, GoogLeNet. The CifarNet is used for the recognition object contains in the CifarNet. For the evaluation and analysis of CNN architecture three pooling layers and two fully-connected layers are used. Two convolution layers, two pooling layers, and nine Inception layer are present in GoogLeNet . The inception layer consists of six convolution layers and one pooling layer. It concentrates mainly in dimensions, size and form a new single dimensions. In this paper mainly learn about CNN architecture,the applications of CNN.

In this paper [14] critical heat flux (CHF) play important role in the related thermal performance for the developing of the nuclear fuel for the pressurized water reactor. The overfitting of the data can be validated using the data they validate it. The larger training set are independently validated using smaller validation data in correlation. In this method the techniques used are hold-out cross validation, k-fold cross validation, and leave-one-out cross-validation to developing the correlation training data set. In this method first we give the input and set the initial database. Then data is validate and trained. The validated data set is then give to the run ID from the main dataset. The validation process is taking there and fit into the correct size. Extract the datas and again to the first stage to train the data. Repeat the step Run ID from main database validation, extraction and save it. These are process taking here. systematic process to fit CHF correlation with cross-validation technique and to yield 95/95 DNBR value with statistical logic and correct output will get.

In paper [15] the author proposed a novel traffic signs recognition and classification method based on CNN and SVM, the model use YCbCr colour space method for feature extraction by dividing the colour channel. SVM classifies the data based on the features extracted. The proposed model uses three traffic signs warning signs, prohibition signs and mandatory signs. The proposed model first divide the colour channels using YCbCr colour space and extract features using CNN deep network and then classifies the images using SVM. In this model testing street view image are sent to pre-processing progress. The image in the training data set are of size 48x48.The model uses PIKE F-100Fiwewire camera frame ,size of the video is 1920x1080.Size of the inputted image will be converted in5x5 convolutional kernal and generate six 44x44 feature maps. CNN training based on yCbCr colour space include CNN network, CNN training and yCbCr colour space for CNNs feature extraction. Parameter adjustment based on CNN SVM is based on training dataset and testing street view images, thus increase training accuracy and reduce training time in training parts. Here negative impacts are removed using image pre-processing. The system has high performance and 98.6 percent accuracy.

In this paper [16] propose a system of automatic sign recognition proper traffic flow is a complex planning and designing. There is a harmony behind the flow of traffic and certain rules are there. While driving the drivers are pay more attention or concentration. The system proposed to detect the sign automatically using Advanced Driver Assistance Systems (ADAS) and Single Board Computer (SBC). Using the raspberry pi we can integrate the big things into small form. Those are very easy to fix in the computer. The algorithm used here is that HSV. The input giving and go through different stages of it and checking it whether it is valid or not. The paper say that by the harmonic flow of the traffic will helps reduce the road accidents, pedestrians and smooth flow of the vehicle.

The author proposed a model in paper [17] Author proposed a system that uses CNN and tensor flow library for multithreaded programing CUDA the entire system is executed in real time using a mobile GPU .In the proposed system a end to end technology that detect and recognise the traffic signs in real time. The system uses the speed received from the vehicle which predict the scale and it's coordinates in neighbouring frames in the video sequence.

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The system uses deep learning library tensor flow. The model consist of fully convolutional layer and one softmax layer that normalise the previous layer output. The model is divided into two parts stack block the convolutional block and fully connected block. in order to train and evaluate the model the dataset is split into train and test datasets

In paper [18] explain there are different kinds of traffic signs to obey the rules. These are divided into different classes of signs. The signs are important to the both driver and the pedestrians. So the rules are there the obeying of rules and signs are more important. So the easy way to obey it by any type of monitoring or gestures giving attention to the people. The system say that the signs or boards are giving to them. When the colours are giving the people will attract it. So using the datasets we classify the signs and using CNN the over fitted image and the under fitted images are grid into correct picture. So the traffic sign obey and 95% will obey it.

In the paper [19] author proposed a traffic sign detection and recognition system by applying deep convolutional neural network that includes traffic sign, digits, English letters, Chinese characters. The model is based on the multi task CNN which is trained to achieve effective features for localisation and classification of different traffic signs and text. The main features of the proposed model is to use multi task CNN model that learns a compact yet discriminative feature representation, where detection and classification is implemented simultaneously and it improves the famous RCNN model. There are two modules in the proposed model one which generates region proposals based on a simplified yet efficient scheme for producing candidate regions and the second one is a CNN module which is used to discriminate and classify each of the candidate regions. To detect whether the candidate region proposals is traffic sign or not and to reject false samples a trained multi task CNN is used. CNN consist of three a fully connected layer nonlinear activation layer and Max pooling layer.

In paper [20], author introduces a system 'An in car camera system for Traffic sign detection and recognition' which consists of two subsystems mainly for detection and recognition. The model first adopts the colour information which filters out the most of non-relevant image region using road sign detection subsystem. Then the proposed model use image segmentation and hierarchical grouping to select the candidate road sign region. The model uses a CNN which classify the traffic signs for the candidate regions. The proposed system mainly focus to detect and identify the traffic signs. The system first filter out most of non-sign parts in the images and then it will extracts the region that has image blocks and then again it will extracts the candidate regions from the image block .In the final stage the system uses a deep learning to verify the candidate areas of non-road signs and identify the type of the traffic signs. The system mainly focus on to general are in the HSI colour space which then divides the candidates area into multiple small parts according to some features. The system proposes inception which is used to find and explain the dense components of the local spares structure in the convolutional layer.

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