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Developing a Neural Network Model to Classify Traffic Signs for Autonomous Vehicle System

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Abstract

Recognition of traffic signs is relevant in many applications including self-driving car/driverless car, traffic mapping and traffic monitoring. Self-driving cars have the potential to revolutioniae urban mobility, with efficient, safe, easy and congestion-free transportability.As an AI implementation, this vehicle autonomy has many problems, such as the unfailing detection of traffic lights, signs, unclear lane lines, pedestrains, etc.., these problems can be solved due to the availability of graphical processing units(GPU) and cloud platform in the fields of deeplearning, computer vision.Deep learning models have recently demonstrated promientrepresentatin ability and achieved excellent success in traffic sign recognition.In this model we propose a model for effective traffic light detection and recognition using transfet learning, based on deep neural networks. The approach involves the use for learning transfer of the Tensors flow faster Region Convolutionary Neural Network Inception V2 model. The model was trained on a dataset containing various images of traffic signals in conjuction with Indian traffic signals which are classified into five class groups.

Keywords: *Self-driving, GPU, Transfer Learning, Neural Networks, Convolutional Neural Network, Kera's, Tensor Flow*

I. INTRODUCTION

Recently, the number of automobiles has risen rapidly due to the technical advances in the automotive industry and the very successful availability of low prices. Despite this enormous rise, the number of incidents is also growing year after year due to numerous factors why it is understood that the lack of traffic signals is a major cause of those durations. The implementation of automatic traffic sign recognition systems helps the driver to ensure in various ways the safety of others drivers to stop hazards with this feature. While a system can be designed which can interpret traffic signs, this does not mean that due to any traffic environment difficulties any sign can be properly interpreted by the system. Traffic signs are typically divided into three levels based on their intent, regulatory signs to advise traffic loss or acknowledgment, alert signs to notify unsafe situations and definitely guidance signs to show traffic information, distances etc, There are various subclases with similar generic shape and appearance but different specifics in each of the mentioned TS categories. The first step is to distinguish the sign of traffic in viddeo sequence or image using processing algorithms usually focused on segmentation of form and color.In the first step, the second is typically related by applying a classification algorithm to recognize the defined signs. We present an empirical analysis and its experimental results in this paper, in

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which color segmentation and CNN approach were contrasted with the two main methods.

II. Literature Survey

It is an analytical study of two approaches to detecting and recognizing effective and efficient road signs. The experimental results indicate that tha fast R-CNN system is so much faster than C-CNN after testing both traffic sign detection and recognition dataset. On the other hand, although the CNN method is slow and the size and viewing angle is invariant. [1]

The work acts as a part in the field of self-driving cars or autonomous navigation. Results of the bounding box provide instructions for real-time vehicle control behavior. According to the Indian signaling system, the data collection generated for the system covers different use cases.So, the paper examines how Indian roads learn about self-driving vehicles [2]

It addresses the simulation findings of an autonomous automobile learning to drive in a simplified world with only lane advertising and static barriers. The Deep Q network measures these values for a given image of the road taken by the front camera of the car. Such acts are distinct angles that can be steered by the car for a fixed speed. The autonomous driving system in the car enforces the highest incentive practice. Our simulation results high precision in driving training by following the tracks and by-passing obstacles. [3]

Scientists and engineers in the automotive industry are actively exploring deep learning-based solution to self-driving it has to undergo a strict operational safety assessment.This paper discusses the chances and difficulties of integrating in-depth research for self-driving cars. One common fact in this project is that part of the driving tasks such as environmental awareness, track preparation or even cntrol of the steering wheel are carrioed out through deep learning approaches. [4]

Software of the network was designed to extract main features from traffic sign objects in order to identify them in different categories. The system architecture was designed to extract the main important features from traffic sign images in order to classify them into various categories. The research has discussed, this paper mainly focuses on the identification of traffic signs without considering the detection phase. This paper deals only with the related works from this aspect. That is the success of the methods of classification and recognition; we are in interested in using the new advances in the recognition of traffic signs in different fields, based on deep learning. [5]

Traffic safety is a major problem for autonomous vehicles so its an important task to create traffic sign recognition. Its committed to increasing the deaths and severity of road accidents.This paper tells us a real time algorithm for classifying and recognition of traffic sign in order to provide a driveralert system. The shape of traffic sign is called as a neural artificial network (ANN). Traffic signs are arranged as triangular, square and circular shapes according to their design characteristics analyze the pictogram of the road sign. The performance of the second artificial neural network allows for full road sign classification. This algorithm was proposed is evaluated by a Tunisian on the road signs dataset. [6]

In the current scenario the most the autonomous cars are using lidar sensors, different maneuvers that has to be performed by the vehicles are based upon the data about the objects around it. This leads to a higher risk of committing an error in few locations where the decision that has to be taken by the vehicle is not dependent upon its immediate surroundings, for example in areas where certain speed limits and traffic signs are to be followed.

III. Limitations

The lidar systems used in cars consume a lot of power for processing also with the added disadvantage of not being able to read certain traffic signs like speed limits, dead zones, accident prone areas, construction symbols and many search symbols that might be crucial to take a proper decision which might sometimes be crucial for the survival of passenger.

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IV. Proposed System

In the proposed system we use the camera module which is perfectly capable of reading different traffic symbols placed on the highway, this makes the analysis of different traffic signs possible with higher clarity adding to the improved decision making capabilities of the vehicles eliminating even the rarest of scenarios where an accident could occur due to improper communication of the signs. This particular system is implemented by training 65000 images of different traffic signs with a standard convolutional neural network (CNN) containing a sequential model with. The first layer being a convolutional layer of size 32x32 followed by maxpooling layer and then dense layers.

4.1DIS-ADVANTAGES:

The proposed system processes the images of different traffic signs faster and more efficiently rather than a lidar sensor can process a decision based upon its surroundings.

It is highly economical, both in terms of maintenance and one-time investment.

It consumes a not less power and the camera module is easily replicable in case of damage.

V. Detecting Traffic Sign Using CNN

CNN Model: CNN are convNets or CNNs are very important if you want to pursue a carrier the field of computer vision. CNN helps directly run neural networks on images and is more efficient and accurate than many of the deep neural networks. ConvNet models are easier and faster compared to other models to train or images. To build CNN model we will be using keras package.

GET DATASET:

The data set for the detection of traffic signs is provided here. The data set consists of 43 different classes of 65000 images. The images are unevenly distributed among these classes, so the model can predict some classes more accurately than other classes. With different image modification techniques such as rotation color distortion or blurring the image, we can populate the dataset. On the original dataset, we will train the model and see the model accuracy and then we will add more data and equally render that category and test the accuracy O model.

DATA PRE-PROCESSING:

One of the drawbacks of the CNN system is that it is not possible to train them of another object level. It is there for necessary to have objects of the same length in the dataset.

We will check the dimensions of all the dataset images in order to be able to process the images into similar dimensions. The images in this dataset have a very dynamic size range from 16 * 16 *3 to 32* 32* 3 and therefore cannot be passed directly to ConvNets model.

The image must be compressed or interpolated to single dimensions. No, in order to compress a lot of the data and not to stretch the image too much, we have to decide the dimension between them keep the image data predominantly accurate. I decided to use 5*5*3 dimension.

Using the Open CV package, we will transform the image into the given dimension.

Simulation:

Since the controller and processor based on this model, instructions are provided using python. Python is a language of programming that supports coding and implemented with path basis.

Cloud:

We have used basic python for implementing and datasets are use withtensor flow for path and well trained and being tested with keras dataset has exposed as Tensor flow python keras applications and it takes both input and output of data and follow some methodologies and gives experimental results regarding that points with accuracy 100% as we had well trained and tested the data model according to the model analysis.

Physical:

In this model, various sensors are used. These are

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raspberry pi and paths and pi camera is used for object detection and etc is used. Such as sensor are used to obtain information about different parts of the vehicle such as speed of the vehicles and stress and humidity, and also detects the traffic sign where it has to stop or take direction in path or road. We have implemented using some basic techniques and had created a path for car it moves without any driver assistance for driver using pi camera.

V1. EXPERIMENTAL RESULTS

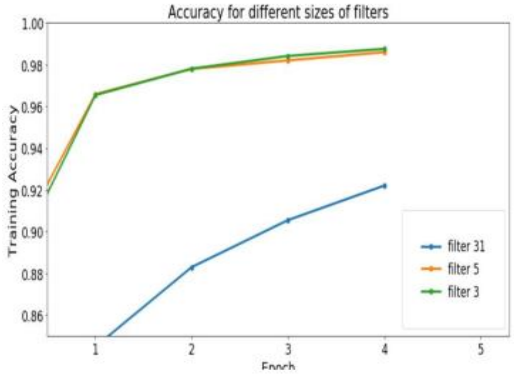

Figure 1 Training Accuracy

The following graph depicts the training section of three different models along with its training accuracy of kernar sizes 3*3, 5*5, 31*31.

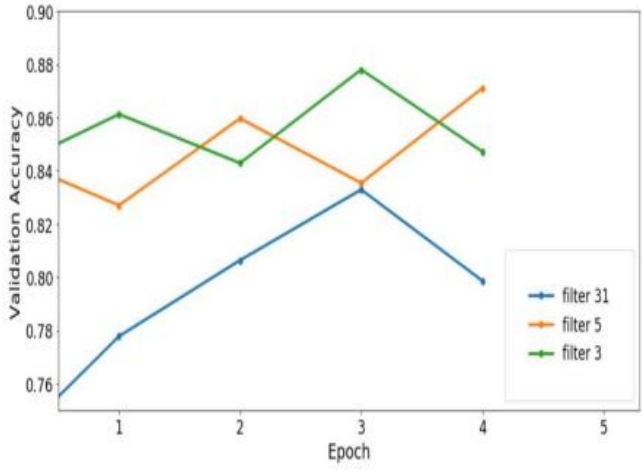

Figure 2Validation Accuracy

The following graph depicts the training section of three different models along with its validation accuracy of kernar sizes 3*3, 5*5, 31*31 out of which we find the model of the kernar size of 5*5 is best suited.

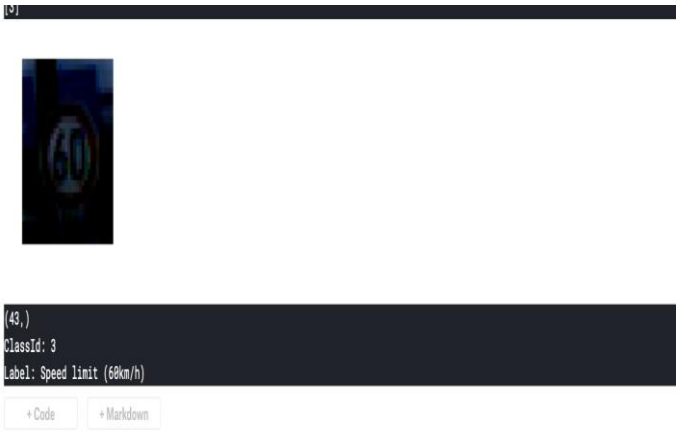

Figure 3 Model Classifying

This is the example of our model classifying a 60km/hr speed limit sign on the street.

VII. Conclusion

The proposed system is successfully able to develop a neural network model that is able to classify different traffic signs on the street with 88% accuracy approx. This model can now be used as a part of different autonomous vehicle systems in real time applications which can drastically reduce accident rate in a more economical way. The output of the CNN allows the complete classification of the road signs. Finally we designed to extract the main important features from traffic sign images in order to classify them into various categories. The model was also able to successfully train the system to detect different traffic signs and display the speed limit of the vehicle.

References

[1] H. Abu Alhaija, S. K. Mustikovela, L. Mescheder, A. Geiger, and C. Rother. 2017. Augmented Reality Meets Computer Vision: Efficient Data Generation for Urban Driving Scenes. (2017).

[2] Baidu Inc. 2018. Apollo Auto – An Open Autonomous Driving Platform. (2018). Retrieved Feb 5, 2018 from https://github.com/apolloauto J. Deng, W. Dong, R. Socher, L. J. Li, K. Li, and F.-F. Li. 2009.

[3] ImageNet: A LargeScale Hierarchical Image

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ISSN: 0193-4120 Page No. 2533 - 2537

Database. In IEEE Conference on Computer Vision and Pattern Recognition (CVPR).248–255.

[4] Keyu Lu, Jian Li, Xiangjing An, Hangen He and Xiping Hu, "Generalized Haar Filter based CNN for Object Detection in Traffic Scenes" in 13th IEEE Conference on Automation Science and Engineering (CASE) 2017, 978-1-5090-6781-7/17/$31.00.

[5] Gwang-Gook. LEE, Byung Kwan PARK, "Traffic Light Recognition Using Deep Neural Networks" in IEEE International Conference on Consumer Electronics (ICCE) 2017, 978-1-5090-5544-9/17/$31.00.

[6] Swathy S Pillai, Radhakrishnan B, Dr.L. Padma Suresh, "Detecting Tail Lights for analyzing traffic during night using Image Processing Techniques" in International Conference on Emerging Technological Trends [ICETT] 2016.

[7] Dwi H. Widyantoro& Kevin I. Saputra, "Traffic Lights Detection and Recognition based on Color Segmentation and Circle Hough Transform" in International Conference on Data and Software Engineering 2015.

[8] Masamitsu Tsuchiya, Yuji Yamauchi, Hironobu Fujiyoshi, Takayoshi Yamashita, "Hybrid Transfer Learning for Efficient Learning in Object Detection" in Second IAPR Asian Conference on Pattern Recognition 2013, DOI 10.1109/ACPR.2013.