A Novel Approach For Traffic Sign Detection

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Abstract- *Object detection is a process to detect the required specific object from the dynamic scenario. Object recognition is the ability to perceive an object's physical properties and apply semantic attributes to it. In order to provide assistance and avoid mishaps on the street which at times prove to be fatal there is a need for a system to detect and recognise traffic signs alongside the street. Related work was studied and it was observed that object detection and recognition can be achieved by an object detection module which will be trained on a specific class of objects. To provide accurate results LSTM (Long Short Term Memory) is embedded in Convolutional Neural Network. The procedure consists of two stages: In the first step traffic signs are trained generating a dataset and second step proposes matching of traffic signs in order to identify them. The main objective is to provide suggestive correct actions to the user based on upcoming traffic sign*

Keywords- Context Embedded Neural network, LSTM , Machine Learning ,Object recognition, Object detection

I. INTRODUCTION

Motivation: Traffic signs are designed to easily contrast with the background, so they can be detected by the driver. Although drivers sometimes miss out these signs or are ignorant about them Traffic sign detection and recognition system will provide assistance to human drivers and also help reduce traffic accidents. It can be used as a must-have for any self-driving car. The system can be used to guide any car about traffic signs. The system also provides real-time information on traffic signs captured by the camera

Problem Definition and Objectives

To design and develop a system to provide assistance and avoid accidents on road which at times prove to be fatal. A system is to be developed for detecting and recognizing traffic signs along the road.

The major objectives are as follows:

• The overall objective is to develop a system that can be used for traffic sign inventory and study the effectiveness of detecting the traffic sign for providing assistance in self driving cars.

• To study the effect and improvement in accuracy for traffic sign detection using context embedded neural network.

•To study the usefulness of such system when it comes to assisting human drivers.

• To observe the improvement in the major functionality in a self driving car for maintaining and updating their road and traffic signs by automatically detecting and classifying one or more traffic signs from a complex scene when captured by a camera from a vehicle

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Methodologies and Problem Solving

Object detection consist of following stages:

1. Image Capture

The first module used is a camera module for capturing images of various traffic signs. The images are captured in real time and are used for detecting and recognizing the traffic sign if present in the captured image.

2. Feature Extraction

Feature Extraction is the second module used for transformation of input images into a set of features. These features are distinctive properties of input patterns that help in differentiating between the categories of input patterns. Feature extraction is related to dimensionality reduction in which data is reduced by measuring certain properties or features and these features are used in a classifier. When the data is too large to be processed, the data will be transformed into a reduced representation set of features.

3. Neural Network

Once a network has been structured for a particular application, that network is ready to be trained. To start this process the initial weights are chosen randomly. Then, the training, or learning, begins. There are two approaches to

training - supervised and unsupervised. Supervised training involves a mechanism of providing the network with the desired output either by manually "grading" the network's performance or by providing the desired outputs with the inputs. Unsupervised training is where the network has to make sense of the inputs without outside help.

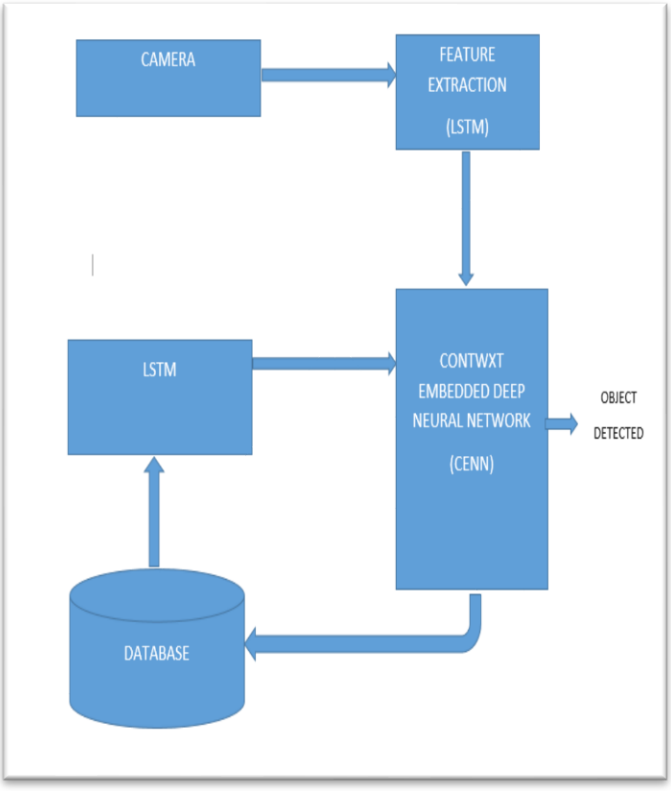
4. Object Detection

Object detection systems construct a model for an object class from a set of training examples. In the case of a fixed rigid object only one example may be needed, but more generally multiple training examples are necessary to capture certain aspects of class variability.

5. Object Recognition

Object recognition is quite complex processes, in which many objects, with different positions and lighting conditions, and with different perspectives, are gathered simultaneously. Object recognition concerns the identification of an object as a specific entity (i.e., semantic recognition) or the ability to tell that one has seen the object before (i.e., episodic recognition).

III. WRITE DOWN YOUR STUDIES AND FINDINGS



Long Short-Term Memory Units (LSTMs)

In the mid-90s, a variation of recurrent net with so-called Long Short-Term Memory units, or LSTMs, was proposed by the German researchers Sepp Hochreiter and Juergen Schmidhuber as a solution to the vanishing gradient problem. LSTMs help preserve the error that can be back propagated through time and layers. By maintaining a more constant error, they allow recurrent nets to continue to learn over many time steps (over 1000), thereby opening a channel to link causes and effects remotely. This is one of the central challenges to machine learning and AI, since algorithms are frequently confronted by environments where reward signals are sparse and delayed, such as life itself. LSTMs contain information outside the normal flow of the recurrent network in a gated cell. Information can be stored in, written to, or read from a cell, much like data in a computer's memory. The cell makes decisions about what to store, and when to allow reads, writes and erasures, via gates that open and close. Unlike the digital storage on computers, however, these gates are analogue, implemented with element-wise multiplication by sigmoid, which are all in the range of 0-1. Analogue has the advantage over digital of being differentiable, and therefore suitable for back propagation

Context embedded neural network

Applications of neural networks have expanded significantly in recent years from
image segmentation to natural language processing to time-series forecasting. One notably successful use of deep learning is embedding, a method used to represent discrete variables as continuous vectors. This technique has found practical applications with word embedding's for machine translation and entity embedding for categorical variables. An embedding is a mapping of a discrete categorical variable to a vector of continuous numbers. In the context of neural networks, embedding's are low-dimensional, learned continuous vector representations of discrete variables. Neural network embedding's are useful because they can reduce the dimensionality of categorical variables and meaningfully represent categories in the transformed space.

Neural network embedding's have 3 primary purposes:

1. Finding nearest neighbours in the embedding space. These can be used to
make recommendations based on user interests or cluster categories.
2. As input to a machine learning model for a supervised task.
3. For visualization of concepts and relations between categories.

IV. CONCLUSION

The proposed system performs detection and recognition of real time traffic signs along the streets. Our dataset consists of Indian traffic signs from which image frames will be extracted to identify and assist the user to take appropriate action. The system holds potential to be used as personal driving assistant and also can be used in driverless cars. Testing the system based on precision recall method the accuracy of the proposed system is found to be 80 percent.

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