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A Neural Network based approach in accident detection from CCTV videos

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ABSTRACT

Intelligent communities are utilizing different creative ideas to improve the quality of human life. Due to fast growing sizes of our cities, need of travelling is constantly increasing, which in turn has increased count of vehicles on the roads. Increasing number of vehicles on the roads has brought about numerous difficulties for Street Traffic Management Authorities. Amongst different traffic related issues, road accidents are something worth giving attention to and must be on the priority list. This project describes various automatic road accident detection techniques, which automatically detect accidents using surveillance videos in real- time and intimates the event scenario to control room and the main uniqueness of the system is it automatically estimates the crash value of the incident and intimates to the user. The proposed method assumes that traffic accident events are described by visual features occurring through a temporal way. Therefore, a visual features extraction phase, followed by a temporary pattern identification, compose the model architecture. The visual and temporal features are learned in the training phase through convolution and recurrent layers using built-from-scratch and public datasets. An accuracy of 98% is achieved in the detection of accidents in public traffic accident datasets, showing a high capacity in detection independent of the road structure.

INTRODUCTION:

According to the data provided by World Health Organization (WHO) in 2018, out of total road accidents in the world, 6% accidents take place in India where the number vehicles present on roads is only 1% of the world's total vehicles. In 2018, nearly 73% of the deaths in South Asia region due to road accidents occurred in India. Also, according to World Health Organization (WHO)'s report in 2017, road accident is one of the most probable reasons out of twelve reasons of death. It is also the ninth most common reason of early death, and the tenth most common cause for permanent disability. This shows that the road accidents are something worth giving attention to and have to be on the priority list of the researcher's agenda to provide timely help at the place of accident and save lives, especially in the densely populated areas.

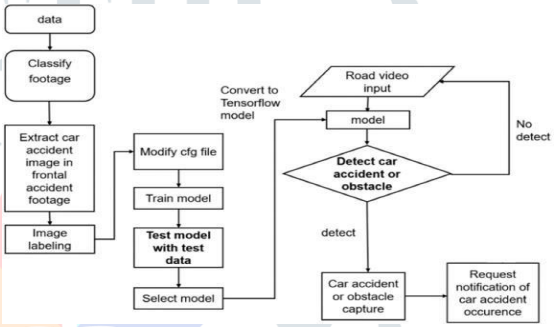
PROBLEM DEFINITION:

On the other hand, there are problems where the spatial relationship of the data is not a determining characteristic. In some problems, the temporal relationship that the data may have been of greater importance. This is because there are events that depend on past and/or future events, that is, on a context of the eventin time to understand the real event. Therefore, a new deep learning model has emerged: recurrent neural networks. These networks have a similar architecture to dense artificial neural networks but differ in that at least one neuron has a connection to

natural language processing, among others. The data processing in these neurons has a higher complexity than the processing performed from a traditional neuron. In addition, these have been improved over the years. One of the most relevant changes was the possibility that the cell can store short- and long-term memory, called long short-term memory neurons (LSTM). These networks have presented improvements in several problems with respect to past models. Among these are travel time prediction problems, language understanding, and natural language processing. However, the analysis of video scenes is not a problem that can be solved using one of the two models mentioned above. This is because a video presents both a spatial and a temporal relationship in its content. Therefore, the scientific community has presented several architectures that use both deep learning layers: convolutional classification of an accident is a complex problem due to the temporal implications it may present. Therefore, we seek to improve the performance of current approaches with the design of a method capable of detecting traffic accidents through video analysis using deep learning techniques.

METHOD FOR AUTOMATIC DETECTION OF TRAFFIC ACCIDENTS

The proposed method is based on techniques used in video analytics. In particular, deep learning neural networks architectures trained to detect the occurrence of a traffic accident are used. Before describing the architecture, it was necessary to define the network input. Since a video must be processed, it is separated into segments. Therefore, the temporal segmentation of the video required a basic analysis to determine which was the most appropriate scheme to generate the segments, considering a trade itself. Such networks are used to solve problems such as rate-of-change prediction, text translation, and off between the computational cost of processing the segment and the generation of enough visual characteristics to extract patterns that the network learned. Once the input was defined, the accident event was built as the occurrence in time of a set of visual patterns. For this, the architecture has two parts. The first one extracts a vector of visual characteristics using a modified Inception V4 architecture; this set of characteristics is processed by a recurrent component to extract the temporal component associated with the occurrence of the event. Next, we describe the two stages: temporal video segmentation and automatic detection of traffic accidents.



PREPROCESSING:

Images come in different shapes and sizes. They also come through different sources.

Taking all these variations into consideration, we need to perform some pre-processing on any image data. RGB is the most popular encoding format, and most “natural images”. Also, among the first step of data pre-processing is to make the images of the same size.

Here we have used auto resizing for training to make all the images in the dataset to convert into same resolution.

AI based architecture for automatically detecting an accident with the help of CCTV surveillance videos are implemented. Despite exceptionally advisable task, very less and restricted work is carried out in this field. Some methods are developed to work on pattern of traffic in restricted environment and those do not consider other affecting factors. All these strategies cansay to be reasonable for small sized samplesand don't ensure the same performance in different situation. This creates an urge to design a new system for automatically detecting accident addressing lawful as well as lawless traffic patterns in various illumination and different environmental conditions and to compare results on some common data set.

FEATURE EXTRACTION:

The process of feature extraction is useful when you need to reduce the number of resources needed for processing without losing important or relevant information. Feature extraction can also reduce the amount of redundant data for a given analysis. Also, the reduction of the data and the machine's efforts in building variable combinations (features) facilitate the speed of learning and generalization steps in the machine learning process.

CONCLUSION

Accident detection operation is not an easy task to handle; it can be an extremely complicated process when it comes to real time applications, which is the main reason why it is not implemented yet on a large scale. The proposed system will help to improve the present scenarios. Although an in-vehicle accident detection system provides emergency responders with essential information as fast as possible, but unavailability of this system is restricted by their nonprobability and costs. The proposed vehicle accident detection system can track an accident at its moment of occurrence. Compared with other deployment systems composed of expensive sensors and unnecessary hardware, the proposed system is more economical, more reliable, and more accurate than similar systems, mainly due to the model-based approach.

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