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Intelligent Accident Detection and Alert System

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Abstract
There are lots of research approximately preventing or detecting the car injuries. most of them consists of sensing gadgets which may cause twist of fate or statistics about injuries. in this study, a gadget which detects happening of injuries could be determined. The system will accumulate vital information from neighbor cars and system that records using device learning tools to come across feasible accidents. system mastering algorithms have proven achievement on distinguishing odd behaviors than regular behaviors. This have a look at pursuits to research site visitors conduct and bear in mind automobiles which flow distinct than cutting-edge traffic conduct as a opportunity of an coincidence. effects showed that clustering algorithms can successfully come across accidents. The proposed device will capture the video stream, computes the enter, and the device alerts are generated in actual-time, because of this that no extra sensors will be required.

Keywords: Faster R convolutional neural network (FRCNN), Deep Learning Introduction (Heading 1)

1. INTRODUCTION

Around the world, over one million people die each year in traffic accidents, with many more sustaining minor injuries. Developing and underdeveloped countries have particularly high rates of traffic accident deaths, despite only accounting for half of the world's vehicles. In India, for example, there are an average of 13 deaths per hour, totaling 140,000 deaths per year. The main goal of this project is to develop a system that can detect accidents in real-time by analyzing video footage from CCTV cameras installed on busy roads. By using advanced deep-learning algorithms, such as convolutional neural networks (CNNs), we aim to achieve fast and accurate accident detection that can alert authorities and emergency services as quickly as possible.

In many cases, timely assistance for accident victims is crucial, and every minute can make a difference in saving lives. By automating the process of accident detection and reporting, we hope to reduce response times and provide faster and more effective emergency assistance. The computing power of modern CPUs has made real-time applications, such as video surveillance, increasingly feasible. One of the most important applications of video surveillance is traffic monitoring, which can detect, track, and evaluate traffic flow, vehicle speed, and classification. By using CCTV systems for traffic monitoring, we can improve road safety and potentially save thousands of lives.

OBJECTIVE

- To establish a system which can capture a video & generate a emergency alert.

2. LITERATURE SURVEY

Durgesh Kumar Yadav,[1] The author stated that framework is required which is completely ready to facilitate between the various moves that will be initiated for the speedy reaction at the mishap area. According to the examination such discovery framework includes various advances like Worldwide Situating Framework [GPS] and Worldwide Framework for Portable Correspondence [GSM], utilizations of cell phones, and so on. Every one of the vehicles are incorporated under these discovery frameworks and different innovations are likewise considered for something similar. this paper addresses an outline connected with the advances that interconnected with that of street mishaps via mechanized street [traffic] mishap identification framework.

Souvik Roy et al,[2] stated that a framework is necessary to facilitate the various actions required for a speedy response at the scene of a road accident. According to the author's research, this discovery framework would include various technologies such as the Global Positioning System (GPS) and the Global System for Mobile Communications (GSM), as well as the use of mobile phones. All vehicles would be integrated into these detection systems, and other technologies would also be considered. The author's paper outlines the technologies involved in an automated traffic accident detection system that can be used to prevent or mitigate the effects of road accidents.

Gokul Rajesh, Amitha Rossy Benny, Harikrishnan A, James Jacob Abraham, and Nithin Sovereign John [3] propose a system to address the issues related to road accidents by detecting accidents and alerting the control room immediately. The system includes a camera module that is deployed in areas prone to accidents. When an accident occurs, the module detects it and promptly reports it to the nearby control room. The system operates based on deep learning techniques that use convolutional neural networks. This system has the potential to save many lives by providing a quick response to accidents.

According to Prof Nicky Kattukkaran and colleagues [4], their framework objectives to inform nearby medical facilities for you to provide instantaneous scientific assistance in case of a avenue accident. The framework consists of an accelerometer in the car that detects the lean of the vehicle and a heartbeat sensor at the person's body that detects any abnormality within the heartbeat to decide the severity of the twist of fate. The machine then makes a decision and sends the data to the person's telephone, which is related to the accelerometer and heartbeat sensor via Bluetooth. The Android software on the cellphone sends a text message to the closest medical center and friends, and also shares the precise place of the twist of fate, that may help keep time.

3. PROPOSED METHODOLOGY

We propose a new accident detection and alerting system based on Convolutional Neural Networks. The system will detect accidents from videos, and generate an alert based on the analysis. The goal is to develop a system for early detection and prediction of accident stages to help victims. Once an accident

is detected, the system will alert emergency services, such as hospitals, as shown in Figure 1. An ambulance will then be recommended to the victim for immediate medical attention by hospitals.

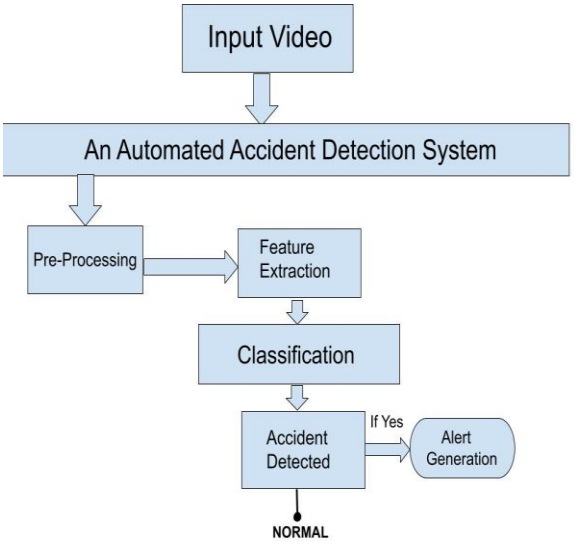

Fig.1. Proposed Architecture

LAYERS IN CNN

Convolutional Neural Networks (CNNs), also known as ConvNets, are a type of artificial neural network that is highly effective in image recognition and classification. The four main operations used in CNNs are:

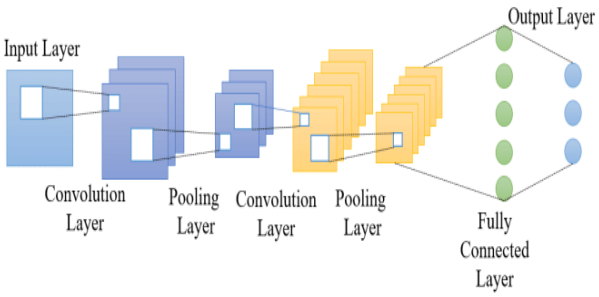

Fig.2. CNN Architecture

(A) CONVOLUTION

Convolution is a mathematical operation that is applied to two functions and produces a third function. In CNNs, convolutional layers are used to extract features from the input image. These layers contain filters that slide over the input image and perform element-wise multiplication followed by summation. The result of this operation is a feature map that represents the presence of a specific feature in the input image. Convolution helps maintain the spatial relationships between pixels and is performed using small squares of the image known as kernels.

(B) RELU

ReLU stands for Rectified Linear Unit and is an activation function that introduces non-linearity in the network. It is applied to the output of the convolutional layer and sets all negative values to zero, while leaving positive values unchanged. This helps in learning complex patterns in the image and speeds up the training process.

(C) POOLING

Pooling is a down sampling operation that is applied to the output of the convolutional layer. It reduces the spatial size of the feature map and helps in reducing overfitting. The most commonly used type of pooling is max pooling, where the maximum value in each sub-region of the feature map is retained while the rest are discarded. This helps in retaining the most important information of the feature map while reducing its size.

(D) FULLY CONNECTED LAYER

Fully connected layers are used at the end of the CNN architecture to classify the input image. These layers take the flattened output of the previous layer as input and perform a dot product with a weight matrix followed by the addition of a bias term. The output of the fully connected layer is then passed through a softmax activation function to obtain the class probabilities.

4. IMPLEMENTATION ALGORITHM

The intelligent accident detection and alert system comprises of two phases: accident detection and alert generation . The system first extracts raw video footage from the road and obtains the frame rate, typically 25 fps for CCTV and normal cameras. The frames are then split to obtain the frame rate for one second. After obtaining the frames, the illumination is adjusted to extract color features. It is important to note that the input size of the image is typically 800 x 800 pixels.

The system then extracts the color features from the images using a Convolutional Neural Network (CNN) and performs color transformation on the features. The frame is passed through a Faster CNN which results in a proposal network and converts the image into a block. This block is then passed through a layer to detect the presence of a vehicle. The vehicle accident detection model is trained to accurately detect accidents.

In an accident detection In order to detect accidents in video using a Convolutional Neural Network (CNN), the system typically follows these steps:

Data Preparation

The first step is to prepare the video data for input into the CNN. This involves preprocessing the video frames to standardize their size, color space, and orientation. The frames may also be normalized to improve contrast and brightness.

Feature Extraction

Once the data has been preprocessed, the CNN extracts relevant features from each video frame. This is typically done using convolutional layers, which identify patterns in the pixel values of the frames. The output of the convolutional layers is a set of feature maps that capture different aspects of the video frames.

Classification

The feature maps are then fed into a fully connected layer that performs classification. The CNN is trained on a large dataset of videos, with labels indicating whether or not an accident has occurred. During training, the CNN learns to recognize patterns in the feature maps that are indicative of accidents.

During inference, the CNN uses these learned patterns to classify new video frames as either containing an accident or not.

Post-processing

Once the CNN has classified a sequence of video frames, a post-processing step may be applied to filter out false positives and improve the accuracy of the system. This might involve smoothing the output over time to remove short-lived anomalies, or combining the output of multiple CNNs to improve robustness. Overall, CNN-based accident detection systems rely on deep learning algorithms to automatically identify relevant features in video data and use those features to classify whether an accident has occurred or not.

ALERT GENERATION

When sending an alert SMS message using Python, a system can use a third-party SMS gateway Twilio API. These Twilio APIs provide a way for the system to send SMS messages programmatically through their platform. To get started, the system will need to sign up for an account with the provider of its choice. Once the system has an account, it will typically need to provide some basic information, such as its phone number and email address, to get started. After the system has an account, it will need to authenticate its requests to the Twilio API. Most SMS gateway Twilio APIs require the system to provide an API key or some other form of authentication token in order to send messages. Once the system has authenticated its request, it can use the API to send an SMS message to a recipient. To do this, the system typically needs to provide the recipient's phone number, along with the text of the message it wants to send. The API will then handle the process of sending the message to the recipient's phone. Some APIs may also provide additional features, such as the ability to schedule messages for later delivery, track message delivery status, or receive replies to the system's messages. When using a Python API to send SMS messages, the system will need to use an appropriate library that provides a Python interface to the SMS gateway Twilio API it is using. For example, the Twilio Python library provides a Python interface to the API SMS gateway Twilio API, while the Nexmo Python library provides a Python interface to the Nexmo SMS gateway Twilio API. Overall, sending SMS messages using a Python Twilio API is a straightforward process that involves signing up for an SMS gateway API, authenticating the system's requests, and using the API to send messages to recipients.

5. CONCLUSION

An accident detection system that utilizes CNNs can be implemented over a large area, providing an effective means of identifying accidents and alerting emergency services. This quick response can potentially save lives, making the system an essential development for addressing the problem of road accidents in modern society. Furthermore, the system can help to pinpoint high-risk areas and improve road safety infrastructure, potentially reducing the number of accidents that occur. Overall, the CNN-based accident detection system has significant potential for improving road safety and protecting human lives.

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