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Intelligent Accident Detection, Prevention and Reporting System

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Abstract –Accidents have been a crucial cause of deaths in India. Higher than 80% of accident-related deaths occur not due to the accident itself but the lack of timely help reaching the accidentvictims. The aim is to build a system to prevent ,detect and report an accident to emergency responders. To prevent the accident we have used ultrasonic sensor to measure the distance of a vehicle by using ultrasonic sound waves. An ultrasonic sensor has a transducer to send and receive ultrasonic pulses that relay back information about the distance between the vehicles. We detect an accident based on video from a CCTV camera installed on road. Our concept is to take each frame/part of a video and run it through a deep learning convolution neural network model which has been trained to classify frames of a video into normal and abnormal. CNN model has proved to be a fast and accurate approach to classify images. CNN model has given accuracy's of more than 95%. The research being carried out on images and not videos. In this we detect the Accident detection or not. If the Accident is detected then system sends the SMS to police station and health care.

Keywords – Accident, Accident Prevention, Accident detection, Convolution Neural Network, CCTV, frame, Ultrasonic Sensor.

1. INTRODUCTION

Accident detection is one of the key problems in computer vision that has been studied for more than 15 years. It is important because of the sheer number of applications which can benefit from Accident detection. For example, Accident detection can be used in applications inclusive of video surveillance, animal tracking and behavior understanding, sign language detection, advanced human-computer interaction. Affordable depth sensors have limitations like limited to indoor use, and their low resolution and noise depth information make it difficult to estimate human poses from depth images. Thus, weplan to use neural networks algorithms to overcome these problems. Accident detection from video surveillance is an active research area of image processing and computer vision. By the visual surveillance, human activities can be monitored insensitive and public areas such as bus stations, railway stations, airports, banks, shopping malls, school and colleges, parking lots, roads, etc. to prevent terrorism, theft, accidents and illegal parking, vandalism, fighting, chain snatching, crime and other Accident detection. It is very challenging to keep an eye on public places constantly, hence an intelligent video surveillance is required that can monitor the human activities in real time and categorize them as normal and abnormal activities; and can initiate an alert. Mostly, the research being carried out are on images and not videos. Also, none of the papers published triesto use CNNs to detect Accident. In this project we detect the Accident detection detected or not. if the Accident detection detected then system send the SMS to police station and medical health care.

1.2 PROPOSED SYSTEM

In our proposed system, we develop a system to prevent, detect and report an accident to the nearby emergency responders. The goal of our system is to provide quick response to the victim whenever the accident takes place by using deep learningalgorithms.

We detect the accident with the use of a Convolutional Neural network model where the algorithm will train the system and then classify the images into normal and abnormal form where the normal form means no accident occurred and a normal formmeans the accident has taken place. Our device will be able to locate the accident location and send the alert message through the form of SMS(Short Message Service) to the nearby police stations and medical health care services to provide quick help tothe victim .

For prevention we use some onboard sensors where we connect the ultrasonic sensor to Arduino board which measures the distance between the vehicles and alerts the user to maintain the safe distance through which accident can be obstruct.

2. SYSTEM ARCHITECTURE

The Figure 1 tells us about the system architecture of the system

.It shows all the components of the system like how the system works. This system efficiently works with great accuracy because of less dependency.

The system works as following :-

The most widely used method for Accident detection is simplyUse video Dataset train the data set by CNN through which identification and detection of Accident are done. In this the system we use the same technique we insert the video as an input to the system then the video is converted into frames which done in preprocessing stage and then the features are extracted by putting these frames into various layers of CNN model and then classification takes place where it classifies the data into normal and abnormal form if the frame is abnormal, itsends the alert message to the emergency responders which then the user can take appropriate

We also have a hardware system which aims to prevention of accident here we have used an ultrasonic sensor, a buzzer whichis then connected to the Arduino board .This sensor uses soundnavigation ranging technique also known as sonar which has transmitter which sends the sound waves and the receiver sendsback the information about the distance about the vehicle whichis known as echo and if the distance calculated between the twovehicles is unsafe it then alerts the user by the ringing the buzzer sound.

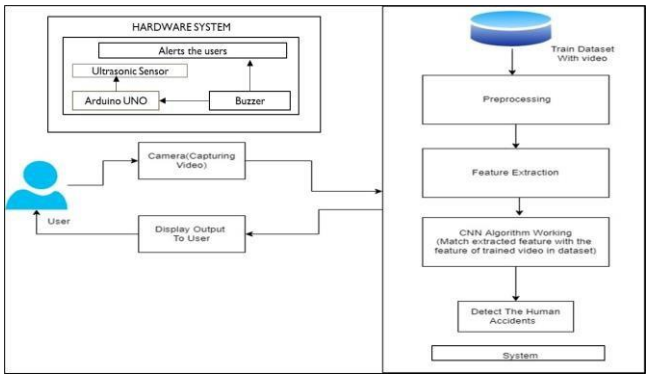

Fig -1: SYSTEM ARCHITECTURE

2.1 IMPLEMENTATION

We develop a system to prevent, detect and report an accident to the nearby emergency responders

We have used CNN (Convolutional Neural Network)which is also known as ConvNet for detection of accident. In our systemthe video is feeded into the system as an input then this video is converted into image frames where the images are trained using CNN algorithm where these images frames are put into some layers for feature extraction and classification of those images and detect the accident the figure 2 below shows the layers of CNN model.

We have used Convolution layer, Relu layer and Pooling layerfor feature extraction.

1. Convolution layer – This layer extracts the high level features such as edges from the input image This layer has number of filters that performs convolution operations on the image. Every matrix of the pixel values are sliding the filter matrix over the image & computing the dot product to detect the pattern.

2. Relu Layer – It is a rectified Linear Unit which an activation function which performs the element wise operation. It is basically if your input is negative, it's going to put it to zero. And then if it's positive, it's does nothing to positive values. This is one of the commonly used because it doesn't saturate inthe positive region.

3. Pooling Layer – Pooling Layer is used to progressively reducethe spatial size of the input image, so that number of computations in the network are reduced. Pooling performs down sampling by reducing the size and sends only the important data to next layers in CNN. There are mainly two types of pooling that are max pooling and average pooling butwe have specifically used max pooling as it calculates the maximum value for patches of a feature map, and uses it to create a down sampled (pooled) feature map.

For classification of an image we have Flatten layer, fully connected layer and soft max function for classification of an image.

1. Flatten layer – In this layer it performs the process of converting all the resultant arrays from the pooled feature mapinto the single long continuous linear vector.

2. Fully connected layer- this layer is responsible to perform where all the inputs from one layer are connected to every activation unit of the next layer. In this ,the last few layers are full connected layers which assembles the data obtained from the previous layers to form the final output

3. SoftMax layer – it's an activation layer. This layer has a mathematical feature which converts a vector of numbers into avector of probabilities, .it then turns a vector of K real

values within a vector of K real values that sum to 1. The entered values can be positive, negative, zero, or greater than one, but the SoftMax converts these values in range of 0 and 1, so that they can be interpreted as probabilities. If one of the entered values is small or negative, the SoftMax turns it into a small probability, and if an entered value is large, then it turns it into ahuge probability, but it'll always remain between 0 and 1.

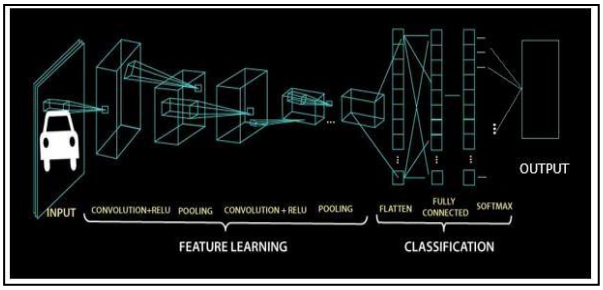

Fig-2 : CNN Model

3. RESULTS AND ANALYSIS

This section shows us the result of the system and also tells usthe accuracy of the system

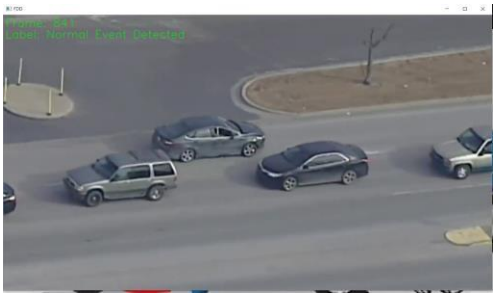

Fig 3– Normal Event Detection.

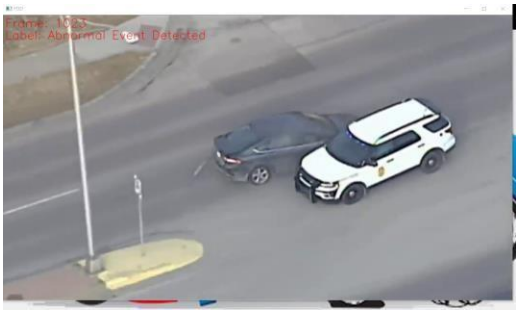

Fig 4– Abnormal Event Detection.

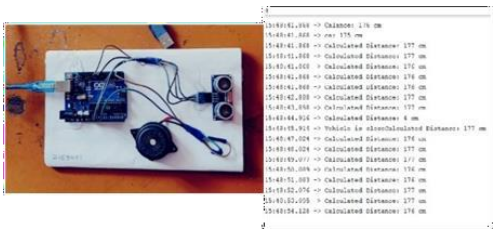

Fig 5 – Hardware System and distance calculation.

Fig 6– Alerting user by sending SMS with the co-ordinates.

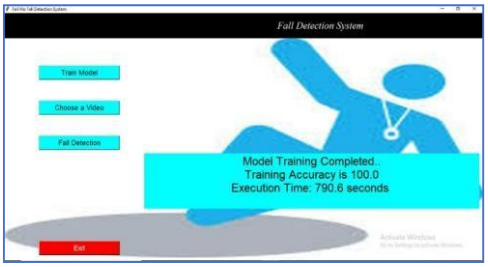

Fig 7– Accuracy of the system

4. CONCLUSION

We proposed system for accident detection using CNN Algorithm, prevention using ultrasonic sensor and reporting system by sending SMS. This project presents vehicle accident detection and alert system with SMS to the user defined mobile numbers .The GPS tracking and GSM alert-based algorithm isdesigned and implemented. The proposed vehicle accidentdetection system can track geographical information automatically and sends an alert SMS regarding accident. The system is successfully implemented and tested. After the detailed experiment, it is observed that this system is efficient and reliable.

FUTURE SCOPE

The proposed model shows high performance for video trafficaccident detection. However, due to the paucity of such datasets in the scientific community, the conditions under which the model works are limited. The solution is restricted

to vehicular collisions, excluding motorcycles, bicycles, and pedestrians due to the negligible number of these types of examples available. In addition, the model has errors in determining accident segments with low illumination (such as nighttime videos) or low resolution and occlusion(low quality video cameras and locations).

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