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ACCIDENT AVOIDANCE AND SAFE JOURNEY USING CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT: In this paper**,** Safety for sure is the primary concern these days, be it applied to any field. Of such, safety while driving is highly prioritized. Road crashes and accidents are becoming common cause of injury and death among human population. According to a report by WHO road accidents resulted in 1.25 million deaths worldwide and for every 25 seconds a person experiences an accident. And majority of 23.5% of the accidents are sleep related. Large number of people drive on highways and of those long distance travelling results in lack of sleep which is dangerous. We even witness a good count of accidents during nights and early hours. Therefore there need to be a system that tackles this problem and ensures safety of driver not just in terms of drowsiness but even if he is with any difficulty. his system monitors the eye movements of the driver to ensure his safety and drowsy status and alarms him if he is suspected to sleep or unconsciousness. This helps a lot in reducing the number of accidents worldwide. This is just the base of how technology can be used in saving the lives of people. With advancements made it can also be embedded with IOT as a device. This can then be used in any kind of driving and be a handy device. Thus the base for making such advancements is this Accident Prevention and Driver Safety using Deep Learning.

KEYWORDS: Convolutional Neural Networks, Keras, Tensorflow, OpenCV, ReLu, Softmax, Haar cascade classifier

INTRODUCTION

Safety brings first aid to the uninjured. Never think because an accident hasn't happened to you that it can't happen. Drowsiness and unconscious or troublesome situation can happen anytime. With the adverse technology available it is not difficult to bring things to our control. In this Accident Prevention and Driver safety we make use of Convolutional Neural Networks a part of Deep Learning and Image processing techniques to prepare a dataset and classify the state of driver by giving it to the classifier model. Thus a sound

or message is generated to alert the driver and thus prevent the injury for himself as well as others.

Human life is a gift of God, it is very precious. Losing such due to unaware activities or negligence costs so much. So itis our duty to protect the precious gift. Here comes the advent of technology. India accounts to 6% of global road accidents. Six percent of this highly populated country is undoubtedly not a small number. Even the statistics showan increased growth from 2005 till date.

So this is definitely an issue that motivates the technocrats to handle it inorder to save the human lives. Of the portion of accidents again drowsiness stands apart. Thus this system is use to monitor the drowsiness of a driver an alerts him.

Image as Input:

Inorder to take image as input from the camera we make use of OpenCV. OpenCV-Python is a library of Python bindings designed to solve computer vision problems. Python is a general purpose programming language started by Guido van Rossum that became very popular very quickly, mainly because of its simplicity and code readability. In OpenCV there are various methods defaultly available. Those methods are used to take face and eyes as input and create Region Of Interest.

Predict if eyes are Open/Closed:

This is done by using Keras. There are various methods available in keras. Firstly we need to load our model that is build using Keras and Tensorflow. This model is nothing but our convolutional neural network. Once on loading the model it will take the eyes as input and predict using the keras functions. If closed the it increments the score and displays the score using OpenCV. If the score exceeds the specified value which is the number of seconds then an alarm sound rings alerting the driver to wake up and thereby preventing accidents and loss of life.

Building the CNN:

Inorder to build the Convolutional Neural Network we make use of Keras and Tensorflow. Neural Networks have many layers. Starting from input layer followed by 2 Convolutional layers of 32 nodes and one convolutional layer of 4 nodes and a fully connected layer of 128 nodes and finally an Output Layer. Any Neural Network Comprises of activation function. Activation functions define the output on giving the input. They decide what must be given to the next layer in the sequence. And mainpurpose of activation function is non linear transformation of data. The activation functions used in our system are ReLu Activation function and Softmax Activation

function. Relu activation function is used in all the layers except the output layer. In the output layer Softmax activation function is used.

Relu stands for rectified Linear Activation Function. It keeps the output as it is if positive and makes it to zero ifnegative. Relu is the most popular and widely used activation function. and for image data Convolutional Neural Networks gives the best results. The various layers that are built are Dense, Flatten, Batch Normalization, Conv2D and Maxpooling2D. Thus upon building all these layers, our model gets ready.

And on using the methods available in keras we train ourmodel on dataset containing the various images of eyesunder different lighting conditions, some with eyes open and others with eyes closed. Therefore this trained model can thus be imported and used to predict the state of eyes of a person while driving.

Objective

Several lives are saved by alerting the driver with help of a sound system that is deemed to prevent any distractions before happen. The cloud services and machine learning are employed in identifying fatigue drivers through the collected and stored dataset from cloud services. The device is experimentally tested, and the results show its efficiency and effectiveness.

LITERATURE REVIEW

Ashish Kumar et al. in [1] also consider visual behaviours viz. eyes, mouth and nose. Face is detected using histogram of oriented gradients and linear support vector machine. The detection algorithm is applied on frames of 2D images extracted from video. After the detection, facial landmarks are marked with the help of landmark points. Feature extraction is implemented for classification. Nose Length Ratio (NLR), Eye Aspect Ratio (EAR), Mouth Opening Ratio (MOR) are calculated. When values of these parameters go beyond threshold, driver is classified as drowsy. The system generates accurate results with generated system data.

Mkhuseli Ngxande et al. [2] Machine learning techniques like support vector machine, convolutional neural network and hidden markov model are used for behavioural measures like eye blinks, yawns and head movements. All three machine learning approaches are applied and results are tabulated. Method with support vector machine approach gives highest accuracy but with high cost, similar to hidden markov model, with accuracy just next to support vector mechanism. Method with convolutional neural network gives good accuracy with lesser cost.

They have also listed various publicly available datasets for drowsiness detection practices

Kyong Hee Lee et al[3]. it has been shown that the drowsiness level of a driver can be determined by extracting its facial features. Video dataset from NTHU-DDD has been used to test the methods. Head pose, eye blinks and mouth status are the features considered. The angle of driver's head, helps find head yaw and pitch angle. PERCLOS is implemented for eye blinks. Action unit from FACS is used to monitor yawning. The face is detected on the screen and parameters of all other detected features like yawn, blinks, head yaw and pitch angle are shown on the screen. A threshold is set for all the attributes. If parameter value exceeds the threshold value, drowsiness is said to be detected.

PROPOSED METHOD

We make use of Convolutional Neural Networks for the sake of improvement in accuracy. Convolutional Neural Networks work best for image data. CNN is a class of artificial neural network, most commonly used for visual imagery. Convolutional Neural Networks take fixed size iput and give fixed size output. There are various types of Neural networks. In comparision with Recurrent Neural Network, CNN is fast and more accurate. RNN takes arbitrary size inputs and outputs. It is notapplicable in our case as we just determine if eyes are open or closed. And most of all, again CNN is useful for image data. Therefore we have built the model using CNN by making use of Keras and OpenCV. Keras uses Tensorflow as backend. Keras is a open source python framework that is used to build Machine Learning and Deep Learning models. tensorflow is free, open source software that enables to build neural networks. There are various methods available in OpenCV to take image as input from video and make the region of interest. Therefore, we are embedding OpenCV and CNN inorder to make our task easier and accurate. OpenCV is used for the sake of Image classification. and Keras is used to build the Neural Network. We even used another module called Pygame that allows us to play sounds. Here we used this module to play the alarm buzzer. Therefore on not just relying on the conventional machine learning techniques to implement the system, we are using Image classification and Deep Learning to make it advanced and make it suitable for all kinds of image data that we encounter in real world. Not that it is the best in all senses. Any technique do has Any technique do has its own limitations. But the only intention is to use the one that is better among all the ways available. And hence we built it with OpenCv and Convolutional Neural

Networks. All these are built in python libraries.

IMPLEMENTATION

The modules used in our system are detection, model. The model module consistsof the python code that is used to build the neural network. We made use of Keras, Tensorflow forbuilding the modules. And the detection module consists of OpenCV and Keras. The already builtmodel is loaded into this module. Using OpenCV we detect the eyes and face and generate regionof interest. Then by using the loaded the module, predictions are made. And the score is calculatedby incrementing the value when both eyes are closed. When the score increments certain specified threshold, alarm sound is produced. In order to produce this sound we make use of another modulePygame.

The "haar cascade files" folder consists of the xml files that are needed to detect objects from the image. In our case, we are detecting the face and eyes of the person.

1. The models folder contains our model file "cnnCat2.h5" which was trained on convolutional neural networks.
2. We have an audio clip "alarm.wav" which is played when the person is feeling drowsy.
3. "Model.py" file contains the program through which we built our classification model by training on our dataset. You could see the implementation of convolutional neural network in thisfile.
4. "Drowsiness detection.py" is the main file of our project. To start the detection procedure, wehave to run this file.

Step 1 – Take Image as Input from a Camera With a webcam, we will take images as input. So to access the webcam, we made an infinite loop that will capture each frame. We use the method provided by OpenCV, cv2.VideoCapture(0) to access the camera and set the capture object (cap). cap.read() will readeach frame and we store the image in a frame variable.

Step 2 – Detect Face in the Image and Create a Region of Interest (ROI)

To detect the face in the image, we

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need to first convert the image into grayscale as the OpenCV.

SAMPLE RESULTS

CONCLUSION

The world today, is witnessing large number of accidents. This system aims to reduce the number of accidents that occur mainly due to fatigue and unconsciousness. It will be of a great use while travelling for long distances especially during nights. The driver need not strain himself from controlling the fatigue. The system automatically alerts him by producing an alarm sound. Therefore this will be of a great help to the mankind. The number of deaths, injuries will eventually decrease. And thus it will be one of the ways of increasing the driver's as well the passenger's safety.

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