ACCIDENT PREVENTION AND DRIVER SAFETY USING CONVOLUTIONAL NEURAL NETWORKS

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ABSTRACT

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. This 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 Convolutional Neural Networks.

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 it is 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 show an 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 if negative. 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 suing the methods available in keras we train our model on dataset containing the various images of eyes under different lighting conditions, some with eyes open and others with eyes closed. Threfore this trained model can thus be iported and used to predict the state of eyes of a person while driving

EXISTING SYSTEM

The existing system is built using Support Vector Machine, and Logistic Regression. But building the system using SVM and Logistic regression does not give much accuracy. Though there are various ways to build a model, building it with optimistic method helps prevent the issues. As this system can be of great help in real time, confining it with these methods cannot help always and in all circumstances. Thus these techniques are to be replaced with the one that gives best results.

PROPOSEDSYSTEM

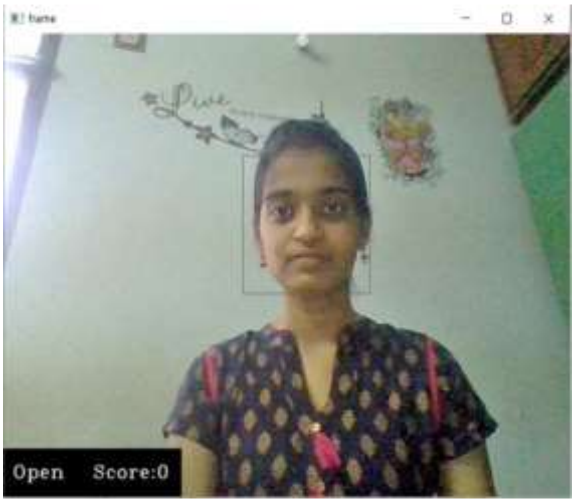
We make use of Convolutional Neural Networks for the sake of improvement in accuracy. Convolutional Neural Networks work best for image data. CNN is a class of artificial neural network, most commonly used for visual imagery. Convolutional Neural Networks take fixed size iput and give fixed size output. 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 not applicable 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 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

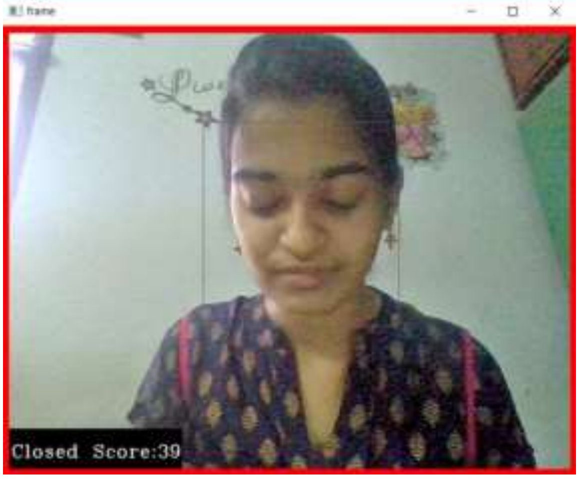
(modules)

The modules used in our system are detection, model. The model module consists of the python code that is usedto build the neural network. We made use of Keras, Tensorflow for building the modules. And the detection module consists of OpenCV and Keras. The already built model is loaded into this module. Using OpenCV we detect the eyes and face and generate region of interest. Then by using the loaded the module, predictions are made. And the score is calculated by incrementing the value when both eyes are closed. When the score increments certain specified threshold, alarm sound is produced. Inorder to produce this sound we make use of another module called Pygame.

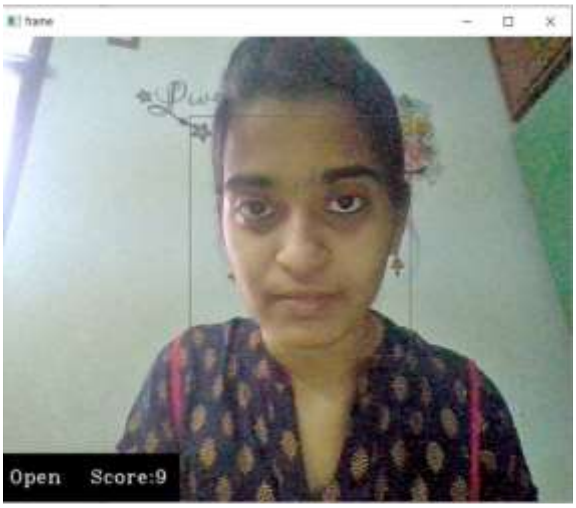
SAMPLE SCREENS



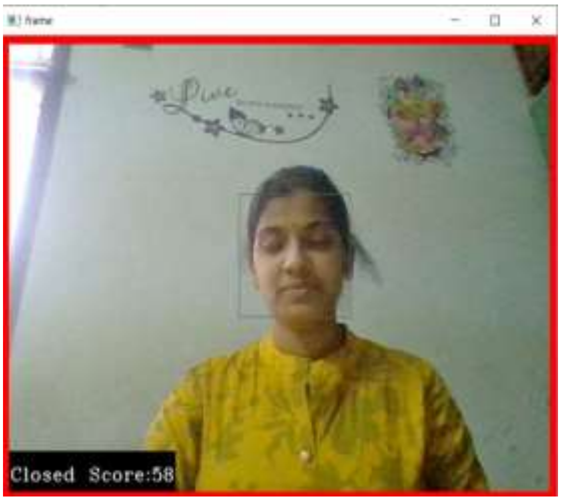
Open Score:0



Closed Score:39



Open Score:9



Closed Score:58

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.

FUTURE SCOPE FOR FURTHER DEVELOPMENT

Apart from detecting the level of drowsiness and alerting the driver with a sound, further advancements can be added. We can contact the frequently contacted numbers of the victim's. A message alert can be sent to th contacts thereby they can put their effort from there side. And the frequently contacted numbers need to be updated automatically by accessing the call log of the person. the last called number and the list of five frequent users among one week's data are to be considered. This improvement will even increase the safety level. Some at times we cannot alert the driver by just a sound, and if anything unforeseen happens, immediate action can be taken from the members of the driver as well. These little modifications and advancements are really helpful in today's world.

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