Emotion Recognition of Occupants of a car

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Abstract-Self-driving cars are nice, but the real revolution is automotive empathy. Cars are learning to get in touch with our thoughts in dramatic ways. The biggest reason for this tech shift is safety, because the most dangerous thing about a is the driver. In our project we present a model capable of performing various functionalities related to safety and marketing using the facial data collected from the driver and the other passengers of the car while maintaining its performance.

BACKGROUND

[1] Christine et al. provides a SVM based classification approach to determine the emotion score by training a model to classify images based on shape of the mouth for different emotions. [2] Vesselenyi et al. explains a complicated method of drowsiness detection using artificial neural networks (ANN) which consisted of 1 hidden layer and an autoencoder network. [3] Shaikh et al. explains the ability of increasing the brightness of dark image using different techniques which we have adapted for our model to enable the model to carry out other functions during night times. [4] Hlaing in his paper explains an approach of detecting the age and gender of a person by taking into consideration a number of facial factors. Women safety has been a huge problem currently in India where women no longer feel safe to travel alone in cabs. Currently Uber offers an option to send an alert if the person is feeling any sort of harassment which involves the voluntary action of the victim.

CURRENT RESULTS

We have combined all these functions along with other to provide a smart car system capable of handling safety and carry out another function which has not been worked upon. For our drowsiness detection function we carry out a simple method of finding the eye aspect ratio after obtaining the co ordinates of the edges and corners of the eyes as shown in Fig 1. This method is simpler hence processing time is very less. To carry out the emotion detection we have used a pretrained CNN model which uses XCeption architecture using multimodal technique we plot class activation maps as shown in Fig 3 and take all facial factors like eyes , mouth, tip of the nose to determine the emotion, for ex happiness seems to depend on pixels related to eyes and mouth, whereas anger and sadness is more related to the eyebrows. We have added a function of phone usage detection by building a CNN based classification model which has been trained by images obtained from google. To carry out violence and molestation detection we take two factors one is the Amazon Rekognition API for detecting unsafe content in images and the fear score and detect molestation and violence where an emergency is alerted without the victim having to voluntarily send a notification which is a huge advantage. To determine the age and gender we have used talhassner's pretrained model to determine the age and gender of a person using a single image. Using these values we provide an opportunity for the passengers to shop where the system will display products based on the gender and the age for example for a child it will recommend toys and for ladies cosmetics and so on this provides a new experience allowing the person to shop without having to ask for the products. To allow all these functions to be carried out at the night time we have enabled night vison for this we do not use any infrared cameras thereby saving the cost on expensive cameras instead we modify the existing frame by a technique of histogram equalization we have tried other techniques like contrast stretching and adaptive equalization among which histogram equalization provides better results and the comparisons can be seen in Fig 7. We plan on placing the camera at the middle of the car right

above the rear view mirror. We have used a normal ultra wide camera with f/2.2 lens with an 117 degree field of view. The result has been shown in Fig 9 which shows a wide aperture allowing every person sitting in the vehicle to be detected.

CONCLUSION

We have built a model capable of carrying out various functions while maintaining the processing speed which provides new ways of providing safety to women . Since the night vision is being carried out by a normal camera we can cut down the cost on expensive infrared cameras. We have also stepped into the field of advertising using data available from camera feed without having to search manually.

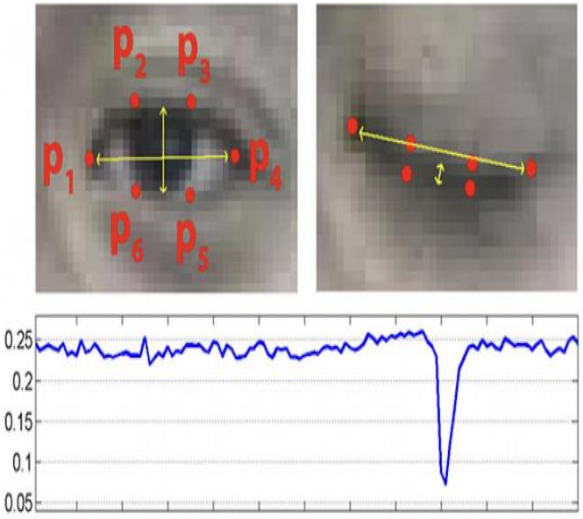

Fig 1 : Detecting edges and corners of eyes

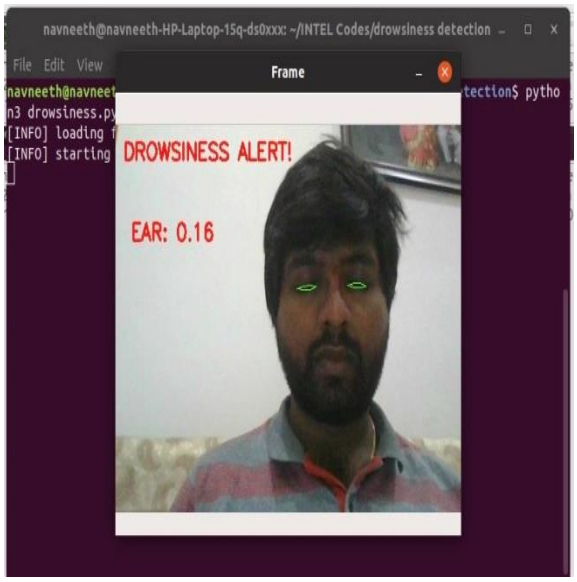

Fig 2: Drowsiness detection

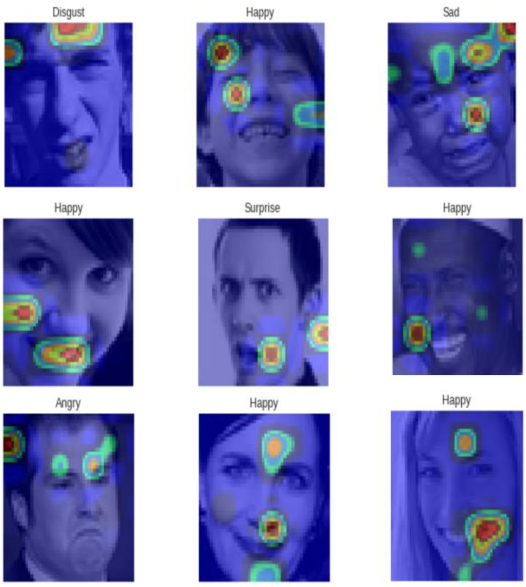

Fig 3 : Class activation maps

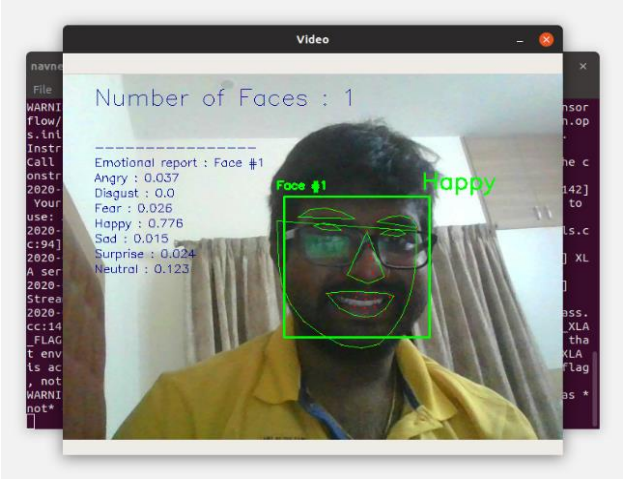

Fig 4 : Emotion recognition

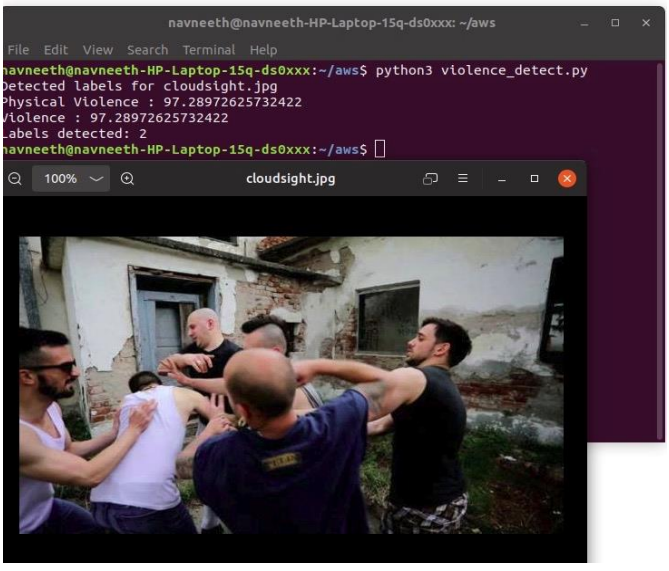

Fig 5 : Violence detection

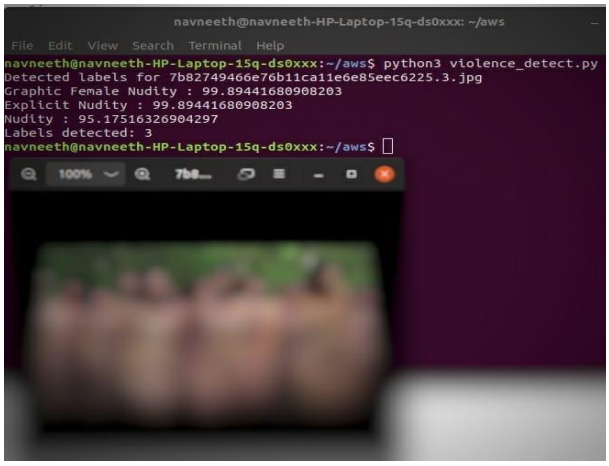

Fig 6 : Women safety detection

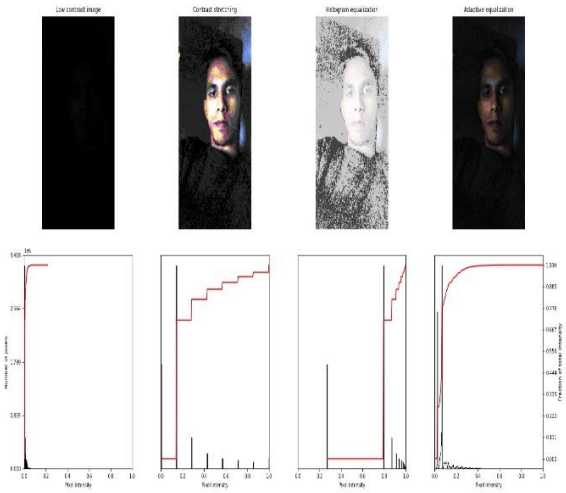

Fig 7 : Night vision techniques

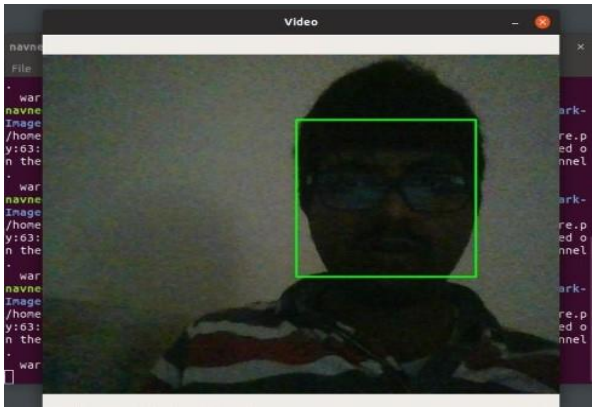

Fig 8 a : Original dark image

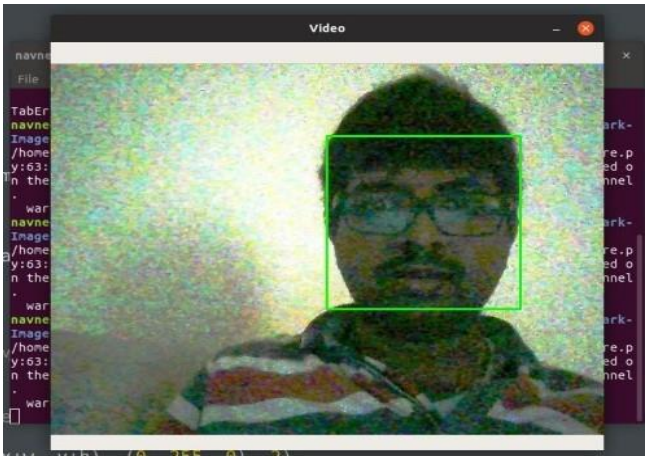

Fig 8 b : Image after histogram equalization

Fig 9 : Position of camera

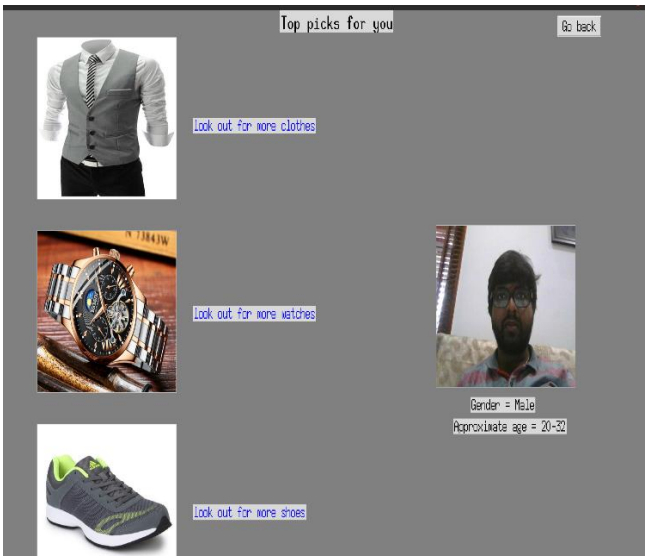

Fig 10 : Product recommender

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[4]Hlaing, “Gender and Age Estimation Based on Facial Images”.