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Recognition of Facial Expression and Drowsiness Using Landmarks

[1]CH.M.H.SAI BABA, [2]S.SAI SRIDHAR, [3]V.KOUSHIK, [4]P.ANIRUDH
[1,2,3,4] Koneru Lakshmaiah Education Foundation, Vaddeswaram, Guntur (Andhra Pradesh)
sridhar79464@gmail.com

Abstract

Emotions are important for extracting facial expressions and they can be calculated by still images, Video frames. While driving the driver should be alert because many accidents occur due to the drowsiness of the driver. To overcome this, we can detect drowsiness and alert the driver. In this paper, we have calculated the drowsiness and facial expression by using facial landmarks with the Euclidean distance algorithm. The landmarks detection is done with the shape-predictor file which is trained with the IBUG 300-W dataset in which about 300 facial expressions are recorded. The shape predictor file is to detect the faces and marks points. Through the shape predictor, we can detect multiple faces that may not possible by neural networks.

Index Terms: *EAR, image processing, dynamic image analysis, computer vision, shape predictor.*

1. INTRODUCTION

Facial expression Recognition is a very essential feature in many applications which we see in our life. There are two types of image analysis one is static image analysis and another one is dynamic image analysis. Static image analysis is calculating expression in image or detection of face/object in an image. dynamic image analysis is dividing a video into frames and calculates expressions for each frame.

According to the National Highway Traffic Safety Administration every year 100000(1 lakh) people involved in crashes with drowsy driving. Even a person tries not to get sleep but unknowingly, the diver may fall sleep which leads to the cost of some people's lives. So, In our project, we developed a system that detects drowsiness and makes a sound to make a driver alert. There may be variations in showing emotion in the human faces but while showing emotion facial features are varying, using this we can find the emotion with the landmarks. There are files that are trained with several objects(faces, eyes) and use them to mark the points. Through image processing, there are numerous applications like biometric and security purposes.

Facial expression can be used in computers to interact with the human accordingly like robots.

2. RELATED WORK:

There are many methods to detect the face and find the expression like convolutional neural network (CNN), support vector machine (SVM). Multiple faces in the classification of expressions “random forest algorithm” can be used. It is like decision trees predicting the result by calculation (or) through the dataset. Here we did research on our project using landmarks. There are two types of files that are trained using a dataset named 1BUG 300. Both are used to detect the face and mark the points on the face. One file is used to mark the 68 landmarks and the other is used to mark 128 landmarks in our project. We used 68 landmarks file. Both are trained to mark the number of points.

Open CV is an open-source library used in many applications like machine learning, Artificial Intelligence. Open CV is used for the computer vision in the object detection color spaces or color models, used in image processing and various purposes in the systems. Some of the color spaces are RGB. YCbCr, CMY.K, HSV.

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3. PROPOSED METHODOLOGY:

Through dynamic image analyses, we captured video and finds the emotion and drowsiness of a person.

3.1 Video Acquisition:

Capturing video dynamically through the webcam

3.2 Extracting Frames:

Video is a collection of images or frames. After capturing the video to detect the face and to calculate emotion.

3.3 Face Detection:

Using the shape predictor 68 landmarks file we can detect face and in this step, we can detect multiple faces.

3.4 Landmark Detection:

Using the shape predictor 68 landmarks file points are marked on a detected face.

3.5 Emotion Detection:

Since we detecting emotion by calculating the distance between the considered points. While showing emotion the person's facial features are changing.

3.6 Eye Aspect ratio:

In this technique, we are using different achievements to recognize the opening and closing of the eye. The landmark detector that marks points on the face and all the points on both of them are considered to compute the distance between the vertical eye landmarks and distance between horizontal eye landmarks.

In this venture, we utilize some feelings smile, anger, surprise, leye when we rise our left eyebrow and right eyebrow it will show leye and reye and when we rise the two eyebrows then it will show eye act. The video is recorded right away by utilizing webcam and through it, we further separated into frames and we will compute or each frame and indicated the resultant in the frame.

We can see in figure 2 marking 68 points in the face and coming to the consideration of points through which emotion will be calculated

Extracting points for drowsiness detection:

As shown in the figure2 to detect drowsiness p1,p2,p3,p4,p5,p6 points are considered on both eyes.

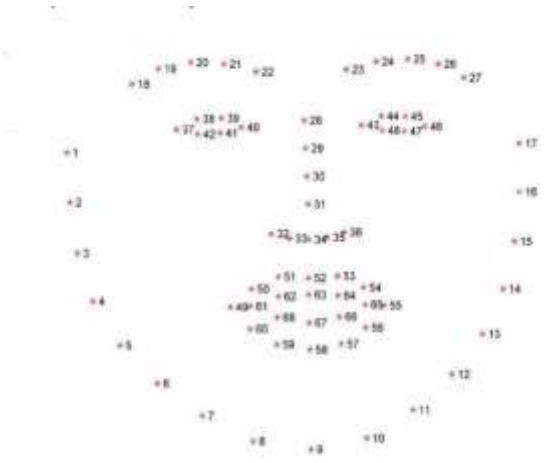

Figure 1.0

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Expression to be calculated	Points to be considered
smile	49 and 55
anger	22 and 23
Leye	38 and 41
Reye	44 and 47
surprise	Both leye and reye are considered
Drowsiness	All the points on both eyes are considered

Table 1.0 consideration of points to classify emotion

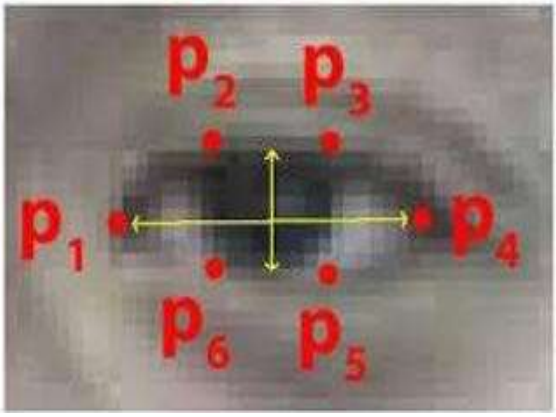
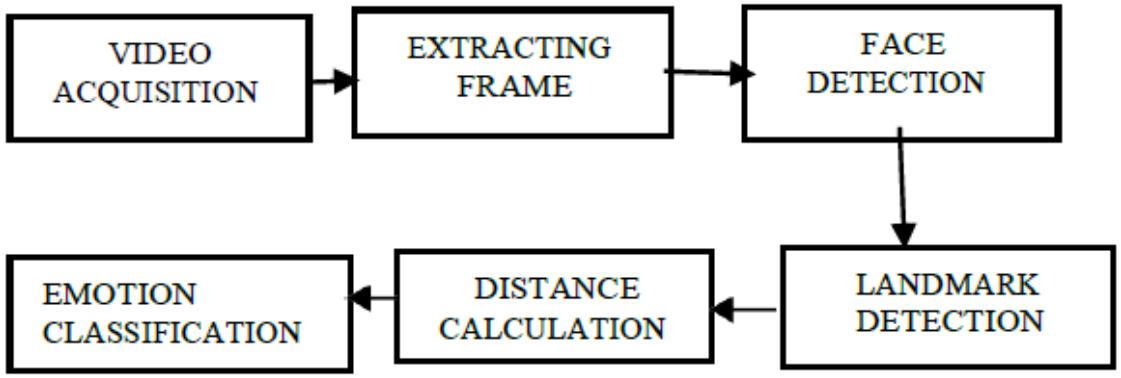


Figure 2.0

Requirements:

1. CMAKE
2. PYTHON 3.6
3. DLIB
4. NUMPY
5. OPENCV
6. PYGAME

Flowchart



4. DLIB FACIAL LANDMARK DETECTOR

We use dlib library(dlib is a general software library which is written in c++ programming language and it also includes many machine learning algorithms) to support the dlib file, shape predictor 68 landmark and OpenCV to detect facial landmarks in an image. Facial landmarks are used to localize and represent salient regions of the face:

1.Eyes 2.Eyebrows 3.Nose 4.Mouth 5.Jawline

Eye Aspect Ratio:

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

The eye flicker is a quick shutting and reviving of a natural eye. Everyone has an individual way of blinking. The blinking varies in the speed of shutting and opening of the eye. The eye flicker keeps going roughly 100-400ms. For every video frame, the eye landmarks are detected. The eye aspect ratio between height and width of the eye is computed.

5. PROCEDURE

5.1Emotion detection :

It starts with the recording of video dynamically through the webcam. After the video is recorded, it will be divided into frames, and face detection will be done to that frame then after landmarks are marked on the face by using the file shape predictor 68 face landmarks.dat. To calculate the emotion certain points need to be considered and calculate the distance between those two points. How the emotion will be classifiable is that suppose, if a person is smiling then the distance between points 49 and 55(can observe from Table 1.0). If a person is in anger then the distance between points 23 and 22 is converged. if the person opened his left eye a little bigger than usual then points 38 and are considered. In the same manner for the right eye 44 and 47 are considered.

When the smile is recognized in the frame then the count of the smile will be increased by 1 and when a person is continuously smiling parallelly the count of the smile will be increased at a certain value(threshold value which is set by user) the music will be started automatically and after 4 seconds it will be stopped automatically and the smile count will zero it is to know the person's emotion by listening to music because we can't observe person's emotion continuously. The procedure will repeat the anger also. The music can be any kind that matches the emotion.

5.2 Drowsiness detection:

In the drowsiness detection, the six points which refer one eye are considered and two eyes with having 6 points each are considered for **EAR** calculation. **EAR** is calculated based on the person's eye blinking it differs from person to person as shown in figure 2.0

If the person opens his/her eyes then the EAR will be between 0.25 and 0.30.

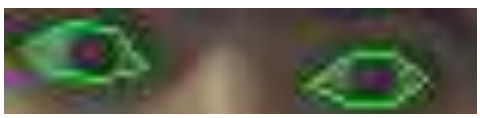


Figure 3.0

I the person closes his/her eyes then the EAR value will be less than 0.15.

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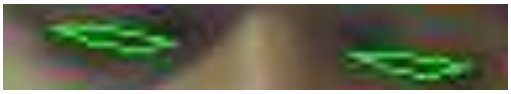
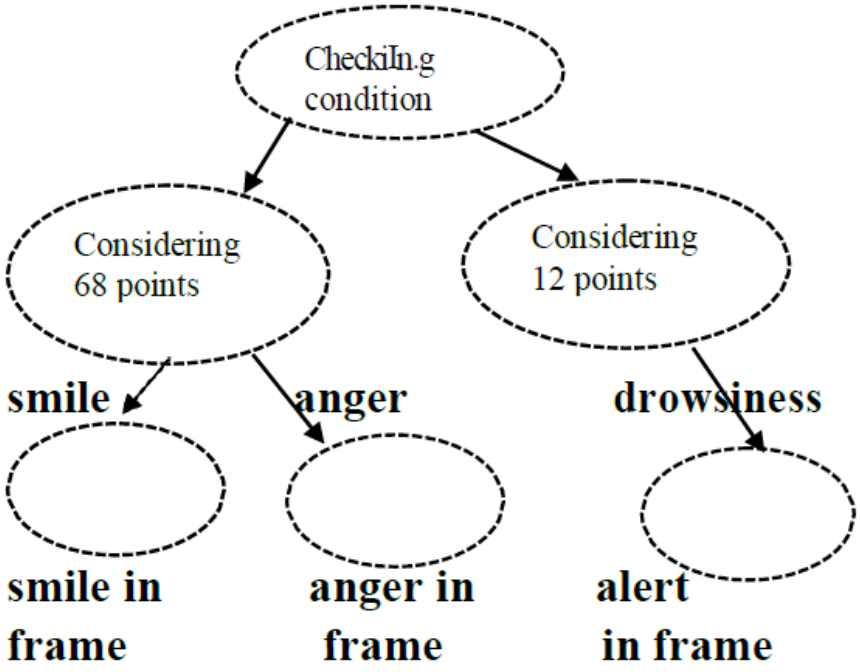


Figure 3.1

5.3 Random forest:

Random forest is one of the supervised learning algorithms. Random forest is having a bunch of decision trees for the classification.

In our research, we classify emotion based on the distance between the points.



6. FUTURE ENHANCEMENT:

There is a vast usage of facial expression and drowsiness in the present technology.

Facial Expression Technology in Robots:

There is a huge scope of robots in the future like the medical industry, for patients with Lewy body disease. In the process of diagnosis, doctors can know the emotions of patients. if they are irregular in emotion then doctors came to know and take care of the patients.

Robots are also having facial expression technology to interact and for further communication so that the robot knows the person's feeling and respond accordingly.

Drowsiness detection is used in the automobile industry to detect the drowsiness of drivers and prevent accidents.

7. Conclusion:

We find a method to classify emotion and know the person's emotion by listening to the music and detect the drowsiness of a person, makes a person alert. Shape predictor file is used to point the landmarks and further those points are used to classify emotion and drowsiness.

REFERENCES:

[1] D. Lundqvist, A. Flykt, A. hman, (1998). The Karolinska Directed Emotional Faces - KDEF, CD ROM from Department of Clinical Neuroscience, Psychology section, Karolinska Institutet, ISBN 91-6307164-9.

[2] D. Ghimire, J. Lee, Geometric feature-based facial expression recognition in image sequences using

multi-class AdaBoost and support vector machines. Sensors 2013, 13, 77147734. [CrossRef] [PubMed] .

[3] S.L Happy, A. Routray ,Automatic Facial Expression Recognition Using Features of Salient Facial Patches in IEEE Transactions on Affective Computing - May 2015, DOI 10.1109.

[4] M.H. Siddiqi, R. Ali, A.M Khan, Human facial expression recognition using stepwise linear discriminant analysis and hidden conditional random fields. IEEE Trans. Image Proc. 2015, 24, 13861398.

[5] R.A Khan, A. Meyer, H. Konik, S. Bouakaz, Framework for reliable, real-time facial expression recognition for low resolution images. Pattern Recognit. Lett. 2013, 34, 11591168.

[6] D. Ghimire; S. Jeong; J. Lee; S.H Park, Facial expression recognition based on local region specific features and support vector machines. Multimed. Tools Appl. 2017, 76, 78037821.

[7] M. Suk, B. Prabhakaran, Real-time mobile facial expression recognition systemA case study. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops, Columbus, OH, USA, 2427 June 2014; pp. 132137.

[8] F.D Torre, W.-S. Chu, X. Xiong, F. Vicente, X. Ding, J. Cohn, IntraFace. In Proceedings of the IEEE International Conference on Automatic Face and Gesture Recognition, Ljubljana, Slovenia, 48 May 2015; pp. 18.

[9] M. Szwoch, M. Pieni, Facial emotion recognition using depth data. In Proceedings of the 8th International Conference on Human System Interactions, Warsaw, Poland, 2527 June 2015; pp. 271277.

[10] A.A.S Gunawan, Face expression detection on Kinect using active appearance model and fuzzy logic. Procedia Comput. Sci. 2015, 59, 268274.