A Systematic Review on Facial Recognition of candidates during interviews by using sentimental recognizers

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***Abstract*—Face recognition is playing an important and vital role especially in the field of commercial, banking, social and law enforcement. By detecting the face in videos and extracting local characteristics (landmarks) to generate the geometric-based features to discriminate between a set of five emotion expressions such as amusement, outrage, disgust, fuss, and sadness for videos. Emotion more often is communicated by subtle changes in one or a few discrete facial features, such as a tightening of the lips in anger or obliquely lowering the lip corners in sadness artificially and naturally. The thousands of facial features analyzed include brow furrowing, brow raising, the amount eyes widen or close, lip tightening, chin raising and smiling.**

Keywords— Facial Expression, Geometric Facial Features, Emotion Recognition;

I. INTRODUCTION

Emotion is a psycho-physiological process triggered by conscious and/or unconscious perception of an object or situation and is often associated with mood, temperament, personality and disposition, and motivation. Human sentiments and feelings are so unpredictable and require more examinations to be deciphered well regardless we have a little knowledge about them. We present a novel system which employs automatic facial emotion recognition technique for adaptive AI candidate behavior. The widely used feature extraction algorithms are Local binary pattern, Gabor filter and Scale Invariant Feature Transform [10]. A facial expression is worth a thousand words and few realize how loud their expressions really are. A smile from a stranger walking by on the street can indicate his good intention which could even make you smile back, while his scowl might turn you away. Without words, humans use their facial expressions to show their emotions and intentions to others.

II. RELATED WORK

In general, facial expression recognition consists of two stages: 1) feature extraction, and 2) classification. The main aim of feature extraction is to transform the input videos into the feature subspace while preserving the facial expression information. Face emotion recognition uses support vector machine for finding the different emotions of face and also for classifying them and is used to extract the facial features and to reduce the image dimensions. Face is a two-dimensional image, for face analysis it is preferred to use two-dimensional vector space.

III. PROPOSED WORK

Face emotion detection is used to predict the emotion state of the person based on their facial expressions. The overview of the proposed system architecture is shown in the Figure 1. The input video is classified into two types: training set and testing set. Training set is used for training of classifier. Testing set is used to verify the algorithm by predicting the different emotions of the face. Expression analysis is the major part of the emotion detection. PCA is applied to training images to reduce the dimensionality. Because training set is more compared to testing and if the dimension is high then the time taken for processing will be more. Support vector machine

classification is done for classifying different emotions namely, Happy, Sad, Angry, Fear, Disgust and Surprise. Facial features such as eyes, nose, lips and face contour are considered as the action units of face and are responsible for creation of expressions on face, are extracted using open source software called dlib. SVM classifier compares the features of training data and testing data to predict any emotion of the face. Here facial features are considered as the key points which are used for training and testing. Support vector machine is the supervised learning method of machine learning. Machine learning algorithms are advantageous over other algorithms, because of less error rate and faster results. Video analytics is a technology that processes a video using various special algorithms in order to perform the required function. There are various types of video analytics but we make use of facial recognition systems.

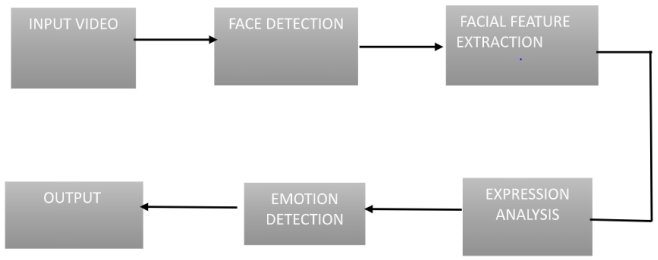

Figure 1 Architecture of proposed framework

The Figure 1 describes the outline of the proposed framework. Recognition is based on the stored image data of the different group of persons. Input images are of any type can be used for recognition. Input image is subjected for face detection to detect the face. Detected face is the extracted from the image and these images are saved as a database. The objectives of our system are as follows:

- A candidate-interviewer interaction is susceptible to many categories of judgment and subjectivity. Such subjectivity makes it hard to determine whether candidate's personality is a good fit for the job.
- Identifying what a candidate is trying to say is out of our hands because of the multiple layers of language interpretation, cognitive biases, and context that lie in between.
- To employ standards of face recognition and emotion detection and create a real time way to find the emotions of the people interacting over a video call or through webcam.

A. PROPOSED METHODOLOGY

In order to detect facial landmarks in the input video we utilize dlib and OpenCV. Facial landmarks are used to localize and represent salient regions of the face, such as eyes, eyebrows, nose, mouth, jawline etc. Detecting facial landmarks is a two-step process:

Step 1: Localize the face in the image.

Step 2: Detect the key facial structures on the face.

The first step of face detection can be achieved in a number of ways. We make use of OpenCV's built-in Haar cascades [3]. We can also apply the SVM object detector specifically for the task of face detection. The second step of detecting key facial structures in the face region can be achieved by the use of variety of facial landmark detectors which try to localize and label the facial regions such as Mouth, right eyebrow, left eyebrow, right eye, left eye, nose and jaw. The facial landmark detector is included in dlib library [5]. The proposed methodology can be broadly classified as:

- Data organization
- Extracting faces
- Classification and Training

I. DATA ORGANIZATION

A face consists of some features on it which play an important role in the detection of the emotions on it. The emotion recognition system is divided into 3 stages: face detection, feature extraction, and emotion classification. Each image sequence consists of the development of an emotional expression, starting from a neutral face and ending with some particular emotion. So, from each image sequence, our focus is to extract two images that are one neutral and one with an emotional expression in the sequence.

II. EXTRACTING FACES

The classifier will work properly if the images contain only the faces so the images were processed accordingly for the detection of the faces and then were converted to grayscale and were cropped and were stored in some specific folder.

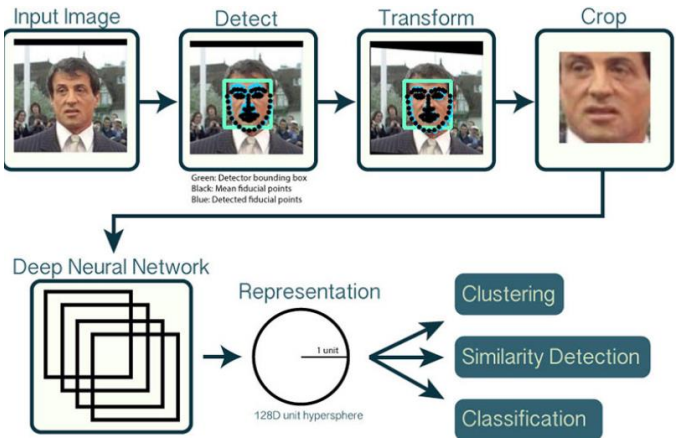

Figure 2 Face recognition using Open CV

The Figure 2 gives an overview of face recognition using Open CV. We have used a HAAR filter from Open CV for automatic detection of faces [4]. As OpenCV contains 4 pre-trained classifiers, so it is better we detect as many faces as possible. The process of face recognition is done using Open CV. OpenCV - Open source computer vision is a library of programming functions mainly aimed at real time computer vision. It is library used for Image Processing. It is mainly used to do all the operation related to images. Feature extraction process can be defined as a process of extracting relevant information from the face. In feature extraction, a mathematical representation of original image called a biometric template or biometric reference is generated which can be used for further processing and analysis.

III. TRAINING AND CLASSIFICATION

The dataset has been organized and is ready to be recognized, but initially, we need to actually train the classifier what particular emotions look like. The approach we have used is to split the complete dataset into a training set and a classification set. We use the training set to teach the classifier to recognize the labels to be predicted, and used the classification set to estimate the performance of the classifier [9]. The classification operation is done using different machine learning models including random forest (RF), support vector machines (SVM), k-nearest neighbors (KNN) and recurrent neural network (RNN), then the evaluation operation is done to generate different discrimination rates [7]. The concept of video analytics is used to analyses video streams in near real-time and for identifying characteristics, actions or patterns of specific behavior via analysis of monitored environments.

IV. CONCLUSION

The system implies that user independent real-time coding of facial expressions in the continuous video stream is an achievable goal with present power of the computer, at least for applications in which frontal views can be assumed using the webcam. This machine learning based system for the emotion recognition can be extended to the deep learning system using the Convolutional Neural networks which will have many layers and the chances of getting much higher accuracy.

REFERENCES

[1] Mehrabian, A. (2015). Communication without words.Communication Theory, 193-200.

[2] Ekman, P., & Friesen, W. V. (1971). Constants across cultures in the face and emotion. Journal of personality and social psychology, 17(2),124.

[3] Gunes H, Pantic M. Automatic, Dimensional and Continuous Emotion Recognition[J]. International Journal of Synthetic Emotions, 2010, 1(1):68-99.

[4] Russell, J. A., & Mehrabian, A. (1977). Evidence for a three-factor theory of emotions. Journal of research in Personality, 11(3), 273-29

[5] Kazemi and Sullivan, One Millisecond Face Alignment with an Ensemble of Regression Trees(2014).

[6] He R, Wu X, Sun Z, et al. Wasserstein CNN: Learning Invariant Features for NIR-VIS Face Recognition[J]. 2017.

[7] Drucker, Harris; Burges, Christopher J. C.; Kaufman, Linda; Smola, Alexander J.; and Vapnik, Vladimir N. (1997); "Support Vector Regression Machines", in Advances in Neural Information Processing Systems 9, NIPS 1996, 155–161, MIT Press..

[8] Guosheng Hu and Xiaojiang Peng, "Frankenstein: Learning deep face representations using small data", IEEE Transactions on Image Processing (2017).

[9] El Khiyari, Hachim, and Harry Wechsler, "Age Invariant Face Recognition Using Convolutional Neural Networks and Set Distances", Journal of Information Security 8, no. 03 (2017).

[10] C. Liu and H. Wechsler, “Independent component analysis of gabor features for face recognition,” IEEE transactions on Neural Networks, 2003.

[11] G. Donato, M. S. Bartlett, J. C. Hager, P. Ekman, and T. J. Sejnowski, “Classifying facial actions,” TPAMI, 1999.

[12] S. Jain, C. Hu, and J. K. Aggarwal, “Facial expression recognition with temporal modeling of shapes,” in ICCV Workshops,2011.

[13] M. F. Valstar, M. Mehu, B. Jiang, M. Pantic, and K. Scherer,“Meta-analysis of the first facial expression recognition challenge,” IEEE Transactions on Systems, Man, and Cybernetics,Part B (Cybernetics), 2012.

[14] T. R. Almaev and M. F. Valstar, “Local gabor binary patterns from three orthogonal planes for automatic facial expression recognition,” in ACII, 2013.

[15] W. Liu, C. Song, and Y. Wang, “Facial expression recognition based on discriminative dictionary learning,” in ICPR, 2012.

[16] L. Zhong, Q. Liu, P. Yang, B. Liu, J. Huang, and D. N. Metaxas, “Learning active facial patches for expression analysis,” in CVPR, 2012.

[17] L. Zhang, B. Fielding, P. Kinghorn, and K. Mistry, A Vision Enriched Intelligent Agent with Image Description Generation. In Proceedings of International Conference of Autonomous Agents and Multiagent Systems. Singapore, 2016.