

A Survey on Emotion Recognition Based on Face with Process and Various Techniques

Jaspreet Singh¹, Amitabh Sharma²

¹M.Tech (Scholar), ²Associate Professor

Department of Information Technology, Chandigarh Engineering Colleges, Landran

Abstract - Automatic facial expression detection scheme has several applications with, but not limited to, human behaviour understanding, detection of mental disorders, and synthetic human expressions. Human faces provide various information about emotions. As per psychological researcher, a person expresses his emotions less by verbal talk and more by nonverbal body posture and gestures. Emotion classification or Emotional Computing (AC) presence the AI connected area communicates intelligence to computers in recognizing human emotions. Recognition and extracting various emotions and then validating those emotions from the facial expressions have become important for improving the overall human computer interaction. This paper reviews the literature on different aspects like different theories of emotions, methods for studying different images in the databases, different action units like outer brow raisers where the frontals and pars medal's facial muscles are studied. The paper reviews comparative techniques for automatically recognizing facial actions in sequences of images. Facial Expression Recognition system is used in security. Facial Expression recognition system should be able to automatically detect a face in an image. This involves extracts its features and then recognize it, regardless of lighting, expression, illumination, ageing, transformations (translate, rotate and scale image) and pose, which is a difficult task. There are studies performed mainly on six basic emotions that include happy, sad, anger, fear, disgust, surprise. In this paper we present a literature survey on facial emotion recognition. This paper presents various methods of face expression recognition.

Keywords - Automatic Facial Expression, Affected Computing, Enhance Security and Technique in Facial Emotions.

I. INTRODUCTION

Human face is a very valuable and powerful basis of communicative info about human behaviour. It provides information about human personality, emotions and thoughts. Facial expression provides sensitive cues about emotional response and plays a major role in human interaction and nonverbal communications. One of the non-verbal communication method by which one understands the mood/mental state of a person is the expression of face (for e.g. happy, sad, fear, disgust, surprise and anger) [1]. Automatic facial expression recognition (FER) has become an interesting and challenging area for the computer vision field and its application areas are not limited to mental state

identification, security, automatic counselling systems, face expression synthesis, lie detection, music for mood, automated tutoring systems, operator fatigue detection etc. In 1994, Ekman found the evidence supporting the claim about universality of facial expressions or mimics which was speculated since Charles Darwin's "The expression of the emotions in man and animals". These universal facial expressions represent emotions such as happy, sad, anger, fear, surprise and disgust. Along with neutral emotion, facial expression sums up to seven universal emotional classes. Since then, interest in this type of interaction is been increasing [2]. Emotion recognition has been an increasingly popular research area topic in recent year. According to James-Lange Theory, actions precede emotions and the brain to interpret said actions as emotions. A situation occurs and then the brain interprets the situation, and causes a characteristic physiological response. This may include any or all of the following: heart rate elevation, perspiration, facial and gestural expression. These reflexive replies occur only earlier the person is conscious that he or she is experiencing an emotion or only when the brain cognitively assesses the physiology that is it labelled as an "emotion" [3].



Fig 1. The Seven Basic Emotions and their Universal Expressions

Facial expression analysis has wide range of applications in areas such as in social psychology, video conferencing, user profiling, image retrieval, psychological area, face animation etc. Facial expressions help organize discussion, and have considerably additional effect on whether a listener feels liked or disliked than the speaker's spoken words. Facial expressions have been studied by cognitive

psychologists, social psychologist, neurophysiologists, cognitive scientist and computer scientists. Computer vision based approaches to facial expression analysis discriminate among a small set of emotions [4].

II. RELATED WORK

Dayana Mathew et al.,2015 [5] has proposed an edge feature extraction method using neuronal threshold logic models to automatically recognise the facial expressions. The system is replicated at digital system level containing of interpretation an image followed up with edge extraction system that can be implemented with hybrid CMOS memristive digital circuits. The results indicate robust edges of the facial features and it's useful in development of real-time emotion recognizing digital chip. **Salwa Said, Olfa Jemai et al.,2015[6]** Face emotion recognition is one of the most important and rapidly advanced active research areas of computer science. A new method for facial expression recognition based on wavelet network classifier is proposed in this paper. It allows us the detection of six basic emotions other than the neutral one: (Joy, surprise, anger, sadness, fear and disgust) The process is composed of three principle steps : face detection, features extraction and classification. The effectiveness of our proposed algorithm is experimentally demonstrated by using well-known test database: the extended cohen-kanade database. **Mounira Hmayda, Ridha Ejbali et al.,2015[7]** presentED feeling recognition system based on Beta wavelet network using the Fast Wavelet Transform in order to improve the performance of this network. The proposed system can be summarized in two main steps: training stage & classification stage. Comparing with many algorithms which suffer from the low classification rates and the long executing time the rates given by our experimental results show the effectiveness of the FWT **Nattawat Chanthaphan et al.,2015[8]** the Facial Emotion Recognition Based on Facial Motion Stream generated by connect employing two kinds of facial features. The first one was just a simple distance value of each pair-wise coordinates packed into 153-dimensional feature vector per frame. The second one was derived from the first one based on Structured Streaming Skeleton approach and it became 765-dimensional feature vector per frame.

III. CHALLENGES IN FACIAL EXPRESSION RECOGNITION SYSTEM

It has already been specified that face expression recognition methods have always been a very stimulating task for researchers because of all difficulties and limitations. The challenges associated with face expression recognition can be attributed to following types:

- A. Pose:** The images of face changes due to relative camera face position such as frontal and non-frontal. Face may have a different angle so some of the facial features such as an eye or the nose may become partially or wholly occluded. To overawed this challenge riggings good pre-

processing methods which are invariant to translation, rotation and scaling.[9]



Fig 2. Face Different poses

- B. Occlusion:** Faces may be partially occluded by other objects. In an image if face is occlude by some other faces or objects such as mask, hair, glasses etc. For that image extraction of expression features are complex.



Fig 3. Occlusion Faces [10]

- C. Illumination:** If the pictures are occupied in different lights. Then appearance feature can be detected inaccurately and hence recognition rate of facial expression is low. This factor would typically make feature extraction more difficult. To recompense the variation of light in an input image, image pre-processing approaches like DCT normalization, Histogram Equalization, Rank Normalization can be applied before feature extraction.



Fig 4. Illumination Faces

IV. HUMAN RECOGNITION SYSTEM

The purpose of the paper is the recognition of different facial emotions that include happy, sad, angry, fear,

surprised, neutral. Humans are accomplished of creating thousands of facial actions during message that vary in complexity, intensity, and meaning. This paper analyses the limitations with system that is Emotion recognition using brain activity. In this paper by using an existing simulator 1, 97 per cent accurate results are acquired. This system depends upon human face as known that face also reflects the human brain activities or emotions. In this paper neural network has been used for better results [11].

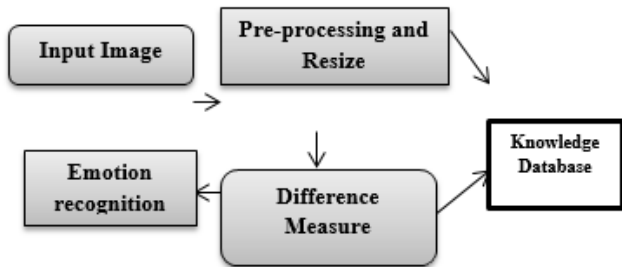


Fig 5. Emotion Recognition system work

V. SEVERAL FACIAL EMOTION RECOGNITION TECHNQUEIUS

Facial expression recognition consists of three main steps. In the first step face image is acquired and detect the face regions from the images and pre-processing the input image to obtain the images that have a normalised size or intensity. Next is expression features are extracted from the observed facial image or image sequence. Then removed topographies are given to the classifier and classifier delivers the recognized expression as output [12]. The input image can be represented in various ways. If face image can be represented as a whole unit then it is called holistic representation. If face copy can be represented as a set of topographies then it is named analytic representation. Face can also be represented as a combination of these two then is called hybrid approach. The structure / architecture diagram of facial expression recognition system is given in fig. 6.

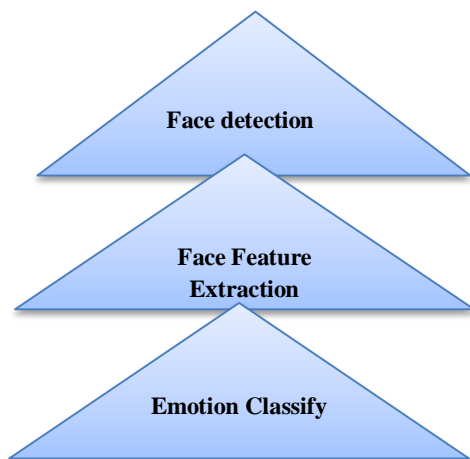


Fig 6. Recognition System

A. **Face Detection:** Face Detection is the process of localizing and extracting the face region from the background. It involves segmentation, extraction, and verification of faces as well as facial features from an uncontrolled background. It follows two different approaches: Emotion detection from still images and Emotion detection from images acquired from a video [13].

B. **Feature Extraction:** Facial feature extraction is the process of translating the input data into some set of features. Use of feature extraction can help reduce huge amount of data to a relatively small set which is computationally faster. It is influenced by many problems like difference in dissimilar pictures of the same facial expression, the light directions of imaging, and the variety of posture, size and angle. Even to the same people, the images taken in different surroundings may be unlike. There are two types of features that are usually used to describe facial expression:

- (i) Geometric Features and
- (ii) Analytic Features.[14]

Table 1: Types of Features

Geometry Features	Analytic Features
The topographies measure the movements of certain parts of the expression such as eyebrows or mouth corners.	The Features describe the change in face texture when particular action is performed such as wrinkles, bulges, forefront, regions surrounding the mouth and eyes.
The facial mechanisms or facial feature points remain removed to form a feature vector that represents the face geometry.	Image Filter are used applied to either the whole face or specific regions in a face image to extract a feature vector.
Feature measure i.e., connected with face region analysis.	Feature Measure i.e, covariance matrix, pattern recognition.

C. **Classification:** classification block which uses the features extracted from the previous block and tries to classify the features based on the similarities between the feature data. Classifiers like Artificial Neural Networks; linear classifiers etc. are generally used for this. After the set of features are extracted from the face region are used in classification stage. The set of topographies are accustomed label the facial expression. Organization fwants supervised training, so the training set should consist of labelled data. Once the classifier is trained, it can recognize input images by assigning them a particular class label.[15]

VI. CONCLUSION AND FUTURE SCOPE

In this paper we have presented various approaches for facial emotion recognition in the images. There are various techniques that are implemented for emotion recognition through image, whether it be a real time image or still image. There are various databases available for the purpose of emotion recognition. Human detect and identify faces and

facial expressions in a scene with little or no effort. Still, development of an automated system that accomplishes this task is rather difficult. Various methods have been made near robust facial expression recognition, smearing different image acquisition, and feature extraction, analysis and classification methods. This paper has briefly overviewed the methods of facial expression recognition. Feature extraction is important stage for expression recognition system because extracted feature are used for classification stage. Feature removal for expression credit using geometric features is additional difficult because it be contingent on the shape and sizes of features so appearance based features are easier to extract.

VII. REFERENCES

- [1]. Lörincz, L. A. Jeni, Z. Szabó, J. F. Cohn, and T. Kanade, 2013, "Emotional expression classification using time-series kernels", in Proceedings of the IEEE International Workshop on Analysis and Modelling of Faces and Gestures, Portland, Ore, USA, 2013, abs/1306.1913.
- [2]. Anderson K. & Peter W. McOwan (2006, February), "A Real-Time Automated System for the Recognition of Human Facial Expressions", IEEE Transactions on Systems, Man, and Cybernetics—Part B: Cybernetics, 36(1), 96-105.
- [3]. Sánchez, Daniela, and Patricia Melin. "Modular neural network with fuzzy integration and its optimization using genetic algorithms for human recognition based on iris, ear and voice biometrics." *Soft Computing for Recognition Based on Biometrics*. Springer Berlin Heidelberg, 2010. 85-102.
- [4]. Comparelli, A., Corigliano, V., De Carolis, A. et al, 2013, "Emotion recognition impairment is present early and is stable throughout the course of schizophrenia", *Schizophr Res.* 2013;143:65–69.
- [5]. Mathew, Dayana, Dinesh Sasi Kumar, and Alex Pappachen James. "Facial emotion recognising memristive threshold logic system." 2015 IEEE Recent Advances in Intelligent Computational Systems (RAICS). IEEE, 2015.
- [6]. Said, Salwa, et al. "Wavelet networks for facial emotion recognition." 2015 15th International Conference on Intelligent Systems Design and Applications (ISDA). IEEE, 2015.
- [7]. Hmayda, Mounira, Ridha Ejbali, and Mourad Zaid. "Facial emotions recognition based on wavelet network." 2015 15th International Conference on Intelligent Systems Design and Applications (ISDA). IEEE, 2015.
- [8]. Chanthaphan, Nattawat, et al. "Facial feeling recognition based on facial motion stream generated by Kinect." 2015 11th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS). IEEE, 2015.
- [9]. Kumari, Jyoti, R. Rajesh, and K. M. Pooja. "Facial expression recognition: A survey." *Procedia Computer Science* 58 (2015): 486-491.
- [10]. Fasel, Beat, and Juergen Luetttin. "Automatic facial expression analysis: a survey." *Pattern recognition* 36, no. 1 (2003): 259-275.
- [11]. Khatri, Nidhi N., Zankhana H. Shah, and Samip A. Patel. "Facial expression recognition: A survey." *International Journal of Computer Science and Information Technologies (IJCSIT)* 5, no. 1 (2014): 149-152.
- [12]. Mahto, S., and Y. Yadav. "A survey on various facial expression recognition techniques." *Int. J. Adv. Res. Electr., Electron. Instrum. Eng* 3 (2014): 13028-13031.
- [13]. Shukla, Prachi, and Sandeep Patil. "Survey Paper on Emotion Recognition.", *International Journal of Engineering and Applied Sciences (IJEAS)* ISSN: 2394-3661, Volume-3, Issue-2, February 2016.
- [14]. Sumathi, C. P., T. Santhanam, and M. Mahadevi. "Automatic facial expression analysis a survey." *International Journal of Computer Science and Engineering Survey* 3, no. 6 (2012): 47.
- [15]. Butalia MA, Ingle M, Kulkarni P. Facial expression recognition for security. *International Journal of Modern Engineering Research (IJMER)*, 2012;2:1449±1453.