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A Survey on Human Face Emotion Recognition Techniques

Ms.Uttama Suryavanshi[1], Mr. Soumya Mukherjee[2]

[1]M.Tech. Student, [2]Assistant Professo, Computer Sc. And Engg. Department, O.P.Jindal University

Abstract: Facial appearance assumes an imperative part in human association and correspondence since it contains basic and fundamental data with respect to feeling. The assignment of consequently perceiving distinctive Facial appearances in human-PC environment is huge and challenging. The human facial emotion recognition system catches notable application in regions like social communication and social intelligence like in dissimilar investigation systems, defense systems, authentication or corroboration of individual like delinquents etc... The human face can articulate emotion rather than people express or even comprehend their posture. Consequently, there is ostensible need of dependable recognition and recognition of human facial expressions. In this paper we have gone through different literature and tabular comparison carried out and we have verbalized the Face expression recognition technique as different stages and the survey is characterized accordingly.

Keywords: MLP; SVM; PCA; HMM; Facial Expressions

I. INTRODUCTION

Facial expression recognition has long been an actively researched topic in Human Computer Interaction(HCI) to plays a major role in human interaction and non-verbal communication. The ability to recognize and understand facial expression automatically may facilitate communication .Emotions have been described as discrete and reliable responses to interior and exterior events which have a particular significance fir the organism. Emotions are brief in duration and consist of responses which may include verbal, physiological, behavioural, and neural mechanisms. Facial Expressions also described as biological way given and a result of evolution they provide good solution to ancient and recurring problems that faces our ancestors.

Human correspondence has two principle perspectives; verbal (sound-related) and non-verbal (visual). Outward appearances are a critical segment of interpersonal correspondence. Notwithstanding their non-verbal nature, they pass on a considerable measure of data about the individual and the individual's full of feeling state, anticipation and identity. Especially for the acknowledgment of the full of feeling state, people depend intensely on investigating outward appearances. Facial appearances additionally bolster verbal correspondence because of their reciprocal nature to the acoustic side of the talked words. Not at all like people, can current PC frameworks barely perceive the full of feeling condition of a human client. The most recent decade has seen a pattern towards an undeniably pervasive registering environment, where overarching and ease calculation frameworks are being joined into autos, therapeutic instruments, cell phones and around each side of our life, which makes an enormous enthusiasm for programmed procedure of pictures and recordings in different applications, including human-PC communication, observation, biometric verification and mixed media administration. Advancement in programmed confront acknowledgment takes after actually. Confront acknowledgment is a visual example acknowledgment issue where a three-dimensional protest is to be recognized in light of its two-dimensional picture. As of late, the noteworthy advance has been made around there; inferable from better face models and all the more capable PCs, confront acknowledgment framework can accomplish great results under compelled circumstances. However in light of the fact that face pictures are affected by a few components: enlightenment, head posture, appearance etc, by and large conditions, confront acknowledgment is as yet difficult. From a PC vision perspective, among every one of these "commotions" outward appearance perhaps the hardest one as in expressions really change the three-dimensional question while different components, similar to position and light just influence imaging highlights. To get absolve of appearance clamor", above all else we need to guesstimate the presence of a picture; this is called Facial Expression Recognition".

The foremost concern of building a human facial expression recognition system is face detection & alignment, image normalization, feature extraction, and classification. There are various techniques which were used for identifying the facial expression. Some of the researchers presented the system which can recognize the dissimilar human gesture in color image.

Viola and Jones (2012) designates the face detection technique by the use of Add Boost Haar classifier. Subsequently performing the pre-processing over face image the recognition is accomplished, the simplicity and robustness of the system is significant. Consequently concluded that emotion detection system constitutes of four phases Pre-processing, Segmentation, Feature Extraction and Classification; to enhance the performance of existing system there need to opt better algorithms for above phases.

In next section of this paper we will discuss different kinds of literature, in section III we will elaborate phases of recognition system through a flow diagram, in section IV we discuss about problem identified over earlier system, in section V we provide the brief tabular comparison of different kinds of literature and will discuss about technique used for emotion recognition, and in the last section we will conclude our work.

II. LITERATURE SURVEY

S L Happy and Aurobinda Routra exhibited a computationally productive outward appearance acknowledgment framework for exact grouping of the six all-inclusive expressions. It explores the importance of various facial fixes in the acknowledgment of various outward appearances. All significant dynamic districts on face are removed which are in charge of the face distortion amid a look. The position and size of these dynamic locales are predefined. The framework examinations the dynamic fixes and decides the notable regions on face where the components are discriminative for various looks. Utilizing the appearance highlights from the striking patches, the framework plays out the one-against-one order assignment and decides the expression in light of larger part vote. Furthermore, a facial historic point identification technique is portrayed which distinguishes some facial focuses precisely with less computational cost. Expression acknowledgment is done utilizing the proposed milestone location strategy and additionally the as of late proposed CLM display in view of DRMF technique. In both cases, acknowledgment exactness is practically comparative, while the computational cost of the proposed learning free technique is essentially less. Promising results has been gotten by utilizing piece based LBP histogram elements of the remarkable patches. Broad tests has been completed on two outward appearance databases and the joined dataset. Examinations are directed utilizing different bandwidths of LBP histograms, uniform LBP and revolution invariant LBP features.

Mariusz Szwoch ,Paweł Pienia ln this paper an original approach was presented that enables to recognize emotions in real time using depth information only. The requirement of speeding up the recognition process enforced many compromises and the use of simple heuristic algorithms for depth image preprocessing, detection of user's face position and orientation, as well as recognition of user's emotions. Depending on the processing power and availability of other information channels it is possible to use more sophisticated algorithms at any of the processing pipeline levels, as well as fusing the results at any stage with results from other channels, such as RGB video, user's skeleton or physiological signals.

G.N.Matre, S.K.Shah have discussed the various techniques used in facial expression recognition. These methods are measured on the basis of recognition rate in which higher the recognition rate, provides better performance they are The tensor perceptual color framework has the highest recognition rate and has highest performance. The genetic property evolution framework for facial expressional system can be studied to suit the requirement of different security models such as criminal detection, governmental confidential security breaches etc.

H. Seyedarabi, Ali Aghagolzadeh, Sohrab Khanmohammadi, describes a facial expression recognition system, based on the facial features extracted from facial characteristic points in frontal image sequences. Selected facial feature points were automatically tracked using a cross-correlation based optical flow, and extracted feature vectors were used to classify expressions, using RBF neural networks and Fuzzy Inference System (FIS). Then recognition results from two classifiers were compared with each other. Success rates were about 91.6% using RBF and 89.1% using FIS classifiers .Comparing two systems shows that RBFN classifier acts better than FIS classifier and gives higher recognition rate but it takes more processing time and for the real time implementation FIS classifier preferred.

S. Agrawal, P. Khatri, S. Gupta works objective was to introduce the recent advances in face expression recognition and the associated areas in a manner that should be understandable even by the new researchers. In order to do so, surveyed at the various aspects of facial expression recognition in detail. The techniques used in past detect Human Facial expression and recognize them on the basis of accuracy and computational time and different algorithms. Some of them contain drawbacks in terms of recognition rate or timing. The most optimum recognition rate can be obtained though combination of given techniques, extract their features as per our need and final comparison will be done to find out the results. The success of implementation depends on pre-processing stage on the images because of illumination and feature extraction. Proper Static conditions must be applied to enhance them.

Ashwini Ann Varghese, J.P Cherian, J.J.kizhkkethottam discribe. Human emotion recognition relationship. The automatic recognition of emotions has been an active research of. Emotions are reflected from speech, hand and gestures of the body and through facial expressions. Emotion has a high importance of the interaction between human and machine communication. This paper describes the advances and the various approaches used for recognition of emotions. In this paper is to propose real time implementation of emotion recognition system Most of the real time issues can be improved by using this recognition system. The emotion recognition system can play a vital role in the real world applications such as HCI, humanoid robotics, security, games etc.

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Uzair Asad, Nirbhay Kaashyap,Shailendra N.Singh focused on, Feature Extraction, Feature Selection and Expression Classification. Facial Expression Recognition (FER) has a objective of this research work is to explore in Facial Expression Recognition domain to identified the different models that are being utilized for feature extraction, the methods used for feature selection process and the classifiers employed for the purpose of expression classification. We gathered all the data like the methods used in different publications and their main contribution in this field and assembled the information in a tabulated form. In this survey using Nearest Neighbour classifier with Euclidean distances was used in classification stage. contributions of the existing systems, And analysis of FER. Also the different methods applied does not include all parameters for the purpose of expression recognition and point out on standard databases like CK, CK+, BU-3DFE, JAFFE etc in which expressions were performed by trained actors.

Nathan aintrator, Daniel Reisfeld, YehezkelYeshurun This paper describes an approach to Automatic detection of the eyes and mouth is followed by a spatial normalization of the images. The classification of the normalized images is carried out by a hybrid Neural Network. The warping of the image using affine transformation such that the eyes and mouth are mapped to standard locations reduces variability between images, thus reducing the number of prototypes needed for training, and helps to overcome viewpoint variability. The use of neural network classification reduces dimensionality of image representation and improves recognition performance. The use of ensemble of networks improves recognition performance and reduces substitution error.

III. FACE EMOTION RECOGNITION SYSTEM

As we have discussed in introduction section face emotion recognition system constitutes of different phases as:
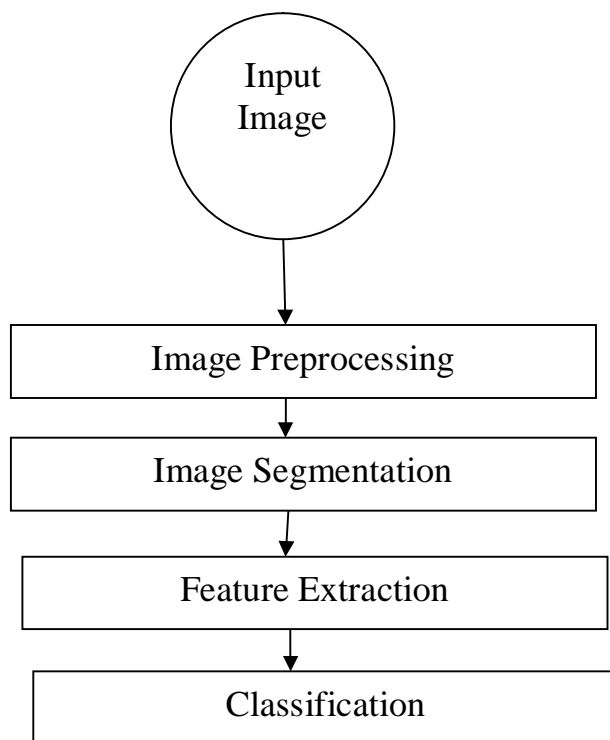

Fig. 1. Face Emotion Recognition System Phases

A. Image pre-processing

Convert the image into the desired resolution, PCA based de noising performed and thereafter in the next module the feature extraction will be performed. with segmentation, location, or tracking of face or its parts. In which the image local features can be well preserved after coefficient shrinkage in the PCA domain to remove the noise.

B. Image Segmentation

As explained in our proposed layout in our project we are using active contour model for segmentation. Active contour model gained popularity since then which represents an object boundary or some other salient image feature as a parametric curve.

C. Feature Extraction

For extraction using the PCA algorithm will generate the Eigen faces for each of the image and through these Eigen faces; the system will generated the Eigenvectors. These Eigen vector will be sent into next module for database training. converts pixel data into a higher-level representation of shape, motion, colour, texture, and spatial configuration of the face or its components. It can reduces the dimensionality of the input space. It is one or more motions or positions of the muscles beneath the skin of the face. These movements express the emotional state of the person to observers. It is a form of non-verbal communication.:

D. Classification

In this part following algo.Load the image set., Normalize image, Compute covariance matrix., Compute Eigen values of covariance matrix, Compute image decomposition coefficients, Reconstruction of Image, Compute Index of face to be reconstructed. ,Find similar faces by comparison Expression categorisation is performed by a classifier, which often consists of models of pattern distribution, coupled to a decision procedure.

JAFEE facial expression recognition database used by most the researchers for experimental evaluation.
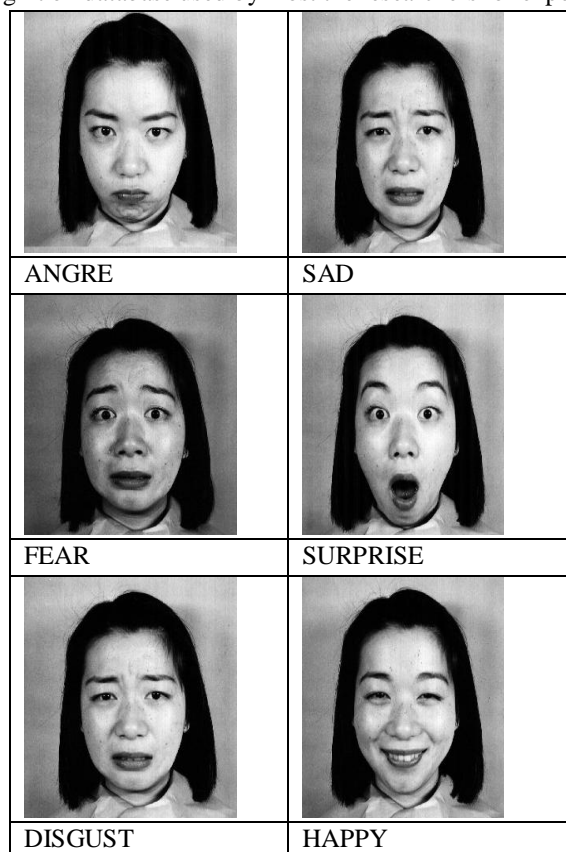

Fig. 3. JAFEE Database

IV. PROBLEM IDENTIFICATION

Numerous factors supply in conveying emotions of personality. Speech, Posture, facial expressions, activities and actions are some of them. From these above mentioned factors facial idiom have a higher implication since they are easily perceptible. In communication with others humans can recognize emotions of another human with considerable level of exactness. If we can professionally and effectively utilize hetero-fore found knowledge in computer science to find practical solution for automatic recognition of facial expression, we would be able to attain accuracy that is virtually comparable to the human perception. To obtain better result, some researchers have constrained their approaches by either using less feature points or by using neural image of the person in the expression classification phase. If we can address this problem from an identified set of critical feature points and use straightforward feature detection techniques the overall performance can be augmented.

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Recent improvement in this area have encouraged the researches to extend the applicability of facial expression recognition to areas like chat room avatar. Suspect detected system and intelligent improvement system meant for children with brain development disorders are some other beneficiaries. The task of automatically recognizing different facial expressions in human-computer environment is significant and challenging.

As we have seen image preprocessing and segmentation is primary step for recognition hence it is vital to put some efficient technique for the same. We can conclude some problem or how we can improve the performance of earlier system.

A. Requires better preprocessing technique unlike technique used for noise removal etc.
B. Efficient segmentation algorithm can improve the accuracy for instance better dimensionality reduction algorithm applied on input image will be much beneficial for feature extraction.
C. Efficient feature extraction technique require which will improve the accuracy of classification phase of emotion recognition system.

V. TECHNIQUES USED FOR FACIAL EXPRESSION RECOGNITION

There are unalike face emotion recognition techniques that smear commonly to the fore faces. This section gives an summary of all these techniques. The methods which are used for the face recognition includes hidden Markov model(HMM), eigenfaces, neural networks, geometrical feature matching, Principal Component Analysis (PCA),Support Vector Machine(SVM).

Principal Component Analysis (PCA) The main idea of PCA is to reduce the dimensionality of a data set consisting of many variables correlated with each other, either heavily or lightly, while retaining the variation present in the dataset, up to the maximum extent and the Eigen face approach is popular methods for facial expression recognition. It characterizes geometry of face. Face can be easily reconstructed by using Eigen faces. Inactive stochastic modelling that depends on HMM is an ideal approach for speech applications. A HMM is a statistical model in which the system being model is assumed to be a process with unobserved (hidden) states, which control the mixture component to be selected for each observation. HMM is learnt for each emotion category, each of which can learn facial expression dynamics for that emotion category . To train a HMM for an emotion type, the sequence of topics for all the sequences in the training data set corresponding to that emotion category

Geometrical feature matching techniques works on the calculation of a set of geometrical features from the picture of a face. The complete configuration can be depicted with the help of a vector which provides help in the representation of position and size of the main facial features. The main facial features are such as eyes, eyebrows, nose, mouth, & the shape of face outline. Every geographical element (river, road, contour line and so on) has innate geometric features and these geometric features can be represented by the geometric data which are also called as the coordinates. The main goal of this method is to find a set of representative features of geometric form to represent an object by collecting geometric features from images and learning them using efficient methods.

Literature	Algorithm Used	Recognition Performance
S.L. Happy	Using a Hybrid feature vevtor,PHOG,LBP,SVM.	Comparatively slight deprivation in recognition under partial face occlusion.
Mariusz Szwoch ,Paweł Pienia	Using simple heuristic Algo.,FEEDB,ICP,AU	63%
G.N.Matre, S.K.Shah	Fisher's Linear Discriminant, PCA, Multilinear Image Analysis Color Subspace Linear Discriminant Analysis Gaussian mixture model	85%
YUZheng-hong, LICong	A number of techniques have been proposed in this field are used which include ASM,SVM,JAFFEE database	91%
Uzair Asad, Nirbhay Kaashyap,Shailendra	Nearest Neighbor Classifier, standard databases CK, CK+, BU-3DFE, JAFFE	91%
Carlos	Using Gaussian mixture model ,RBF,PCA and Euclidean and a Mahalanobis based classifiers.	98%

Table 1. Comparison of Literature

VI. CONCLUSION

This paper introduces an abnormal state review of facial expression recognition; it highlights the primary framework parts and some exploration challenges. This work gave a system to facial expression recognition that can successfully boost data accumulated about the feeling change and minimize the effect of individual personality. Analyze comes about uncover that acknowledgment execution shifts for various neural system methods for expression arrangement. So we can take best component extraction parameter and neural system strategy for expression arrangement technique to expand Recognition precision. As we have seen image preprocessing and segmentation is primary step for recognition hence it is vital to put some efficient technique for the same.

VII.ACKNOWLEDGMENT

REFERENCES

[1] F. Bourel, C.C. Chibelushi, A.A. Low, "Robust Facial Expression Recognition Using a State-Based Model of Spatially-Localised Facial Dynamics", Proc. Fifth IEEE Int. Conf. Automatic Face and Gesture Recognition, pp. 106-111, 2002.

[2] F. Bourel, Models of Spatially-Localised Facial Dynamics for Robust Expression Recognition, Ph.D. Thesis, Staffordshire University, 2002

[3] V. Bruce, "What the Human Face Tells the Human Mind: Some Challenges for the Robot-Human Interface", Proc. IEEE Int. Workshop Robot and Human Communication, pp. 44-51, 1992

[4] A.K. Jain, R.P.W. Duin, J. Mao, "Statistical Pattern Recognition: A Review", IEEE Trans. Pattern Analysis and Machine Intelligence, Vol. 22, No. 1, pp. 4-37, 2000

[5] J.J. Lien, T. Kanade, J.F. Cohn, C-C. Li, "Automated Facial Expression Recognition Based on FACS Action Units", Proc. Third IEEE Int. Conf. Automatic Face and Gesture Recognition, pp. 390-395, 1998

[6] M. Pantic, L.J.M. Rothkrantz, "An Expert System for Multiple Emotional Classification of Facial Expressions", Proc. 11th IEEE Int. Conf. on Tools with Artificial Intelligence, pp. 113-120, 1999

[7] A.K. Jain, R.P.W. Duin, J. Mao, "Statistical Pattern Recognition: A Review", IEEE Trans. Pattern Analysis and Machine Intelligence, Vol. 22, No. 1, pp. 4-37, 2

[8] Philipp Michel and Rana El Kaliouby " Facial Expression Recognition Using Support Vector Machines "

[9] Claude C. Chibelushi ,Fabrice Bourel, " Facial Expression Recognition :A Brief Tutorial Overview" 2002

[10] Ashutosh Saxena, AnkitAnand, Prof. Amitabha Mukerjee "Robust Facial Expression Recognition Using Spatially Localized Geometric Model." 2004 pp-124-129

[11] Praseeda Lekshmi.V Dr.M.Sasikumar "RBF Based Face Recognition and Expression Analysis " 2008, pp- 559-562

[12] Alex Graves, J¨urgenSchmidhuberChristoph Mayer, Matthias Wimmer, Bernd Radig "Facial Expression Recognition with Recurrent Neural Networks." 2008.

[13] Caifeng Shan, Shaogang Gong , Peter W. McOwan "Facial expression recognition based on Local Binary Patterns: A comprehensive study. " 2009.

[14] Pushpaja V. Saudagare, D.S. Chaudhar "Facial Expression Recognition using Neural Network –An Overview " 2012.

[15] Neha, Deepti Jaglan "A Literature Review: Various Facial Expression" Journal of Network Communications and Emerging Technologies (JNCET) Volume 7, Issue 5, May 2017

[16] S L Happy and Aurobinda Routray "Robust Facial Expression Classification Using Shape and Appearance Features " IEEE, 2015

[17] Shaohua Wann, J.K. Aggarwal "Spontaneous facial expression recognition: A robust metric learning approach" ELSEVIER ,2014 ,Pattern Recognition 47 ,1859-1868.

[18] Ying-li Tian, Takeo Kanade and Jeffrey F. Cohn," Recognizing Action Units for Facial Expression Analysis" IEEE, Transactions On Pattern Analysis and Machine Intelligence VOL. 23, NO. 2, February 2001.

[19] Victor-Email Neagoe, Adrian-Dumitru Ciotec" Subject-Independent Emotion Recognition from Facial Expressions using a Gabor Feature RBF Neural Classifier Trained with Virtual Samples Generated by Concurrent Self-Organizing Maps " Recent Advances in Signal Processing, Computational Geometry and Systems Theory ISBN: 978-1-61804-027-5,pp - 266-271

[20] Uzair Asad , Nirbhay Kashyap, Shailendra Narayan Singh" Recent Advancements in Facial Expression Recognition Systems: A Survey" IEEE, ICCCA 2017, pp-1203-1208.

[21] G. N. Matre, S. K. Shah "Facial Expression Detection" IEEE International Conference on Computational Intelligence and Computing Research 2013.

[22] Samiksha Agrawal, Pallavi Khatri, Shashikant Gupta," FACIAL EXPRESSION RECOGNITION TECHNIQUES: A SURVEY", International Journal of Advances in Electronics and Computer Science, ISSN: 2393-2835 Volume-2, Issue-1, Jan.-2015

[23] Ashwini Ann Varghese, J.P Cherian, J.J.kizhkkethottam" Overview on Emotion Recognition System", 2015 International Conference on Soft-Computing and Network Security (ICSNS -2015), Feb. 25 – 27, 2015, Coimbatore, INDIA

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