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RESEARCH ARTICLE

Recent Advances in Facial Recognition Analysis

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ABSTRACT : ***Facial expression recognition has attracted significant interest in the scientific community due to its importance for human centered interfaces. In recent years, considerable progress has been made in the area of face recognition with the development of many techniques. Applications include border security systems, forensics, virtual reality, computer games, robotics, machine vision, video conferencing, user profiling for customer satisfaction, broadcasting and web services. Various methods have been proposed for automatic recognition of facial expression in the past several decades, In general all the face recognition algorithms uses any one or the combinations of the features namely shape, texture, color, or intensity to represent the facial image structure. There are six universally recognized expressions viz. Angry, Disgust, Fear, Happy, Sad and Surprised. There have been several advances in the past few years in terms of face detection and tracking, feature extraction mechanisms and the techniques used for expression classification. This paper surveys some of the published work since till date.***

Keywords - Feature Selection; Genetic Algorithm; human-computer interaction; Particle Swarm Optimization; Intelligence

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I. INTRODUCTION

Humans are capable of producing thousands of facial actions during communication that vary in complexity, intensity and meaning. Emotion or intention is often communicated by subtle changes in one or several discrete features. In the simplest form, facial expressions can indicate whether a person is happy or angry. More subtly, expressions can provide either conscious or subconscious feedback from listener to speaker to indicate understanding or doubts toward what the speaker is saying. *Expression recognition* is the task of learning the appearance of an expression from a set of facial expression videos and then classifying the expression in a previously unseen video. It is a desirable feature of the next generation human-computer interfaces. Computers that can recognize facial expressions and respond to the emotions of humans accordingly enable better human-machine communication.

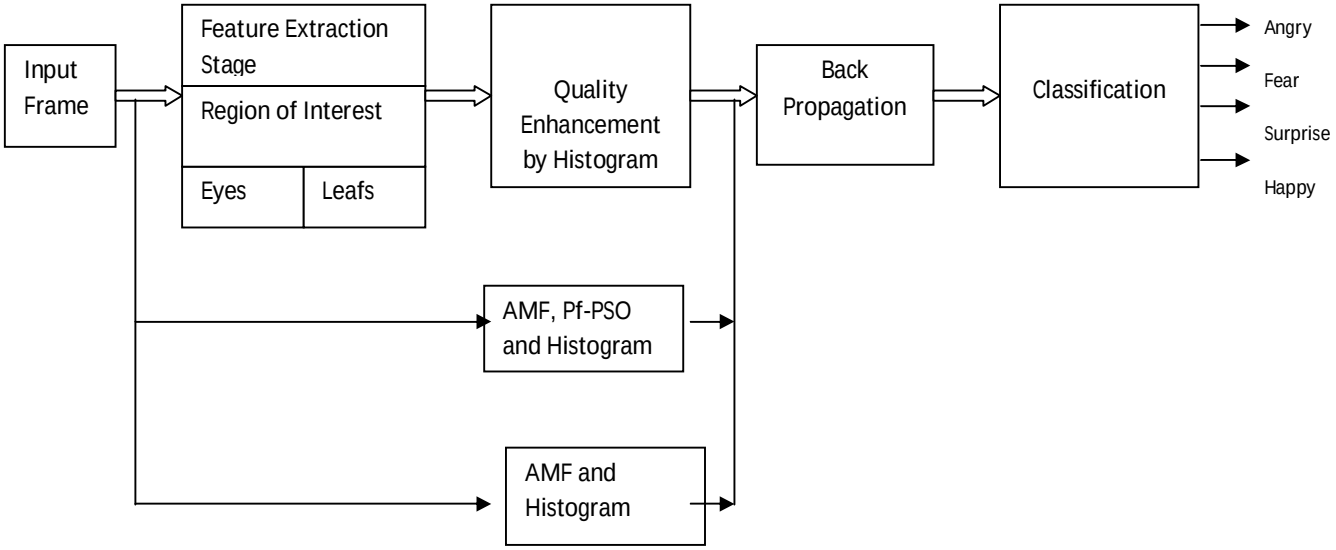

Fig.1 Implementation Overview of Facial Expression Recognition System

Human beings interact with one another not only using verbal languages but also using nonverbal methods such as gestures and facial expressions or emotions. Recently, a lot of research effort has been extended towards improving human-computer interaction so that computers can also have the intelligence to perceive the emotional state of a human and react accordingly. There are several applications that can be derived from such technology. For example, intelligent mechanisms, such as robots could be developed to assist bed-ridden and highly disabled people who are confined to a room in their houses. This is important given the present modern life style where the population of children is declining, the middle-aged are getting busier with work schedules and where the senior citizens and the disabled are increasingly being left to fend for themselves. Thus, in such circumstances, the development of welfare robots that are able to perceive emotions and act accordingly could be a means of providing support and comfort to the senior citizens and the disabled for the rest of their lives. Facial expressions are the facial changes in response to a person's internal emotional states, intentions, or social communications facial expression analysis refers to computer systems that attempt to automatically analyze and recognize facial motions and facial feature changes from visual information. Sometimes the facial expression analysis has been confused with emotion analysis in the computer vision domain. For emotion analysis, higher level knowledge is required[2].

II. FACIAL EXPRESSION RECOGNITION IN IMAGE PROCESSING

The design and implementation of the facial Expression Recognition System can be subdivided into three main parts. The first part is image processing and second part is a recognition technique which includes training of the images and the third part is testing. The first part consists of several image processing technique. Firstly noisy face's image acquisition is achieved by scanner or from JAFFE database. These images are added with salt and pepper noise from noise density of 10% to 90%. Adaptive Median Filter followed by Particle Swarm Optimization known as Swarm technique is used to remove salt and pepper noise. Then finally features are extracted the region of interest is eye and lips, eyes or lips are clipped .These extracted features of image are then fed into Back-propagation Neural Network for training In the second part Back-propagation Neural Network is used. Neural Network is used for classification of expression. In the proposed research work, five emotions namely angry, fear, happy, sad along with neutral can be considered. The region of interest like eyes, lips as well as eyes and lips are combine selected through the mouse.

Facial expression analysis deals with analysis of different facial motion changes by extraction of facial parameters. A typical system extracts number of facial parameters from an image, and classifies the image into the set of defined expressions. There are six universally recognized expressions viz. Angry, Disgust, Fear, Happy, Sad and Surprised.

- **EMOTIONS**

Discrete emotion theorists have identified six basic emotions that are universally expressed and recognized independently from cultural background. These include happiness, anger, sadness, surprise, disgust and fear. When compared to the many other possible expressions, these six are the easiest to recognize.

1.Disgust 2. Fear 3.Joy

4. Surprise 5. Sadness 6. Anger

Figure2:Emotion Specified Facial Expressions

Apart from the six basic emotions, the human face is capable of displaying expressions for a variety of other emotions which is broadly classified into primary secondary and tertiary[3].

III. NEED FOR FACIAL EXPRESSION RECOGNITION SYSTEM

A key challenge in face expression recognition system is achieving optimal preprocessing, feature extraction or selection, and classification, particularly under conditions of input data variability. To attain successful recognition performance, most current expression recognition approaches require some control over the imaging conditions. The controlled imaging conditions typically cover the following aspects[3].

1. View or pose of the head, as it can result in wide variability of image views. Further research is needed into transformation-invariant expression recognition.

2. Environment clutter and illumination. Complex image background pattern, occlusion, and uncontrolled lighting have a potentially negative effect on recognition.

3. Miscellaneous sources of facial variability. Facial characteristics display a high degree of variability due to a number of factors, such as differences across people arising from age, illness, gender, or race, growth or shaving of beards or facial hair, make-up, blending of several expressions, and superposition of speech-related (articulator) facial deformation onto affective deformation. The controlling of imaging conditions is important for the widespread deployment of expression recognition systems, because many real-world applications require operational flexibility.

IV. LITERATURE SURVEY

Literature survey consist of Recent Advances in Facial Recognition are as follows. There are number of researchers dealing with the automatic facial feature tracking and facial expression recognition problem and stress is laid for some remarkable studies to summarize the ongoing scientific research in these areas.

An artificial neural network is a non linear and adaptive mathematical module inspired by the working of a human brain. It consists of simple neuron elements operating in parallel and communicating with each other through weighted interconnections Neural Networks are used for automated Facial Expression Recognition System [1]. A method using RBFN and MLP has been described. They used point contour method to obtain the features of the eyes, mouth and eyebrows.

The best classifier such as Radial Basis Function Neural Networks are used Face Recognition instead of simple neural network . Principal Component Analysis is used to extract the face features and then Fishers Linear Discriminate technique to further process the features and then for training RBF Neural Network is used for classification [2].

The images are decomposed and then Neural Networks are used Human Face Recognition. Singular value decomposition as images and back propagation is used as its classifier [3]. SVD Based Algorithm is performed well for Robust Face and Object Recognition which is suitable for Robot Vision Applications. Performance Comparison of different algorithm has been made in JAFFE database for Facial Expression Recognition [5].

A Neural Network Based Gabor Wavelets present a method to analyze Facial Expression from images by applying Gabor Wavelet Transform and Discrete Cosine Transform on face images then RBF neural network is used for classification.

Since 1960's Genetic Algorithm (GA) has proved its dominant role in the optimization world. Genetic Algorithm and Back Propagation Neural Network is combining used for Face Recognition. Median filters to images and then genetic algorithm is used for the region of eyes and lips then neural networks are used for classification[1].

An Iterative approach [11] is used for the extraction of mouth for identification the expressions of the students to recognize their comprehension from the facial expression in static images containing the frontal view of the face

Combined Global and Local Preserving Features (CGLPF) algorithm along with other existing conventional algorithms under different types of noises such as Gaussian noise, speckle noise, salt and pepper noise and quantization noise are is for Facial Expression Recognition The extraction of eyes is done for identification of the expressions of the students to recognize their comprehension in static images containing the frontal view of the face is used From the past surveys (and this one), we can see that different research groups have focused on addressing different aspects of the above mentioned points. For example, some have worked on recognizing spontaneous expression, some on recognizing expressions in the presence of occlusions; some have developed systems that are robust against lighting and resolution and so on. However going forward, researchers need to integrate all of these ideas together and build systems that can tend towards being ideal.

V. COMPARISON OF DIFFERENT ALGORITHMS

It consists of comparison of genetic algorithm and particle swarm optimization algorithm with respect to their outputs.

5.1 Introduction

Particle Swarm Optimization (PSO) is a relatively recent heuristic search method whose mechanics are inspired by the swarming or collaborative behavior of biological populations.PSO is similar to the Genetic Algorithm (GA) in the sense that these two evolutionary heuristics are population-based search methods. In other words, PSO and the GA move from a set of points (population) to another set of points in a single iteration with likely improvement using a combination of deterministic and probabilistic rules. The drawback of the GA is its expensive computational cost.

5.2 Particle Swarm Optimization

PSO proposed by Dr. Eberhart and Dr. Kennedy in 1995 is a computational paradigm based on the idea of collaborative behavior and swarming in biological populations inspired by the social behavior of bird flocking or fish schoolingPSO simulates the behaviors of bird flocking. Suppose the following scenario: a group of birds are randomly searching food in an area. There is only one piece of food in the area being searched.

All the birds do not know where the food is. But they know how far the food is in each iteration. So what's the best strategy to find the food? The effective one is to follow the bird which is nearest to the food. PSO learned from the scenario and used it to solve the optimization problems. In PSO, each single solution is a "bird" in the search space. We call it "particle". All of particles have fitness values which are evaluated by the fitness function to be optimized, and have velocities which direct the flying of the particles. The particles fly through the problem space by following the current optimum particles. PSO is initialized with a group of random particles (solutions) and then searches for optimal by updating generations. In every iteration, each particle is updated by following two "best" values. The first one is the best solution (fitness) it has achieved so far. (The fitness value is also stored.) This value is called pbest. Another "best" value that is tracked by the 271 particle swarm optimization is the best value, obtained so far by any particle in the population. This best value is a global best and called gbest. When a particle takes part of the population as its topological neighbors, the best value is a local best and is called lbest. After finding the two

best values, the particle updates its velocity and positions with different equation[3].Recently PSO has been applied as an effective optimizer in many domains such as training artificial neural networks, linear constrained function optimization, wireless network optimization, data clustering, and many other areas where GA can be applied [3]. Computation in PSO is based on a population (swarm) of processing elements called particles in which each particle represent a candidate solution. PSO shares many similarities with evolutionary computation techniques such as GA's.

VI. DATABASE

One of the most important aspects of developing any new recognition or detection system is the choice of the database that will be used for testing the new system. If a common database is used by all the researchers, then testing the new system, comparing it with the other state of the art systems and benchmarking the performance becomes a very easy and straightforward job. However, building such a 'common' database that can satisfy the various requirements of the problem domain and become a standard for future research is a difficult and challenging task. With respect to face recognition, this problem is close to being solved with the development of the FERET Face Database which has become a de-facto standard for testing face recognition systems. However the problem of a standardized database for face expression recognition is still an open problem. But when compared to the databases that were available when the previous surveys were written, significant progress has been made in developing standardized expression databases[2].

When compared to face recognition, face expression recognition poses a very unique challenge in terms of building a standardized database. This challenge is due to the fact that expressions can be posed or spontaneous. As we have seen in the previous sections, there is a huge volume of literature in psychology that states that posed and spontaneous expressions are very different in their characteristics, temporal dynamics and timings. Thus, with the shifting focus of the research community from posed to spontaneous expression recognition, a standardized training and testing database is required that contains images and video sequences(at different resolutions) of people displaying spontaneous expressions under different conditions (lighting conditions, occlusions, head rotations, etc)[2].

VII. CONCLUSION

This papers aim was to introduce the recent advances in face expression recognition.. In order to do so, we have looked at the various aspects of face expression recognition in detail. Let us now summarize: We started with a time-line view of the various works on expression recognition. We saw some applications that have been implemented and other possible areas where automatic expression recognition can be applied. Then we looked at some notes on emotions, expressions and features followed by the characteristics of an ideal system. We then saw the recent advances in face detectors and trackers.

REFERENCES

[1] Meng Joo,Shiqian Wu,Juwei Lu,Hock Lye Toh(2002), "Face Recognition with Radial Basis Function Neural Networks", IEEE Transactions on Neural Networks, Vol. 13,No.3.

[2] Frank.y.Shih,Chao-fa Chuang(2008), "Performance Comparison of Facial Expression Recognition in JAFFE database". International Journal of Pattern Recognition and Artificial Intelligence Vol.22,No.3

[3] Rabob M. Ramadan and Rehab F. Abdel- Kader(2009),"Face Recognition using Particle Swarm Optimization-Based Selected features", International Journal of Signal Processing ,Image Processing and Pattern Recognition,Vol.2,No.2.

[4] Bashir Mohammed Ghandi, Ramachandran Nagarayans Hazry Desa(2009),"Classification of Facial Emotions using Guided Particale Swarm Optimization-1"'International Journal of Computer and communication Technology,Vol. 1.

[5] G.Sofia ,M. Mohamed Sathik ,(2010)"An Iterative approach For Mouth Extraction In Facial Expression Recognition", Proceedings of the Int. Conf. on Information Science and Applications ICISA 2010 6 February 2010, Chennai, India.

[6] Ruba Soundar Kathavarayan and Murugesan Karuppasamy,(2010)"Preserving Global and Local Features for Robust Face Recognition under Various Noisy Environments" , International Journal of Image Processing (IJIP) Volume(3), Issue(6)

[7] Ramesha K, K B Raja, Venugopal K R and L M Patnaik(2010), "Feature Extraction based Face Recognition, Gender and Age Classification", International Journal on Computer Science and Engineering, Vol. 02, No.01S, 2010, 14-23

