



A Survey on Facial Expression Reorganization from Video

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Abstract— Now a day's Facial Expression Recognition field is growing and playing important role in communication. Facial expression recognition is a prototype where both humans and computer underperforms. It has great significance for the classification of video based management and video retrieval. It may be using in behaviour science and psychologist. There are many methods which is used to recognized facial expression. In this article, we present some method/techniques such as Principal Component Analysis (PCA), Linear Discriminate Analysis (LDA), Gabor Filter/Energy, Line Edge Mapping (LEM), Neural Network, and Independent Component Analysis (ICA) which will used to recognize human expression.

Keywords— Facial Expression, Facial Acquisition, Face Detection, Facial Extraction, Expression Recognition.

I. INTRODUCTION

Facial Expression Recognition is dynamic research area in computer science, Artificial Intelligence and computer vision. Recognizing facial expression is complex task and there are several limitations such as lighting condition, Age, similar each type expression. Facial Expression communicate nonverbal inters actions. Facial expressions can play an important role wherever humans interact with machines. Ekman and Friesen [1] represent 6 basic face expressions, show in figure 1, which are Happy, Surprise, Disgust, Sad, Angry, Fear [1].



Figure 1: Six Basic Human Expressions [1].

Smart Devices like computer, robots can understand the human's intension from their expression then it will helpful to the system to help them by giving suggestions. In this paper we described techniques which are used for recognizing facial expression from any types of dataset.

Facial Expression Recognition from videos process divided into three major steps firstly image frame extract from video then processing for future step which is feature extraction from facial expression for that various techniques used then finally classifier used for classifying different expression.

II. FACIAL EXPRESSION RECOGNITION

Facial Expression Recognition steps are divided into mainly three parts

- 1) Facial Acquisition
- 2) Facial Expression Extraction
- 3) Expression Recognition

Face Acquisition is preprocessed in which face will be detected from the input image. The facial acquisition is detecting faces from input images or first frame.

Once the face is to be found then the features are extracted to identify the expression of human faces. Facial Expression is classified into two types 1) Geometric features and 2) Appearance features.

1) **Geometric Features:** In this feature there are some kind of feature which are always present on face but wrapped due to some expression that are eyes, eyebrows, mouth, tissue, textures, nose. Feature vector which is extracting from facial feature points are representing facial geometry.

2) **Appearance Features:** Some facial feature which is hidden in expression will be detected in this process. For such method Gabor filter is applied. That type of filter applied on whole face or some kind of area and calculating feature vector. Facial Expression Recognition is recognized based on the action units (AU).

Figure 2[5] is represent how the Facial Expression Recognition done?

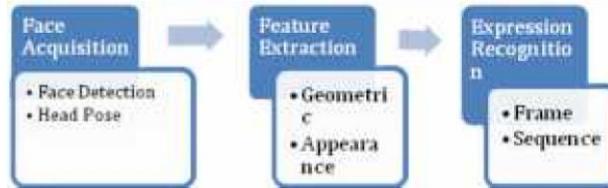


Figure 2: Step of Facial Expression Recognition [5].

1) **Facial Acquisition:**

There are mainly two types of method to detect faces form frontal and near frontal view of images. Two methods are face detection and head pose estimation.

1.1 **Face Detection:** There are many type of method to detect the face. We had use Viola-John algorithm which gives good effective output. There are some kind of approaches use to detect the faces like top-down model, bottom-up model, texture-base model, neural network approach, color-based model, and motion-based model approaches.

1.2 **Head Pose Estimation:** The head is identified using the smoothed outline of the foreground object as a segment using background subtraction and computing the negative curvature minima (NCM) points of the outline.

2) **Facial Expression Extraction:**

The extraction of facial feature is classified into two types that are Geometric feature and Appearance feature. There are two kind of extracting feature which is identifying based on facial deformation and motion. Facial deformation recognizing feature form Action Units and classified into different types of emotions. This Extraction will be applied into facial images or image sequences. Motion based feature is depending on different type of frames and that frames are emotionally correlated with each other. Image based models which are extracting features from images. Model based features are characteristically shape or texture models. Motion extraction techniques used methods are feature point tracking from difference images. The Various techniques in facial expression extraction methods are presented into following table [7].

Table 1: Facial Expression Extraction Methods [7].

Extraction	Geometric Feature	Appearance Feature
Deformation Image Based	Gabor Filter	Local Gabor Filter Bank, Fisher's Liner Decomposition, Singular value decomposition
Deformation Model Based	Point Distribution Model	Feature point tracking.
Motion Frame Based	Active contour	Gabor Filter Bank
Motion Sequence Based	PCA, Gabor Filter Bank & AdaBoost.	Haar like feature, Multimodal facial feature tracking, Candid Grid Node.

2.1 **Geometric Feature Extraction and Appearance Feature Extraction:** Geometric Extraction is used to detect and track changes of facial components from facial images. Figure3 [3] shows how geometric extraction and appearance extraction work? As per Model based, Active Appearance Model mapping the geometric feature of initial frame then that feature vector will be mapped to different emotional frames. In Image sequence, the facial region and appropriable facial feature are detected from initial frame automatically then after feature changes are detected from image sequences.

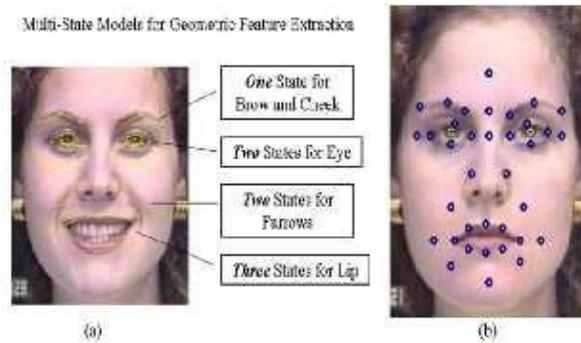


Figure 3: (a) Multistate models for geometric feature extraction and (b) Locations for calculating appearance features. [3] Gabor filter is linear filter which is used to extract the facial feature. Gabor filter values frequency and orientation gives human visual extraction. Gabor filter parameters wavelength, orientation, phase offset, aspect ratio and bandwidth are calculated and result will be display in below figure 4 with different values of parameter.

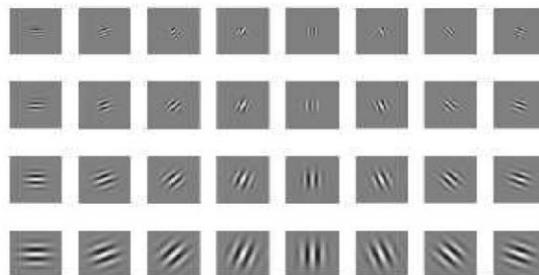


Figure 4: Gabor filter result of different parameter values.

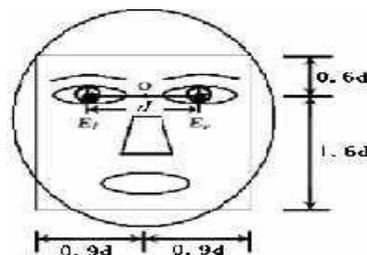


Figure 5: Facial Feature [8].

As shown in figure 5, Firstly Gabor filter is detecting facial feature like eyes, lips and nose then after locating and cropping facial feature using rectangle model. Haar-like features, facial feature tracking methods are used to track the facial feature.

3) EXPRESSION RECOGNITION

There are two classifier for expression recognition, Frame based and Sequence based expression recognition. Frame based expression recognition use information from the current frame. Input images are static or image sequences. There is some classifier used to recognize different emotion like neural network, support vector machine, linear discriminate analysis. Sequences based extraction recognition stored temporary information from image sequences. HMM, recurrent neural network such type of classifier used in sequence based recognition. Table 2[4], shows the methods for feature extraction recognition.

Table 2: Feature extraction recognition method [4].

Techniques	Method
Frame based	PCA plus LDA, Multistream Hidden Markov Models, Neural Network, SVM & Adaboost, PCA & ANN
Sequence based	SVM, Fussy Neural Network, Adaboost, HMM, Genetic algorithm

III. RESULT

As we survey some paper we get the following table 3.

Table 3: Analysis of papers.

Sr. No.	Author Name	Year	Extraction Method	Classifier	Result
1	Ketkipatil, Prof S D Giripujem, Dr. Preety Bajaj	2010	Gabor Filter	Neural Network	96.2%
2	Ruchir Srivastava, Sujoy Roy, Shuicheng Yan and Terence Sim	2009	AMI & PHOG	SVM	79%
3	Laszlo A. Jeni, Daniel Takacs, AndrasLorincz	2011	AAM & CLM	SVM	86.7%
4	Sander Koelstra,studentmember IEEE,Maja Pantic,Senior Member,IEEE,oannis Patras,memberIEEE	2010	Quad tree Decomposition	Hidden Markov model	94.3%
5	Irene Kotsia and Ioannis Pitas, Senior Member, IEEE	2010	Local Gabor filter	PCA+LDA	97.3%
6	VarshaSarawagi, K.V. Arya	2013	LBP+ASM	SVM	94.2%
7	Guoying Zhao,Matti Pretikainen	2009	Adaboost	Boosted Multi resolution spatial temporal descriptors	93.8%

IV. CONCLUSIONS

In this paper, by observing some techniques which is shown above table like SVM, Neural network, PCA, LBP, Gabor filter for facial expression recognition on the bases of efficiency and time complexity. Above all the techniques are useful for recognize emotion of human face for any database and it will give effective result. Some techniques has time consuming drawback and some have weak result. So, according to that method will be choosing for better emotion recognition.

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