

A Recent Survey and Problem on Facial Expression Recognition using Pattern Analysis and Machine Intelligence

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Abstract

Emotions play an important role in viewer's content selection and consumption. When a user watches video clips or listens to music experience certain feelings and emotions which manifest through bodily and physiological cues, pupil dilation and contraction, facial expressions, frowning, and changes in vocal features, laughter. In order to translate a user's bodily and behavioral reactions to emotions and emotion assessment techniques are required. Emotion assessment is a task even users are not always able to express their emotion with words all the time and the self-reporting emotions have a high probability of false emotions. In this research the emotion of the users are used to characterize the image and to arrange them accordingly. The emotion of the user is recognized with the captured image and the features extracted from them. The features extracted from the image will be quantified and will be used as training set for the pattern recognizing neural network. The trained neural network in future will classify the images according to the emotions expressed by the person.

Facial expressions are recognised by the humans, virtually without effort or delay. But automatic expression recognition is still a challenge. There are challenges in capturing and preprocessing the image, in feature extraction or selection, and classification. Attaining successful recognition automatically is very difficult. The objective of this research is to overcome these difficulties and obtain a successful recognition.

This paper gives a review on the mechanisms of human facial behavior recognition using pattern analysis and machine intelligence, which includes a brief detail on framework, literature survey, problems, applications and comparative survey in facial behavior recognition using pattern analysis and machine intelligence.

Keywords—Face detection, Feature extraction, classification, Pattern analysis and machine intelligence, emotion recognition, human-computer interaction

I. INTRODUCTION

Human Emotions play an important role in viewer's content selection and consumption. Emotion assessment is task even users are not always able to express their emotion with words all the time and the self-reporting emotions have a high probability of false emotions.

There are challenges in capturing and preprocessing the image, in feature extraction or selection, and classification. The new methods are developed in the field of human computer interaction and to go for many research is necessary to find optimal methods with respect to automation, speed and accuracy.

II. OBJECTIVE OF THE RESEARCH

To design a soft computing based face emotion independent detection system by applying different face acquisition, facial feature extraction, facial expression classification.

A. Applications of the research

- Psychological diagnosis and training
- Video surveillance and security
- Testing driver stress
- Intelligent tutoring system
- Age estimation
- Human machine intelligent interactions
- Health support appliances
- Gaming
- Pain and depression analysis
- Human emotion analysis

III. EXISTING RESEARCH

- Existing results are obtained 93.9% accuracy only
- Not successful emotion detection in the conditions of pose variation, feature occlusion, lighting condition
- Need to improve the accuracy and reliability of driving fatigue detection
- Still challenges in the expression classifications in real time from live webcam feed

- Leads incorrect recognition while training data is insufficient
- Some system require more processing power
- Some system does not more flexible, accurate and more feasibility
- Existing system takes more time per frame
- Does not fully person independent
- Need good method for handle partial occlusions and make robustness

IV. PROPOSED RESEARCH

- To achieve Improved emotion recognition rate when compared to previous research.
- To proposed to detect new positive emotions such as interest and confidence, negativeemotion such as stress and anxiety,neutral emotion such as calm and relaxed.

A. Robustness

- Deal with subjects of different age, gender
- Handle lighting changes
- Handle large head motion

- Handle occlusion
- Recognize all possible expressions

B. Automatic Process

- Automatic face acquisition
- Automatic facial feature extraction
- Automatic expression recognition

C. Real Time Process

- Real time face acquisition
- Real time facial feature extraction
- Real time expression recognition

D. Autonomic Process

- Output recognition with confidence
- Adaptive to different level outputs based on input images

V. PROPOSED ARCHITECTURE

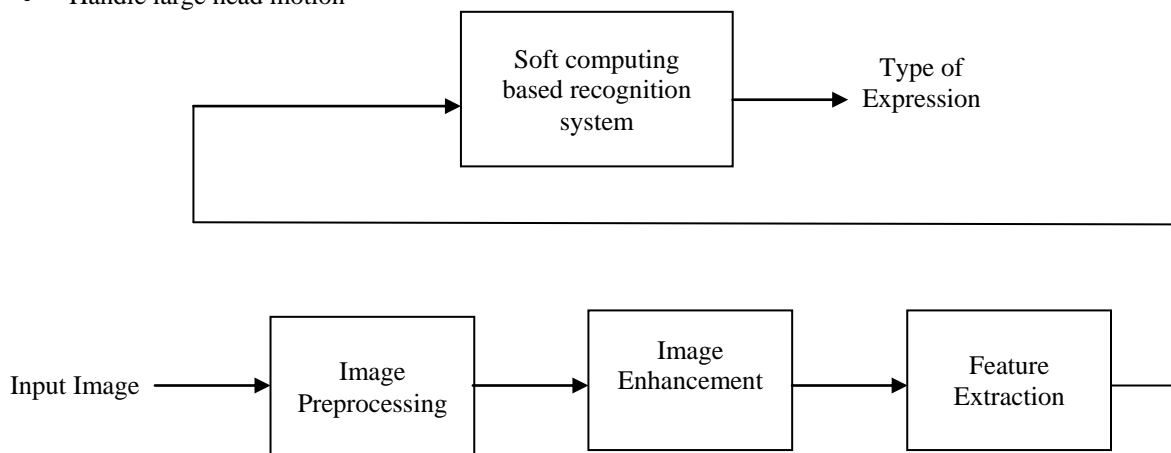


Fig 1: Overall architecture of proposed emotion detection system

VI. COMPARATIVE SURVEY

The comparative analysis of human facial behaviour recognition systems using pattern analysis and machine intelligence is given in the table. The table shows the technique they use in each phase, advantage and disadvantage of that system.

Publication/year	Title	Methods and techniques	Key points +pros & -cons
ELSEVIER/2007	Facial expression classification : an approach	Transferable belief model	+It is a powerful approach for static

	based on the facial deformations using the transferable belief model		classification -not suitable for dynamic approach
IEEE/2009	Emotion Recognition From Facial Expressions and Its Control Using Fuzzy Logic	Fuzzy approach	+good accuracy 90%
ELSEVIER/2011	Sad benefit in face	Cognitive	+applied for psychologic

	working memory: An emotional bias of melancholic depression	behavioral therapy	al interventions -not for positive emotions	Springer/2012	Facial expression recognition using local binary patterns and discriminant kernel locally linear embedding	DKLLE(discriminant kernel locally linear embedding)	+handle embedded data set-high discriminating power
Springer/2011	Multi-label classification of music by emotion	Multilabel feature selection method	+overall predictive performance was high	Springer/2013	Automatic landmark point detection and tracking for human facial expression	Differential evolution -markov chain(DE-MC)	+tracking video sequences -low tracking performance
Springer/2011	Face Detection and Facial Expression Recognition Using a Novel Variational Statistical Framework	Gd mixture models	+it is a powerful approach for dealing with the problems of face detection and expression recognition	IEEE/2013	Phase-Blender-Based FIR Noise Filtering Techniques for Fractional-N PLL	FIR filter	+good noise filtering
Springer/2011	Biologically inspired emotion recognition from speech	Mel frequency cepstral coefficients and lyon cochlear model	+better recognition rate	ELSEVIER/2014	Sentiment analysis algorithm and application: A survey	Machine learning, lexicon and hybrid approach	+applied to real time applications -need some enhancements
ELSEVIER/2012	Classification Algorithms Research on Facial Expression Recognition	K-nearest neighbor algorithm	+improve reliability -lack of mixed emotions	Springer/2014	Effect of negative emotions evoked by light, noise and taste on trigeminal thermal sensitivity	PANAS method (positive and negative affect states)	+increase negative rating -more complex operation
ELSEVIER/2012	Theory of evidence for face detection and tracking	Evidential modelling and classical bootstrap particle filter technique	+settings are made easier +computational cost is reduced. -not for dynamic settings and detection rate reach only 80%	IEEE/2014	Face Detection and Facial Expression Recognition System	Active appearance model	+achieved 92 % accuracy -require the extraction and training of additional facial points
Springer/2012	A model for inference of emotional state based on facial expressions	Kalman filtering	+produce excellent result -detect slow emotion	IEEE/2014	Robust Driver Fatigue Recognition	SVM	+detect driver fatigue -low

	Using Image Processing		processing speed	ELSEVIE R/2016	Testosterone and attention deficits as possible mechanisms underlying impaired emotion recognition in intimate partner violence perpetrators	IPV	+high attention -poor emotion recognition
ELSEVIE R/2015	A Human Facial Expression Recognition Model based on Eigen Face Approach	Eigen face approach	+suitable for training datasets -need more extensive training	ELSEVIE R/2016	Student Emotion Recognition System (SERS) for e-learning improvement based on learner concentration metric	Viola jones algorithm	+ good face analyzing -only for positive emotions
ELSEVIE R/2015	Facial expression recognition: A survey	Automatic FER	+increase accuracy rate -handle occlusion	ELSEVIE R/2016	Intact emotion recognition and experience but dysfunctional emotion regulation in idiopathic Parkinson's disease	QADP,S ADS	+good intensity -poor accuracy
ELSEVIE R/2015	Breaking bad news, the diagnosis of cystic fibrosis in childhood	Utrecht copyng list	+it identify strong emotions -accuracy was poor	ELSEVIE R/2016	The emerging role of in vitro electrophysiological methods in CNS safety pharmacology	3D neuron model	+applied medical field -problem in appropriate training set
ELSEVIE R/2015	Facial expression recognition: A survey	FER	+good accuracy +handle acclusion -improve accuracy rate	ELSEVIE R/2016	Smart environment architecture for emotion detection and regulation	Bayesain network classifier, neuralnet work, SVM,hidden markov models	+it maintain emotions towards positive mood -used more techniques
Springer/ 2015	Towards effective touch interaction: Predicting mobile user emotion from finger strokes	SVM,maximum entropy model,K-means clustering	+achieved 90.47 accuracy	ELSEVIE R/2016	Pain	Gabor	+produce
IEEE/2015	Driver Gaze Tracking and Eyes Off the Road Detection System	EOR(eyes off the road)method	+does not require any driver-dependent calibration	IEEE/201			
Springer/ 2016	Secured ECG signal transmission for human emotional stress classification in wireless body area networks	Probability of data intercept data detection model	+high classification rate 90% -improve transmission rate				

6	Recognition and Intensity Classification Using Facial Expressions	features and SVM	higher accuracies - computationally expensive -recognition rate was low	R/2017	emotional support messages tailored to stressors	d algorithm	performs better -very low accuracy
ELSEVIER/2017	Emotion recognition using facial expressions	K-NN,MLP	+identify 7 emotional states -not for real image -accuracy rate was 73%	Springer/2017	Sensorimotor simulation and emotion processing: Impairing facial action increases semantic retrieval demands	Facial motor interference	+measures neural correlates associated with semantic processing -very complex operation
ELSEVIER/2017	Emotion expression modulates perception of animacy from faces	Pearson correlations	+good threshold -more complex	Springer/2017	COGNIMUS E: a multimodal video database annotated with saliency, events, semantics and emotion with application to summarization	Multimodal computational algorithm	+highly consistent & accurate algorithm
ELSEVIER/2017	The expectancy bias: Expectancy-violating faces evoke earlier pupillary dilation than neutral or negative faces	Pupillary dilation method	+increased attention -suitable for negative emotion	IEEE/2017	Robust Driver Fatigue Recognition Using Image Processing	Robust algorithm	+less complex algorithm +good accuracy and reliable performance
ELSEVIER/2017	A systematic review of anxiety interventions in stroke and acquired brain injury: Efficacy and trial design	Medline, embase, psychinfo	+design high quality assessment -more complex operation	IEEE/2017	Retrieval of TV Talk-Show Speakers by Associating Audio Transcript to Visual Clusters	Clustering strategy	+fast tracking video image
ELSEVIER/2017	Impact of emotional intelligence on teacher performance in higher education institutions of Pakistan	PLS-SEM(partial least square structural equation modeling)	+improve emotional intelligence				
ELSEVIER	Designing	Optimize	+it				

VII. CONCLUSION

Emotion recognition through facial expression detection is a challenging task in the area of image processing and human computer interaction. Extensive research have already been conducted in this field for around past two decades and last few

years it received a great amount of attention due of its various applications and implementations in many domains. In this paper we have presented a comparative study on various approaches of real-time emotion recognition through detection of facial expression from a live image and video using approaches such as land marking algorithm, Bayesian model, corner detection, skin classifier, Fourier descriptors, Principle of component analysis and Support vector machines. This paper shows a survey of recent trends to automatic recognition of human facial behavior using pattern analysis and machine intelligence. Pattern analysis and machine intelligence proves effective techniques to the problem of classification, prediction, optimization, pattern recognition, image processing, etc. There are a lot of effective methods are there to detect face expression, but no method performs best in all types of situation. Each method has their limitations. The future of human facial behavior recognition system is to make a robust system that will perform efficiently in any circumstances.

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