An Efficient Approach for Facial Expression using Beizer Curve based Features:

Harman Ali, Dr.DinesahKumar Rajoriya

ABSTRACT: Aspeoples use a huge amount of their time familiar with computers of one kind or a different way. In contrast, computers are expressively unsighted and uninterested to the emotional circumstances of their customers. Human communicate with computer which does not think emotions take no notice of a whole control of existing information.
Faces contain a huge component of our expressively meaningful behavior. We make use of facial expressions to demonstrate our emotional circumstances and to agreement with our communications. In addition, we state and understand sentiments in faces naturally. Alternatively, automatic recognizing of facial expressions is an extremely complicated job computationally, particularly in the attendance of extremely inconsistent masquerade, appearance, and explanation. Here in this paper a new and efficient technique for Facial Feature Expression Recognition is proposed which provides efficient results as compared to the existing methodology.

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INTRODUCTION

A facial expression is a visible manifestation of the affective state, cognitive activity, intention, personality, and psychopathology of a person [1]; it plays a communicative role in interpersonal relations. Facial expressions, and other gestures, convey non-verbal communication cues in face-to-face interactions. These cues may also complement speech by helping the listener to elicit the intended meaning of spoken words. Facial expressions in naturally occur in face-to-face interaction. The focus is on how facial expressions (e.g., smiles and frowns) are part of the collaborative construction and modification of shared emotional stances between speakers and hearers. The data corpus of this study consists of five recorded dyadic Finnish conversations over lunch between individuals who were familiar with each other. The conversations were recorded with three video cameras: two cameras recorded the participants' facial expressions and upper bodies and one camera the overall situation. The method of this study is conversation analysis, which makes it possible to examine how participants use their facial expression, move-by-move or turn-by-turn, in the joint negotiation processes of shared emotional stances. Automatic emotion recognition tools based on the assumption that the basic emotions correspond to facial models [2] have emerged to systematically categorize the physical expressions of emotions [3].

Computers are quickly becoming a ubiquitous part of our lives. We spend a great deal of time interacting with computers of one type or another. At the moment the devices we use are indifferent to our affective states. They are emotionally blind. However, successful human-human communication relies on the ability to read affective and emotional signals. Human-computer interaction (HCI) which does not consider the affective states of its users loses a large part of the information available in the interaction. Recently, affective computing has been widely studied and there is a growing belief that providing computers with the ability to read the affective states of their users would be beneficial [4].

As it was already learnt from the definition of emotion presented above, emotion is a multifaceted construct. Here they [5] have presented a model, which describes the structure of emotion (Figure 1). In this model, emotional phenomena are caused by an emotionally meaningful situation. Emotional phenomena can be manifested in three different ways: verbal reports, physiological responses and behavior. These three ways of manifestation are also central in emotion research. Lang suggested that the behaviors related to each manifestation are partly independent and consequently the co-variation of the different emotion measures can be poor. This implies that it is important to study emotions on all three levels.

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• _Author name: Harman Ali is currently pursuing masters degree program in computer science engineering in Bansal Institute of Research and Technology,Bhopal,,INDIA,PH-918989883373.E-mail: ali.harman21@gmail..com_

• _Co-Author name:Dr.Dinesh kumar Rajoriya, Director,Bansal Institute of Research and Technology ,Bhopal INDIA, PH-919630451135. E-mail: author_name@mail.com_
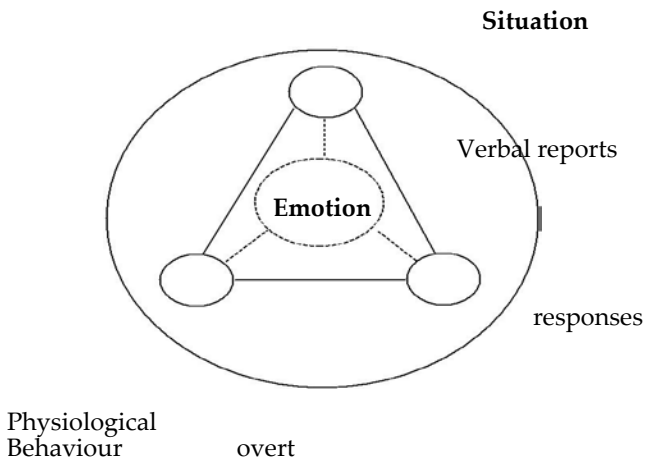
Situation

Verbal reports

Emotion

responses

Physiological
Behaviour   overt

Figure 1:The structure of emotion as suggested [5].

EMOTIONS

Human beings often experience and express emotion more intensely and more frequently within their interpersonal relationships than they do in private or within their non-interpersonal relationships. In order to understand how emotion is experienced and expressed in an interpersonal context, it is important to distinguish emotional experience, which may or may not be overtly displayed to a relational partner, from emotional expression, which is the communication of emotional information.

An emotional experience is the affective reaction (i.e., positive or negative) one experiences in the appraisal of an object, antecedent, or stimulus in one's environment, including reactions to the behavior of others [8]. In an attempt to understand the experience of emotion developed during socialization. Affective states and their behavioral expressions are an important part of human life. They influence the way we behave, make decisions and communicate with others [9]. This is because our actions are influenced both by the affective state we are in and the affective states of people around us.

LITERATURE SURVEY

In this paper [10] author has proposed a model for generation of unusual categories of facial expressions. Psychologists classified facial expressions according to meaning, role, and appearance. Facial expressions do not always match up to feel emotions: they can be counterfeit i.e.

demonstrating an expression of an unfelt emotion, masqueraded i.e. masquerading a feel passion by an unfelt feeling, superposed i.e. showing a combined of felt emotions, restrained i.e. masking the manifestation of emotion with the impartial expression), contained (de-intensifying the appearance of an emotion), or amplified (intensifying the look of an emotion).

Here [11] author emphasize on facial expression administration. They aspire at determining factors that influence the facial behavior in interpersonal relations and at building the model of the facial activities administration for an ECA. Depending on some parameters those define interpersonal relations and the expressive conditions of the mediator our algorithm alters agent's default i.e. unstructured facial performance.

According to Breazeal et al. [12], with the purpose of be proficient to contribute efficiently in emotion based interactions, robots must be equipped with abilities to recognize and interpret affective signals from humans, acquire their individual inner representations of emotions frequently motivated by psychological theories and be proficient to communicate this affective state to others.

The appraisal hypothesis of emotion provides a suitable framework for the expansion of affective recognition (or interpretation) systems in which the affective expression must be associated to the causing event. In addition, it can connect to the categorical framework of recognition of affect and respectively utilize the available systems for automatic acknowledgment of facial affect that are developed according to the definite scheme. The representing of a motivation, established by a particular human in a particular circumstance and at a particular instant of occasion, leads to elicitation and differentiation of emotions [13].

Facial Expression Recognition is fast becoming area of importance in human computer interface. This paper shows [14] the methodology for a well-organized facial expression investigation and classification. The most communicative way of demonstrating the sentiments by human is all the way through the facial expressions. Here author shows a acknowledgment of facial expression is researched with the help of numerous properties join together with the face itself. Here they present [15] automated, concurrent representations construct with machine learning algorithms which utilize videotapes of subject's faces in combination with physiological amounts to forecast timed emotion. Input consisted of videotapes of 41 subjects observing expressively evocative films along with evaluates of their cardiovascular movement, somatic activity, and electrodermal responding. So the author try to find with the help of algorithms based on extracted points from the subject's faces with their physiological answers. Strengths of the existing come within

reach of are (1) we are evaluating real performance of area under discussions observing emotional videos as an alternative of actors making facial masquerades, (2) the training data permit us to forecast both emotion type i.e. interested in opposition to unhappiness as well as the intensity level of each feeling, (3) we provide a direct evaluation between person-specific, gender-specific, and wide-ranging models. Consequences shows good fits for the models in general, with enhanced presentation for emotion grouping than for emotion intensity, for laughter ratings than unhappiness ratings, for a full model using both physiological calculates and facial trailing than for moreover indication unaccompanied, and for person-specific models than for gender-specific or general models.

In this paper [16], author has proposed a hierarchical structure based on Dynamic Bayesian Network for concurrent facial characteristic following and facial expression recognition in contrast to the typical move towards, we put together a probabilistic model supported on the Dynamic Bayesian Network (DBN) to capture the facial communications at different stages. Consequently, in this proposed model the flow of information's two-way, not only bottom-up, but also top-down by steadily characterizing and modeling put in the ground relationships among different stages of facial behavior, besides the temporal evolution information, not only the facial characteristic patching can add to the expression/AUs recognition, but also the expression/AU recognition helps to additional get better the facial feature tracking presentation.

In this paper [17] author has investigation the modern progress in 3D and 4D facial expression recognition. Here author try to find the new research expansions in 3D facial data acquisition and tracking, and author in attendance at this occasion accessible 3D/4D face databases appropriate for 3D/4D facial expressions examination besides the subsisting facial expression recognition systems that make use of either 3D or 4D data in aspect. As a final point, confronts that have to be concentrate on if 3D facial expression recognition systems are to become a part of prospect requests is comprehensively conversed. Finally of all exceeding expression analysis arrangements will necessitate to become more forceful and be able to become accustomed to impulsive expressions and additional composite situations.

PROPOSED METHODOLOGY

The proposed methodology applied consists of following steps:

1. Take an input Training Dataset.
2. Apply Binarization to each of the input training Dataset.
3. Apply Canny Edge Detector for the Detection of Edges from each of the training Dataset.
4. Extract Features from each of the training Dataset using Bezier Curves.
5. Train the Features using Back propagation Neural Network.
6. Store the extracted and trained features.
7. Take an input testing dataset.
8. Apply Binarization to each of the testing image.
9. Apply Canny Edge Detector on the input image and thinning of edges is done.
10. Extract Feature from the image.
11. Match the Corresponding features with the trained features.
12. Classify Facial Expression Activities.

BINARIZATION

Here for the binarization of the image predefined function im2bw is used. The output image BW replaces all pixels in the input image with luminance greater than level with the value 1 (white) and replaces all other pixels with the value 0 (black). You specify level in the range [0,1], regardless of the class of the input image. The function graythresh can be used to compute the level argument automatically.

CANNY EDGE DETECTOR

Canny edge detection method finds edges by looking for local maxima of the gradient of f(x, y). Here the gradiant value is computed using the derivative of a Gaussian Filter. The approach used here will takes two thresholds to find strong and weak edges, and contain the weak edges in the output only if they are connected to strong edges. Therefore, this approach is additional likely to detect true weak edges.

1. Allocate region seeds si for each region I

2. Calculate ui(x,y): the probability of first arriving sifor a random walker starting from (x,y)

3. Assign (x,y) to Label k if uk(x,y) is the largest among ui(x,y) for i= 1…N

Steps involved in canny method

- The image is smoothed using Gaussian Filter with a specified standard deviation, σ, to reduce noise

- The local gradient point g(x, y) and edge direction are computed at each point.

- The edge point determined give rise to ridges in the gradient magnitude image. This ridge pixels are then thresholds, T1& T2, with T1<T2.

BACK PROPAGATION NEURAL NETWORK

The back propagation neural network consists of a number of input layers and output layers. The network is first initialized with the setting up of weights to all the input layers between -1 to +1. The proposed methodology implemented using BPNN for Face Recognition using Bezier curves contains a number of input pattern Bezier curve points and hence on the basis output is calculated known as forward pass. Since the BPNN generates a different output of the target output due to the variation of random weights to the input layers, hence error rate is computed at each neuron and accordingly weights are changed to get the resultant target output.

The formal algorithm of BPNN is given below:

1. BPNN starts with the setting of input pixel points generated using Beziers points on the face to the input layer and needs to work on output layer, which can vary for each iteration till the target output generated.
2. For each iteration of the BPNN error rate is computed using (sigmoid function)
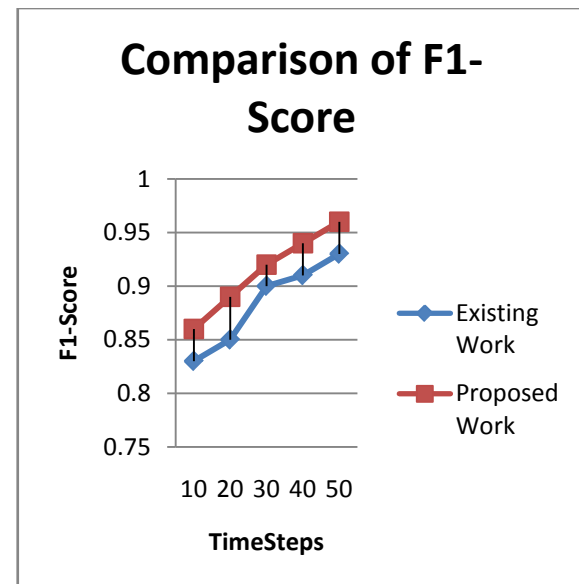
$$EB = OB (1-OB)(TB – OB)$$

Where, E-error rate, O-output, T-Target

3. After each iteration on the basis of error rate weights of the network is changed using
$$Wnew = Wold + (EB * OA)$$

Where, Wnew is the new weight to be trained, Wold is the previous weight

4. Since the training is based on BPNN, hence error rate for hidden layer is computed but instead of calculating the error rate using above formula, it can be computed as
$$EA = OA (1 - OA)(EB\ WAB + EC\ WAC)$$

5. Repeat from step 3 till training is complete.

RESULT ANALYSIS

Optimization Method	Video1	Video2	Video3
None (Initial Guess)	10.15	10.98	10.48
Evolutionary	12.5	12.85	12.29
Hill Climbing	12.65	13.46	12.38
Proposed Work	13.28	14.72	13.82

TimeSteps	Existing Work	Proposed Work
10	0.83	0.86
20	0.85	0.89
30	0.9	0.92
40	0.91	0.94
50	0.93	0.96

Comparison of F1-Score

CONCLUSION

Face detection is a computer knowledge that regulates the positions and scopes of human faces in random (digital) images. It perceives facial structures and disregards anything else, such as buildings, trees and bodies. Many algorithms implement the face-detection task as a binary pattern-classification task. That is, the gratified of a agreed part of an image is transformed into features, after which a classifier trained on example faces decides whether that particular region of the image is a face, or not. Face discovery is used in biometrics, repeatedly as a portion of (or together with) a facial recognition system.

The planned method implemented here is an efficient technique which provides better features extraction as related to further existing techniques. The technique implemented here provides high rate of accuracy and less error rate.

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