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Decision making to evaluate interpersonal skills based on emotion recognition

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ABSTRACT

The main objective of this paper is to evaluate the skills of persons using emotion recognition approach from person independent database. For this evaluation process, we have taken the input as instant capturing the region of person's nose, eyes and lip movements. In each case, expressions are very important during the learning, training and assessment process of every field. However, measuring expressions is a very demanding task nowadays. Several tools have been developed and used for this purpose. In our paper, we have implemented the Affective and Human – Centered Computing for self - training based interview platform. Implemented emotion recognition system is to extract the facial features to train the persons who are fresher to attend the interview. Instant measurements of the Face - Reader were compared with the database where we are created already by using the facial image acquisition process. After that preprocessing approach is performed for conversion of color image into gray scale image, inverting the image, border analysis, edge detection and finally region detection. By using Iterative closest Point algorithm, we can extract the facial features like nose tip detection, lip and eyes regions. Dataset contains the huge number of images with different kind of expressions like sad, good, happy, disgust, angry, excite and so on, that are classified by emotion classification algorithm. Support Vector machine algorithm is used to match the facial features with existing datasets. Finally, the output is displayed with sentence as text for corresponding input expression and evaluates the performance system using accurate rate.

KEY WORDS: Affective and Human – Centered Computing, Iterative Closest Point, Support Vector Machine, Hidden Markov Model.

1. INTRODUCTION

The method for automatic self – training detection of human emotions are becoming an integral part of intelligent products and services that can lead to a breakthrough in domains such as healthcare, marketing, security, education, and entertainment.

In game application, Different models have been developed to describe human-human interaction in game environment. For example, relations of human subjects to other players can be modeled by retrospective and prospective thinking which reflects humans' memories about past behavior of other players as well as certain expectations about future behavior of these players (Gal and Pfeffer, 2007).

Measuring emotions could be crucial in fields as psychology, sociology, marketing, information technology, and e-learning. Consequently, several researchers have developed their own instruments to assess emotions. The methods for measuring emotions are: a) Questionnaire, b) Personal preference information, c) Speech recognition, d) Physiological data and e) Facial expressions. Although this paper evaluates and uses facial expressions method, for self-assessment technique for fresher, who are going to face the interview.

The main contribution of this paper is the development of a model that, on the basis of the available technology, opens possibilities for interpreting affective facial expressions in the context of the events that caused these affects. The emotional events depicted during collaborative gaming could be of different intensities and types. Now a day's students are very less confidence to face the interview all because of fear, tension, hesitation etc. For this problem only, we have designed the tool to check their interview facing capacity mentally. The human face is a complicated visual object; it contains a lot of information with regards to identity, communicative intent and affect, and humans can "read" these cues, even under difficult visibility conditions. In India, for instance, it was believed that the basic emotions are sexual passion, anger, disgust, perseverance, amusement, sorrow, wonder, fear, and serenity. Facial expressions of these emotions are culture-dependent, but also the semantic counterparts of these emotions do not completely overlap with the current understanding of these words, adding to the difficulty of systematically categorizing emotions.

In this paper, we have utilized the intellectual approaches like Iterative Closest Point, Support Vector Machine, Hidden Markov Model for the student self – assessment process. The challenges of these approaches are: a) Recognize the emotions to predict the decision about users, b) Categorize the emotions such as positive and negative, c) Overcome the noise in voice emotion. For the challenge one we have used the Iterative Closest Point technique to find the closest point from the source region with the help of indexing. Emotion classification algorithm is used to solve the next challenge. Hidden Markov Model is for reduce the noise, which is present in the audio series.

One of the important basic concepts of our paper is Affective computing is the study and the development of systems. Any device that can recognize, interpret process and simulate human affects. The Fig. 1 shows the various possible expression of one individual person.

In this figure we have collected six expressions like anger, joy, fear, surprise, sadness and disgust.

Fig.1. Affective computing

2. EXPERIMENTAL

Overall descriptions in proposed system: In this proposed work, we have designed five classified modules to enhance output. Before explain about the each modules, let see the overall architecture in the following fig.2.

a. Facial image Acquisition: In this module, we capture the face image or upload the dataset. The uploaded dataset contains 2d face images. In face identification, we can identify the faces which are captured by the web camera. Then web camera images are known as the 2D images.

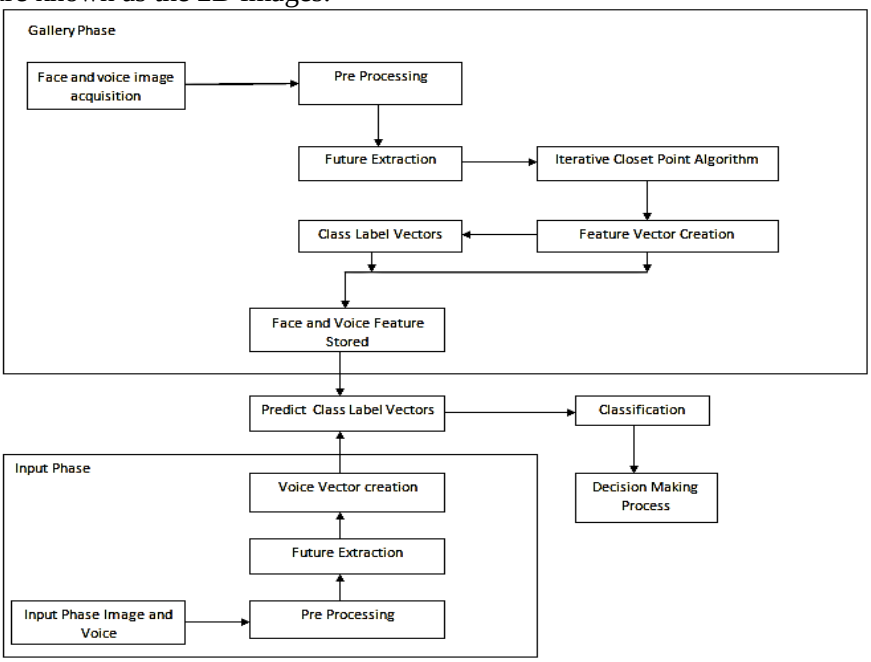


Fig.2. Overall Process of Proposed systems

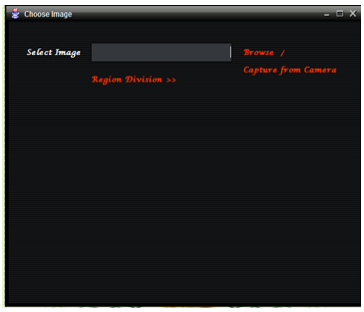


Fig. 3 Image selection

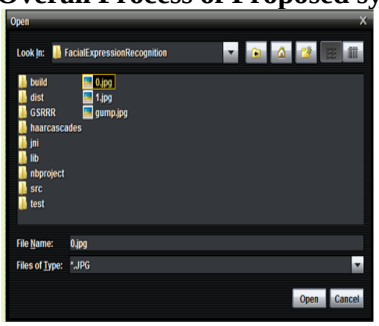


Fig. 4 Image Acquisition

Fig. 5 Region selection

b. Preprocessing: Perform the preprocessing steps such as gray scale conversion, invert, and border analysis, detect edges and region identifications. The gray scale images are called as monochromatic, denoting the presence of only one (mono) chrome (color). It is also used to remove the noises from the images.

c. Facial Feature Extraction: In this we can extract the facial features using Iterative closest point algorithm, a) Nose tip detection, b) Lip movement detection, c) Eyes movement.

ICP Algorithm: ICP algorithm with the point-to-point distance metric to estimate the transform between the 2D datasets (model - red and target - green) depicted in the below fig. 7. For the correspondence estimation please use

the nearest neighbor search with the maximum radius set to 4 grid units. For the rotation estimation use an SVD library of your choice.

Steps: find point pairs; compute centroids, build the correlation matrix H, estimate rotation matrix R using SVD, estimate the translation vector t, calculate the transform T, transform dataset m using the transform T.

Fig.6. Border analysis and Edge detection

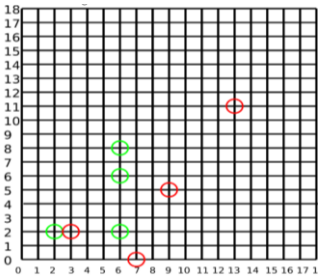


Fig.7. ICP algorithm with point – point distance metric

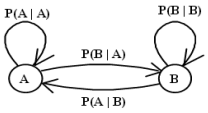
d. Voice Features Extraction: In this we can extract the voice features using Hidden Markov Model algorithm.

Hidden Markov Model: Hidden Markov Model can consider a generalization of mixture model where the hidden variables (or Latent variables), which controls the hidden variable to be selected for each observation, are related through a Markov process rather than an independent of each other. The below given algorithm is used to process the audio components.

Elements:

States : $\mathbf{S} = \langle \mathbf{S}_0, \mathbf{S}_1, \quad \mathbf{S}_N \rangle$

Transition probabilities : $P(q_t = S_i \mid q_{t-1} = S_j)$



Markov Assumption:

Transition probability depends only on current state

$$P(q_t = S_i \mid q_{t-1} = S_j,\ q_{t-2} = S_k, \ldots) = P(q_t = S_i \mid q_{t-1} = S_j) = a_{ji}$$

$$a_{ji} \geq 0 \ \ \forall j,i \qquad \sum_{i=0}^{N} a_{ji} = 1 \quad \forall_j$$

e. Emotion Classification Algorithm: In this we have implemented the Support Vector Machine algorithm to match with the facial features. And also categorize the emotions like negative and positive. It is a supervised machine learning algorithm which can be used for both classification and regression challenges.

However, it is mostly used in classification problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well. The below fig.9 shows the sample data classification for SVM.

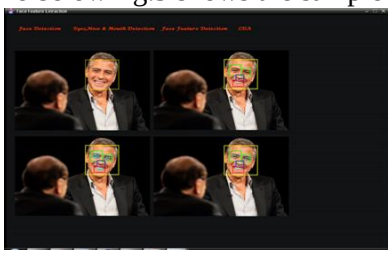


Fig.8. Nose tip, eyes and lip regions detections / extractions

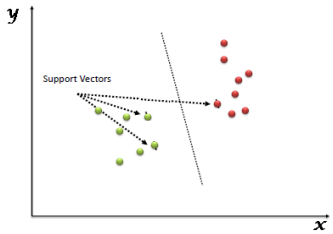


Fig.9. Sample data classification using SVM

3. RESULTS AND DISCUSSIONS

Performance is evaluated here and produces the accuracy of output by accuracy rate. Firstly, it had to be collected some student's expressions like sad, happy, angry, disgust, joy, etc., and stored into the dataset, which we have created already. Then we classify those emotions into three categories like negative, positive and neutral. Example sad, angry are comes under the negative emotions and happy and joy are positive. There is no expression in the lip, nose tip and eyes movement is neutral conditions.

Classified images are stored into the dataset. Next, we have used some students to examine our tools quality. Totally, we used 200 students to participate this checking. Student 1 came and settled down to in front of our system and started to give expressions as input through the video. Next, our system captures the video and converted that into different numbers of frames. Then final frame is exact input tool to extract the output features.

The final frame is 2D image which we given as input. By the help of ICP algorithm the color image is converted into the gray scale image then the edges of eyes, lip and nose tip was detected. SVM is used to match the given expression with dataset. Finally our system responds and produces the relevant sentence as output.

Likewise we analyzed this proposed system efficiency with 200 students. Table 1 refers the sample collected data for five students with two parameters like agree and disagree.

Table.1.Sample collected data with two parameters

Emotions	Stud 1	Stud 2	Stud 3	Stud 4	Stud 5
Happy	Agree	Agree	Agree	Agree	Agree
Angry	Agree	disagree	Agree	Agree	Agree
Sad	Agree	Agree	Agree	Agree	disagree
Disgusted	Agree	Agree	disagree	Agree	Agree
Neutral	Agree	Agree	Agree	Agree	Agree
Scared	disagree	Agree	Agree	Agree	disagree
Surprised	Agree	Agree	disagree	Agree	Agree

Table.2.Numerical survey

Emotions	Agreed status	Disagreed Status
Happy	5	NIL
Angry	4	1
Sad	4	1
Disgusted	4	1
Neutral	5	NIL
Scared	3	2
Surprised	4	1

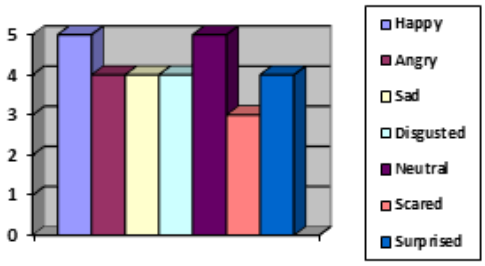


Fig.10.Chart notations for agreed status

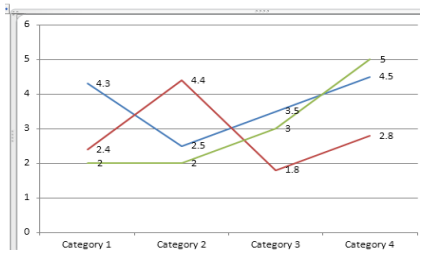


Fig.11.Chart notations for disagreed status

4. CONCLUSION

In this paper we examined the prediction of emotions recognition with various facial. Implemented the emotions with voice modulation, and performed decision making approach. Implemented ICP approach to separate facial images in to patches and calculated facial points labeling facial expressions using support vector Machine algorithm. Make decision based on expressions.

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