An Emotion Recognition System in Matlab

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Abstract - Emotion recognition Analysis is an interesting and challenging problem, and impacts important applications in many areas such as human-computer interaction and data- driven. Deriving an effective facial expressions from the original images is plays a vital step for successful facial emotion recognition. An emotion recognition system should be in real time and highly accurate. In this paper, we propose an emotion recognition system with high performance from the original face images. Face detection can be done by viola-jones algorithm to extract the face regions in the frames. The Bandlet transform is realized on the face regions, and the resultant sub-band is divided into non-overlapping blocks. For an emotion recognition system svm algorithm is used, The Kruskal-Wallis feature selection is applied to select the most dominant bins of the concatenated histograms. The dominant bins are then fed into a Gaussian mixture model based classifier to classify the emotion.

Keywords - Emotion Recognition, Feature selection, Classifier, Bandlet Transform.

I. INTRODUCTION

Due to the ongoing growth along with the extensive use of smart phones, services and applications, emotion recognition is becoming an essential part of providing emotional care to people.

Provisioning emotional care can greatly enhance users' experience to improve the quality of life. The conventional method of emotion recognition may not cater to the need of mobile application users for their value added emergent services. Moreover, because of the dynamicity and heterogeneity of mobile applications and services, it is a challenge to provide an emotion recognition [1] system that can collect, analyze, and process emotional communications in real time and highly accurate [2] manner with a minimal computation time. There exist a number of emotion recognition [5] systems in the literature. The emotion can be recognized from speech, image, video, or text. There are many applications of the emotion recognition in mobile platforms. In mobile applications, for example, the text of the SMS can be analyzed to detect the mood or the emotion [6] of the users. Once the emotion is detected, the system can automatically put a corresponding 'emoji' in the SMS. By analyzing a video in the context of emotion [8], a smart phone can automatically change the wallpaper, or play some favourite songs to coop with the emotion of the user. The same can be applied using oral conversation through a smart phone; an emotion can be detected from the conversational speech [12], and an appropriate filtering can be applied to the speech. To realize an emotion recognition engine must be in real-time, should be computationally less expensive, and give high recognition accuracy[15] with the experimental result.

II. PROPOSED SYSTEM

Figure:1 shows a block diagram of the proposed emotion recognition system in matlab. In the following subsections, we describe the components of the proposed system.

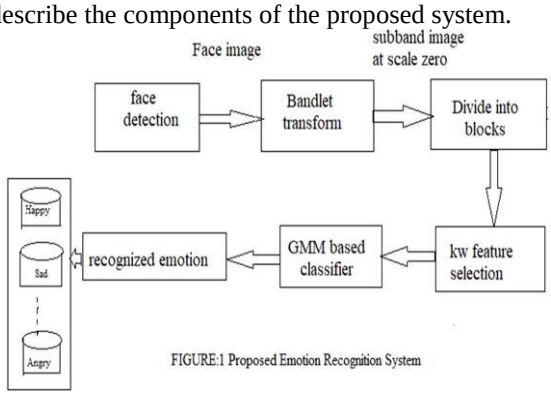


Figure 1: Proposed Emotion Recognition System

In the below section we have to explain the each and every process of this emotion recognition system in matlab by using a flowchart preprocessing steps involved. Flow chart contains the two steps those are real time process and training process [13] through the steps the whole paper should be done. we explain the processes of face detection, facial feature extraction, and the classification method, all of which are important for recognizing emotions from facial expressions.

III. FLOW CHART

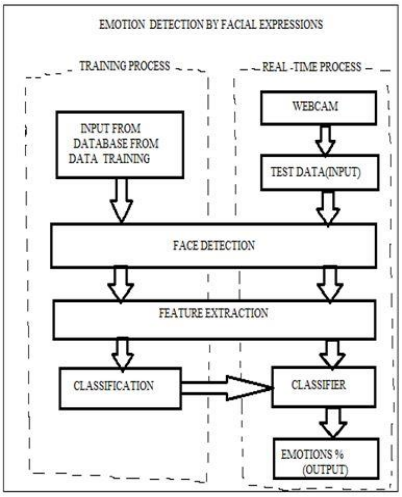


Figure 2: Work flow for real time emotion detection by facial expression

Emotion detection by facial expressions recognizes and interprets human emotions from facial textures, and the movement of facial muscles, eyes, mouth or eyebrows. The workflow of real-time emotion detection by facial expressions proceeds as follows (FIGURE. 2).

- The emotion detection finds a user's face from the video frames (input).
- The detection extracts the facial features [4] and normalizes them to form feature vectors.
- It then classifies the user emotions into one of seven classes (neutral, happiness, sadness, anger, disgust,fear and surprise) using a classifier that is generated from a training process.
- Finally, it calculates the percentage of each emotion for further analysis.

IV. RELATED WORKS

a) Face Detection - Once we select the frames, the face areas in the frames are detected by the Viola-Jones algorithm [16]. This algorithm works fast, and is suitable for a real-time implementation. Now a day, many smart phones have the face detection functionality embedded into the mobile system.

b) Bandlet Transform - The Bandlet transform is applied to the detected face area. A face image has many geometric structures that carry valuable information about the identity[3], the gender, the age, and the emotion of the face. A traditional wavelet transform does not take care much about the geometric structure of an image, especially in sharp transitions; however, represent sharp transitions using geometrical structures can improve the representation of image. One of the major obstacles of using geometrical structure is a high computation complexity. The Bandlet transform overcomes the obstacle to represent geaometric structure of an image by calculating the geometric flow in the form of Bandlet bases.

c) KW feature selection - The number of features for the image is very huge; many features slow down the process, and they also bring the 'curse of dimensionality'. Therefore, a feature selection technique can be applied to reduce the dimension of the feature vector. There are many feature selection techniques [7], each of which has its own advantage and disadvantage. In our proposed system, we adopt the KW technique for its simplicity and low computational complexity, keeping in mind that the system is to deploy in mobile applications.

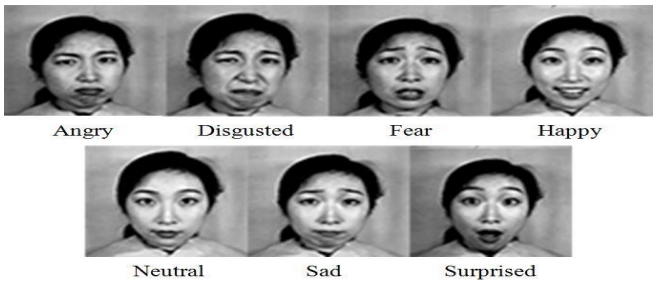
d) GMM based classifier - The selected features are fed into a GMM based classifier. During training, models of different emotions [9] are created from the feature set. During testing, log-likelihood scores are obtained for each emotion using the feature set and the models of the emotion. The emotion corresponding to the maximum score is the output of the system. In the experiments, different numbers of Gaussian mixtures are investigated. We choose the GMM based classifier [14] because it can operate in real-time, it is more stable than the neural network based classifiers.

V. EXPERIMENTAL RESULTS AND ANALYSIS

To validate the proposed system, we used a number of experiments using two publicly available databases, namely CanadeKohn(CK) and the Japanese female facial expression (JAFFE) databases. In the following subsections, we briefly describe the databases, and present the experimental results and discussion.

a) Databases in our experiments - we used two databases. The JAFFE database consists of emotional face images of Japanese actresses. There are total 213 face images of 10 female Japanese. All the images are gray, and have a resolution of 256×256. The original images were printed, scanned, and digitized. The faces are frontal. There are seven emotion classes, which are anger, happiness, sadness, disgust, afraid, and surprise, in addition to neural. The CK database was created by the faces of 100 university-level students. After careful observations, the faces of four students were discarded because they were not properly showing the emotions.

b) Experimental results - We used the JAFFE database in our experiments to set up different parameters of the proposed system. We chose this because it a smaller size database than the CK database. Once we fix the parameters using the JAFFE database, we used the CK database. During classification, we adopted a 5-fold approach, where the database was divided into five equal groups. In each iteration , four groups were trained and the rest was tested. After five iterations, all the five groups were tested.



VI. CONCLUSION

An emotion recognition system for mobile applications has been proposed. The emotions are recognized by face images. The Bandlet transform which are then selected by the KW feature selection method. The GMM based classifier is applied to recognize the emotions. Two publicly available databases are used to validate the system. The proposed system achieved 99.8% accuracy using the JAFFE database, and 99.7% accuracy using the CK database. It takes less than 1.4 seconds to recognize one instance of emotion. The high performance and the less time requirement of the system make it suitable to any emotion-aware mobile applications. In a future study,we want to extend this work to incorporate different input modalities of emotion.

VII. FUTURE SCOPE

The use of spherical canonical images allows us to perform matching in the spherical harmonic transform domain,

which does not require preliminary alignment of the images. The errors introduced by embedding into an expressional space with some predefined geometry are avoided. In this facial expression recognition setup, end-to-end processing comprises the face surface acquisition and reconstruction, smoothening, sub sampling to approximately 2500 points. Facial surface cropping measurement of large positions of distances between all the points using a parallelized parametric version is utilized. The general experimental evaluation of face expressional system guarantees better face recognition rates. Having examined techniques to cope with expression variation, in future it may be investigated in more depth about the face classification problem and optimal fusion of color and depth information. Further study can be laid down in the direction of allele of gene matching to the geometric factors of the facial expressions. The genetic property evolution framework for facial expressional system can be studied to suit the requirement of different security models such as criminal detection, governmental confidential security breaches etc

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