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Emotion Based Music Player through PCA Algorithm

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ABSTRACT: This paper proposes a new neighbourhood highlight descriptor, Local Directional Number example (LDN), for face examination, i.e., face and character acknowledgment. LDN encodes the directional data of the face's surfaces (i.e., the surface's structure) in a conservative way, delivering a more discriminative code than current strategies. The structure of each small scale design with the guide of a scope cover that separates directional data, and encode such data utilizing the conspicuous course records (directional numbers) and sign which permits to recognize among comparable secondary examples that have diverse power changes. It separates the face into a few areas, and concentrates the dissemination of the LDN highlights from them. At that point, it will connect these highlights into a component vector, and then use it as a face descriptor. In this, play out a few analyses in which the descriptor performs reliably under brightening, articulation, and time lapse by varieties. In addition, to test the descriptor with different veils to examine its exhibition in different tasks of face examination. Programmed outward appearance acknowledgment is a difficult issue in PC vision, and has increased huge significance in the uses of human-PC connections. The imperative part of any successful behaviour acknowledgment framework is a powerful facial representation from face pictures and right now, have determined an appearance-based element descriptor, the Local Directional Pattern Variance (LDPv), which portrays both the surface and differentiation data of facial segments to use play music.

KEYWORDS: Face expression, PCA face detect, LDN, plays music.

I. INTRODUCTION

Facial expression is one among the foremost powerful, natural, and immediate means for human beings to communicate their emotions and intentions. Automatic facial expression recognition has attracted much attention from behavioural scientists since the work of Darwin in 1872 and has gained significant importance in applications of human-computer interactions. Although much work has been done with automatic facial expression analysis, recognition with high accuracy remains difficult due to the complexity and variety of facial expressions.

Extracting an effective facial representation from human face images is a vital component of any successful facial expression recognition system. The derived representation should retain essential information possessing high discrimination power and stability which minimizes within-class variations of expressions which maximizes between-class variations. Classification performance is heavily influenced by the information contained in the expression representations. Two types of facial feature extraction approaches are commonly found: the geometric feature-based system and therefore the appearance-based system. Geometric feature vectors represent the shapes and locations of facial components by encoding the face geometry from the position, distance, angle, and other geometric relationships between these components. An Author Zhang represented facial images using the geometric positions of 34 points as facial features. A widely used facial description is the facial action coding system, where facial expressions are decomposed into one or more Action Units (AUs). Detected AUs by monitoring multiple points on the face and advised that in the study of facial expression, geometric approaches work equally or better than appearance-based approaches. However, methods based on geometric features require accurate and reliable detection of the facial components.

Recent psychological research suggests that the entire spatial relationship of the countenance picture are often a further source of data within the perception of facial emotions. Therefore, in appearance based methods one image filter or filter bank is applied to the entire face or some specific region of the face to extract appearance changes. Among the holistic methods, Principal Component Analysis (PCA) has been widely applied to facial images to extract features for recognition purposes. PCA is also used for dimensionality reduction in feature space. Lately, Independent Component Analysis (ICA, Enhanced ICA (EICA), and Zernike Moments (ZM) have been utilized to extract local features and facial changes. A Researcher Donato performed a comprehensive analysis of different techniques, including PCA, ICA, Local Feature Analysis (LFA), Gabor-wavelet and local Principal Components (PCs), to represent face images for facial action recognition. The best performance was achieved by ICA and Gabor-wavelet. Since then Gabor-wavelet representations are widely adopted in face image analysis by other methods. However, convoluting a facial image with multiple Gabor filters of the many scales and orientations makes the Gabor representation time and memory intensive. Lajevardi and Hussain, have utilized log-Gabor filters to beat some limitations of Gabor-wavelet representations but the dimensionality of resulting feature vector remains high.

Recently, Local Binary Pattern (LBP) and its variants have been introduced as a feature descriptor for facial expression representation. Originally, LBP was introduced for texture analysis. LBP is computationally efficient and shows robustness to monotonic illumination change, it is sensitive to no monotonic illumination variation and also shows poor performance in the presence of random noise. A more robust facial descriptor, named as Local Directional Pattern (LDP), was devised by Jabid, where the LDP representation of face demonstrated better recognition performance than LBP. The LDP feature overcomes the limitations of LBP features since LDP is derived from the edge responses which are less sensitive to illumination changes and noises.

In this work, the proposed of LDP variance (LDPv), which characterizes both spatial, structure LDP and contrast variance of local texture information for more accurate countenance recognition performance. Figure 1 shows an overall flow of the expression recognition system based on our LDPv descriptor coupled with PCA and k-NN. The empirical study of the facial representation supported LDPv for human expression recognition. The performance of LDPv representation is evaluated with two machine learning methods: Template matching and k-nearest neighbours (k-NN) with different kernels. Extensive results from the standard expression database Cohn-Kanade facial expression database demonstrate that LDPv feature is more robust in extracting face features that have a higher identification rate relative to LBP, Gabor-wavelet features and other approaches based on appearance. Also, the LDPv descriptor works in a stable and robust manner over a useful range of low-resolution images.

II. RELATED WORK

In this section, a review of different techniques and parameter estimation is made so that the image with face expression is identified and music play is calculated.

Xi Zhao, Emmanuel Dellandrea and Liming Chen[1] face detection framework that is capable of processing images extremely rapidly while achieving high detection rates. There are three key contributions. The first is the implementation of a new image representation called the "Integral Image," which allows very fast computation of the features our detector uses.

The second is a simple and powerful classifier, constructed from a very large number of important visual features using the AdaBoost learning algorithm. The third contribution is a method of combining classifiers in a "cascade" that allows the image's background regions to be easily discarded while spending more computation on promising face like regions.

This provides a series of studies in the field of face detection. In Rudolfo Rizki Damanik [2] method, Absence was a list of documents that the company used to record the attendance time of each employee. The most common issue with a fingerprint machine is the detection of a sluggish sensor or a sensor that does not recognize a digit. Workers late to work because they have issues with the fingerprint device, they need about 3-5 minutes to be absent when the digit state is wet or not suitable. To solve this problem, this work attempted to use facial recognition for attendance process. Viola Jones was the tool used to recognize the face.

For the next level of identification, the processing step of the RGB face image was transformed into a face image of histogram equalization. Mehul K Dabhi, Bhavna K Pancholi [3] system, Locating facial feature in images is an important stage for applications such as eye tracking, recognition of face, face expression recognition and face tracking and lip reading. In this paper, To present a method for detecting face from the live image. The face is detected from whole image using viola-jones algorithm. Than the feature based on AdaBoost algorithm are used to extract the facial region from the image.

Narayanan T Deshpande [4] has proposed a system, the human face is a complicated multidimensional visual model and hence it is very difficult to develop a computational model for recognizing it. The paper provides a framework for identifying the human face, based on image-derived characteristics. The proposed methodology is implemented in two stages. The first stage uses Viola-Jones algorithm to detect the human face on an image. In the next stage a combination of Principle Component Analysis and Feed Forward Neural Network is used to identify the detected face in the picture. The output of the proposed method is compared with current methods.

Better accuracy in recognition is realized with the proposed method. Vikram K [5] has proposed a system presents to detect the faces in an image and locates the facial features in an image. During this process, detecting the facial parts such as eyes, nose, mouth and face is an important activity. Through this work, the sections of human facial factors in an image are identified and detected. The study involves the algorithm of Viola-Jones Cascade Object Detector which gives various combinations of filters and methods to detect these facial expressions.

III. PROPOSED MODELLING

The major variation in head rotation and tilt, lighting intensity and angle, facial expression, age, etc. makes it difficult to identify the issue in face. Some other machine-based attempts at facial recognition have enabled little or no variation in these quantities. But in cases where the variation is large, the approach of correlation (or pattern matching) of unprocessed optical data, which is also used by some researchers, is likely to fail. The connection between two images of the same individual, with two different head rotations, is especially weak. Face recognition does not work well with bad lighting, sunglasses, long hair, or other objects that partially cover the face of the subject, and images of low resolution. Another important downside is that if the facial expressions differ, many systems are less successful. Even a big smile could make the system less successful.

In this Proposed Method, A Face descriptor, Local Directional Number Pattern (LDN), for robust face recognition encoding the structural details and the facial texture strength variations. By analysing its directional information, LDN encodes the structure of a local neighbourhood. To determine the edge responses in the neighbourhood, with a compass mask in eight different directions. Then it picked the top positive and negative direction from all directions to generate a valid descriptor for different textures with identical structural patterns. This approach enables us to differentiate shifts in intensity.

A face expression is a visual representation of a person's affective disorder, cognitive function, purpose, attitude, and psychopathology. Facial expressions are natural means of communications between humans. By looking at the facial expression of a human face the emotional state of that person can be understood. Research in Facial Expression Recognition has considered four basic facial expressions namely happy, sad, surprise and neutral.

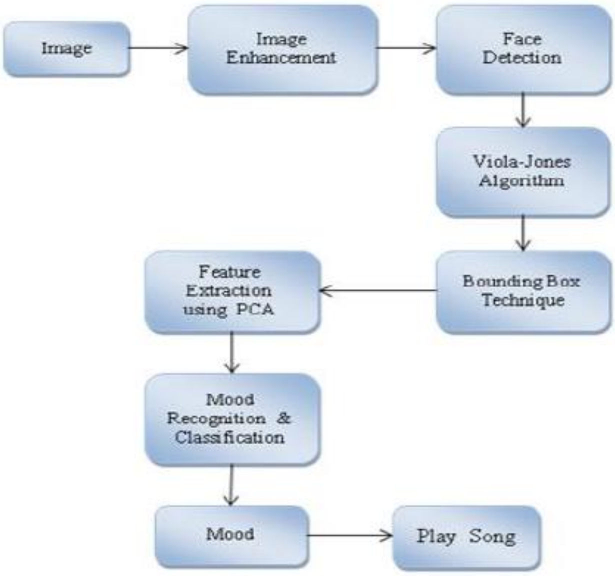

Figure 1 – Architecture diagram

Figure 1 portrays the architecture diagram of the Human image with face expression detection method and with song play respectively. The proposed system methodology is described as follows.

IV. METHODOLOGY

The proposed system helps to estimate the parameters and measure the accuracies by feature technique using Face expression methods. The parameter estimation is very difficult in Face expression with person identification. The proposed system helps to estimate the parameters and measure the accuracies by feature extraction technique using k-NN methods. Implementation is the stage in the process of turning the theoretical concept into a working system and giving users trust in the new framework. It will work efficiently and effectively. This involves systematic preparation, examining the existing program and its implementation limitation, developing plan to improve the change over, evaluating, modifying processes. In addition to preparing big implementation preparedness activities are product awareness and training.

A Coordinating Committee for Implementation was appointed based on individual organizational policies. The implementation process starts with making a strategy for the implementation of the program. According to this plan, the tasks have to be carried out, talk about the equipment and resources and additional equipment to enforce the new program have to be acquired.

The end-user detects an expression into the human face image in detection process. The expression stored in the text format of .txt, and then shares the expression through the song play side. The developed framework is approved and has proven beneficial to the user. The system will be put into effect very soon. A basic operating procedure is provided, so that the user can easily and efficiently identify the different functions. The song finally plays from the picture of face expression. And the data was processed; the original human face image of the image size, the receiver's resolution gets successful. The performances go from few percentages of accuracy to 97%.

V. EXPERIMENTAL RESULTS

5.1 PROPOSED PRINCIPAL COMPONENT ANALYSIS

PCA considers a linear projection of high-dimensional data into a subspace of lower dimensions, such as:

- The variance retained is maximized.
- The least square reconstruction error is minimized.
- LSI: Latent Semantic Indexing.
- Kleinberg / Hits algorithm (Calculate node hubs and authority scores).
- Google/Page Rank algorithm (random walk with restart).
- Image compression (Eigen faces)
- Data visualization (by projecting the data on 2D.

Algorithm: Viola-Jones Face Detection Algorithm

```
Input: original test image
Output: image with face indicators as rectangles
for i ← 1 to num of scales in pyramid of images do
    Downsample image to create image_i
    Compute integral image, image_ii
    for j ← 1 to num of shift steps of sub-window do
        for k ← 1 to num of stages in cascade classifier do
            for l ← 1 to num of filters of stage k do
                Filter detection sub-window
                Accumulate filter outputs
            end for
            if accumulation fails per-stage threshold then
                Reject sub-window as face
                Break this k for loop
            end if
        end for
        if sub-window passed all per-stage checks then
            Accept this sub-window as a face
        end if
    end for
end for
```

5.2 PERFORMANCE EVALUATION

The performance of the process is measured by measuring the accuracy of the process. Performance of each classifier is measure in terms of confusion matrix, sensitivity, specificity and accuracy.

Sensitivity is a measure which determines the probability of the results that are true positive such that expression has identified.

Specificity is a measure which determines the probability of the results that are true negative such that expression does not have identified person.

Accuracy is a measure which determines the probability that how much results are accurately classified.

ACCURACY = (TP + TN) /(FP + TN) + (TP +FN)

SENSITIVITY = TP / (TP + FN)

SPECIFICITY = TN / (FP +TN)

VI. RESULTS AND DISCUSSION

Local Directional Number Pattern

In this module, LDN is a six bit binary code assigned to each pixel of an input image, which describes the texture structure and its transitions in strength. the construction pattern by using a compass mask to measure the neighbourhood's edge response and by taking the top directional numbers, that is, the most positive and negative directions of those edge responses.

Face Expression

Every face is depicted in this Module by an LDN histogram (LH). The LH contains fine to coarse image material, such as edges, spots, corners and other characteristics of the local texture. Since the histogram encodes only the occurrence of such micro-patterns with no position information, the position information is aggregated to the descriptor.

Eigen Faces

Face recognition in this module discriminates the input signals (image data) into several groups (persons).The input signals are highly noisy (e.g. Noise is generated by different lighting conditions, pose, etc.), but the input images are not entirely random and there are patterns that occur given their differences in any input signal. Such patterns that can be found in all signals may be the presence of certain objects (eyes, nose, and mouth) in any face as well as relative distances between these objects in the domain of facial recognition. Those characteristic features in the facial recognition domain (or key components in general) are called individual faces. They can be extracted from original image data via a mathematical tool called Principal Component Analysis (PCA). Using PCA each original image of the training set can be transformed into a corresponding faces of its own. The significant feature of PCA is that one can recreate any original image from the training set by combining the Eigen faces. Note that masks are nothing less than features typical of skin. Therefore one may assume that the original face picture can be restored from one's own faces if one adds all of the proper faces (features) in the right proportion.

Fisher Faces

Bit harder to illustrate in this Module, since they define regions of a face that better differentiate faces from each other. None of them appear to represent different light settings; at least this is not as clear as in the Eigen faces system. The Fisher faces allow a reconstruction of the projected image, a bit like the Eigen faces did. But it can only identified the features to distinguish between subjects, that can’t be expected a nice reconstruction of the original image.

Results between Faces and Play Music

In this module proposes a Face descriptor, Local Directional Number Pattern (LDN), for efficient face recognition encoding structural details and facial strength variations texture and to detect expression and play the song from related expression.

VII. CONCLUSION

In this present system facial expression recognition system based song play on the proposed LDPv representation, which encodes the spatial structure and contrast information of facial expressions and extensive experiments illustrate that the LDPv features are effective and efficient for expression recognition. The newly transformed LDPv features also maintain a high recognition rate with lower computational cost. This system can be used for human computer interaction by facial expressions and play song. In this proposed work presented a facial expression recognition system based on song play the proposed LDPv representation, which encodes the spatial structure and contrast information of facial expressions.

The Future enhancement for the this process will focus on determining adaptively for any video based image expression in the method parameters to ensure play song from the video based images, in order to integrate more knowledge.

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