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A Review on Facial Expressions Recognition Based on LBP & SVM

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***Abstract* – Face Expression plays an important role in human communication. Facial Expression Recognition (FER) is process performed by computers which consist of detect the face in the image and preprocess the face region, extracting facial expression features from image by analyzing the motion of facial features or change in the appearance of facial features. Then classifying this information into facial expression categories like prototypic facial expression such as fear, happy, sad or Action Units (AU) such as eye open or mouth stretched concatenated into single feature vector. This feature vector outlines a well-organized representation of face and is helpful in determining the resemblance among images.. LBP features which are effectual and competent for facial expression recognition are generally used Firstly, face area is divided in small regions, by which histograms, Local Binary Patterns (LBP) are extracted and then Cohn Kanade is the database will be used for this work and the programming language used MATLAB.**

***Keywords*– LBP, FER Feature Extraction, SVM.**

I. INTRODUCTION

Detection is a fundamental task for applications such as face tracking, red-eye removal, face recognition and face expression recognition [1]. To build flexible systems which can be executed on mobile products, like handheld PCs and mobile phones, efficient and robust face detection algorithms are required. Most of existing face detection algorithms consider a face detection as binary (two-class) classification problem. Even though it looks a simple classification problem, it is very complex to build a good face classifier. Therefore, learning-based approaches, such as neural network-based methods or supports vector machine (SVM) methods, have been proposed to find a good classifiers [2][3][4][5][17].

Most of proposed algorithms use pixel values as features. However, they are very sensitive to illumination conditions and noises [6][11]. Papageorgiou et al. [7] used new feature, it is called Haar-like features. These features encode differences in average intensities between two rectangular regions, and they are able to extract texture without depending on absolute intensities. Recently, Viola and Jones proposed an efficient system for evaluating these features which is called an integral image [8].

And, they also introduced an efficient cheme for constructing a strong classifier by cascading a small number of distinctive features using Adaboost. Its result is more robustness and computationally efficient. Base on Viola and Jones' Efficient scheme for calculating 45˚ rotated features. And, Mita and Kaneko introduced a new scheme which makes Haar-like features be more discriminative[2] [10]. Though Haar-like feature provides good performance in extracting textures and cascading architecture and Integral image representation make it template- matching systems and geometric feature-based systems. In holistic systems, a template can be a pixel image or a feature vector obtained after processing the face image as a whole. In the latter, principal component analysis and multilayer neural networks are extensively used to obtain a low- dimensional representation. In geometric feature-based systems, major face components and/or feature points are detected in the images.

Facial expression analysis is a remarkable and demanding problem, and impacts significant applications in various fields like human-computer interaction and data-driven animation. Developing an efficient facial representation from the original face images is a crucial step for achieving facial expression recognition. Facial representation based on statistical local features, Local Binary Patterns (LBP) is practically assessed. Several machine learning techniques were thoroughly observed on various databases. Face Expression plays an important role in human communication. Facial Expression Recognition (FER) is process performed by computers which consist of detect the Face in the image and preprocess the face region, extracting facial expression features from image by analyzing the motion of facial features or change in the appearance of facial features. Then classifying this information into facial expression categories like prototypic facial expression such as fear,

happy, sad or Action Units(AU) such as eye open or mouth stretched[7][5][9].

II. RELATED WORK

Many researchers in their work have attempted to recognize the facial expression of an individual to the samples in a particular database of faces. In the work of S. Kumar, et.al. the aim of facial expression recognition (FER) algorithms is to extract discriminative features of a face. However, discriminative features for FER can only be obtained from the informative regions of a face. Also, each of the facial sub regions have different impacts on different facial expressions.

Local binary pattern (LBP) based FER techniques extract texture features from all the regions of a face, and subsequently the features are stacked sequentially. This process generates the correlated features among different expressions, and hence affects the accuracy. The authors' approach entails extracting discriminative features from the informative regions of a face. In this view, he proposed an informative region extraction model, which models the importance of facial regions based on the projection of the expressive face images onto the neural face images. This feature extraction method reduces miss-classification among different classes of expressions. Experimental results on standard datasets show the efficiency of the proposed method.[1][5][13].

III. LITERATURE SURVEY

Chao Qi et.al. In this paper, a new expression recognition approaches presented based on cognition and mapped binary patterns. At first, the approach is based on the LBP operator to extract the facial contours. Secondly, the establishment of pseudo 3D model is used to segment face area into six facial expression sub-regions. In this context, the sub-regions and the global facial expression images use the mapped LBP method for feature extraction, and then use two classifications which are the support vector machine and surtax with two kinds of emotion classification models the basic emotion model and the circumplex emotion model.

At last, we perform a comparative experiment on the expansion of theCohn-Kanade (CK +) facial expression data set and the test data sets collected from ten volunteers. The experimental results show that the method can effectively remove the confounding factors in the image. And the result of using the circumflex emotion model is obviously better than the traditional emotional model. By referring to relevant studies of human cognition, we verified that eyes and mouth express more emotion

He Jun Cai et.al.: For facial expression recognition, the LBP feature is an important way of texture feature, but usually the whole of image is taken as extracting area, ignoring to extract the key areas of facial expression. In order to solve this problem, based on previous LBP feature extraction method, as well as the division of facial motion unit, we put forward a kind of expression recognition method using the fusion feature of key facial areas expression based on LBP, by dividing into several parts: eyes, eyebrows, between-eyebrow, nose, mouth, then we get the key areas of expression to extracted features independently, at the meaning time to hold global facial features, features of the whole facial is also extracted. After that we combine this two different features together and get a new feature which is called combine feature fused key expression areas. The features combined then classified by SVM and NN to recognize different expressions. This article carries on the experiment in JAFFE database, the results show that the method of facial expression recognition rate obtained obvious ascension.

Lutfiyatul Fatjriyati Anas et.al.:;Facial expression is a change of face in response to a stimulus either in the form of external stimuli such as circumstances surrounding or internal stimuli include personal emotional states. A person's facial expression can reveal a person's judgment of something he or she faces, one of which is when one sees a fashion item image. This study was developed to find out what opinion or assessment of a person to a picture, especially fashion images through the expression of a person's face taken when looking at a fashion picture. Facial expressions that are processed will produce expressions of like or dislike. This facial express recognition system is built using the Facial Landmark to get the expression feature. Then the value of the feature is normalized using min-max. Finally, facial expressions are classified with k-Nearest Neighbour. The results of this system show which fashion images are liked by someone.

Hari Prasad Mal et.al.: Facial expressions are the facial changes indicating internal state of human being, objectives or communal conversation. Subject to the change of emotions on the face, any persons face is the most important mode of conveying and deducing affective states of human ones. On the fly facial expression detection has become a major research area as it plays a key role in Human Computer Interaction. Facial expression detection has major application in areas of social interaction as well as social intelligence. This paper represents the various techniques used in facial expression detection along with system.

Gozde Et.al Facial expressions play an important role in communication. Impaired facial expression is a common sign of numerous medical conditions, particularly neurological disorders. Accurate automated systems are

needed to recognize facial expressions and to reveal valuable information that can be used for diagnosis and monitoring of neurological disorders. This paper presents a novel deep learning approach for automatic facial expression recognition. The proposed architecture first segments the facial components known to be important for facial expression recognition and forms an ionized image; then performs facial expression classification using the obtained ionized facial components image combined with the raw facial images. This approach integrates local part-based features with holistic facial information for robust facial expression recognition. Preliminary experimental results using the proposed system achieved 93.43% facial expression recognition accuracy, more than 6% accuracy improvement compared to facial expression recognition from raw input images. The goal of the proposed study is design of a non-invasive, objective, and quantitative facial expression recognition system to assist diagnosis and monitoring of neurological disorders affecting facial expressions. Emotion recognition based on facial expressions is very

important for interaction between human and artificial intelligence (AI) system such as social robots. On the other hand, it is much harder to recognize subtle facial expressions or facial micro-expressions than facial expressions rich in emotional expression in a real environment. In this paper, we propose a two-dimensional (2D) landmark feature for effectively recognizing facial micro-expression. The proposed 2D landmark feature is obtained by converting existing coordinate-based landmark information into 2D image information, and has an advantage of having a unique feature according to emotions regardless of the intensity of facial expression. Thus, we can achieve effective emotion recognition by learning the proposed 2D landmark feature information on a convolution neural network (CNN) and a long-term term memory (LSTM)-based network.

Experimental results show that the proposed method provides more than 77% classification performance for fine facial expression images even when learning with general facial expression images of CK+ dataset.

IV. PROPOSED APPROACH

In This process we will be propose a face descriptor, using the algorithm local binary pattern (LBP), for facial expression recognition. Hence LBP is used to extract the feature information of emotion-related features by using the directional information and ternary pattern in order to take the fine edge in the face region while the face having the smooth regions. This proposed method has better than the other existing, by extracting the histogram-based face description methods that divide the face into a small blocks and then the sample codes uniformly. Then the grid to construct the face descriptor while sampling expression related information at different scales are classified.

- Image Equitation
- Preprocessing
- Face Detection
- Feature Extraction
- Expression Recognition
- Performance Estimation

Local Binary Patterns: The original LBP operator labels the pixels of an image with decimal numbers, called Local Binary Patterns or LBP codes, which encode the local structure around each pixel. It proceeds thus, as illustrated in Fig.2: Each pixel is compared with its eight neighbours in a 3x3 neighbourhood by subtracting the centre pixel value; The resulting strictly negative values are encoded with 0 and the others with 1; A binary number is obtained by concatenating all these binary codes in a clockwise direction starting from the top-left one and its corresponding decimal value is used for labelling. The derived binary numbers are referred to as Local Binary Patterns or LBP codes.LBP methodology has been developed recently with plenty of variations for improved performance in different applications. These variations focus on different aspects of the original LBP operator:
Improvement of its discriminative capability

- Enhancement of its robustness
- Selection of its neighbourhood
- Extension to 3D data

Combination with other approaches.

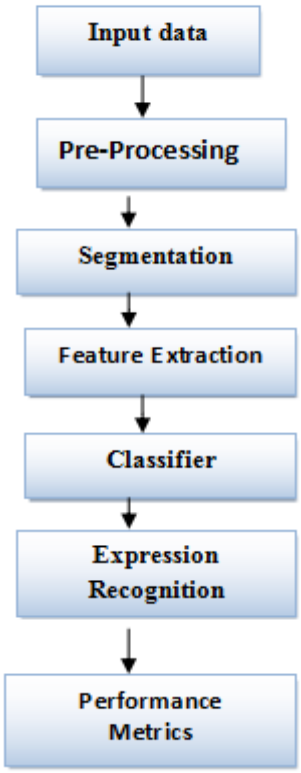

Fig.1. proposed flow chart

LBPs instead compute a local representation of texture. This local representation is constructed by comparing each pixel with its surrounding neighbourhood of pixels. The first step in constructing the LBP texture descriptor is to convert the image to greyscale. For each pixel in the greyscale image, we select a neighbourhood of size r surrounding the centre pixel. A LBP value is then calculated for this center pixel and stored in the output 2D array with the same width and height as the input image. For example, let's take a look at the original LBP descriptor which operates on a fixed 3 x 3neighborhood of pixels just like this.

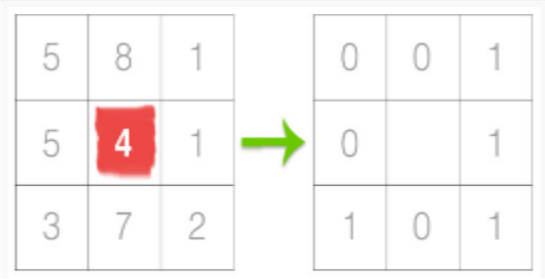

Fig.2 LBP representation.

In the above figure we take the centre pixel (highlighted in red) and threshold it against its neighbourhood of 8 pixels. If the intensity of the centre pixel is greater-than-or-equal to its neighbour, then we set the value to 1; otherwise, we set it to 0. With 8 surrounding pixels, we have a total of 2 ^ 8 = 256 possible combinations of LBP codes. From there, we need to calculate the LBP value for the centre pixel. We can start from any neighbouring pixel and work our way clockwise or counter-clockwise, but our ordering must be kept consistent for all pixels in our image and all images in our dataset. Given a 3 x 3neighborhood, we thus have 8 neighbours that we must perform a binary test on. The results of this binary test are stored in an 8-bit array, which we then convert to decimal, like this

Face Detection: it has the objective of finding the faces (location and size) in an image and probably extract them to be used by the face recognition algorithm.

Face Recognition: with the facial images already extracted, cropped, resized and usually converted to greyscale, the face recognition algorithm is responsible for finding characteristics which best describe the image. The face recognition systems can operate basically in two mode it basically compares the input facial image with all facial images from a dataset with the aim to find the user that matches that face. It is basically a 1xN comparison.

V. CONCLUSION

In this paper, we will be propose a model mainly improve the current work and find that the local facial features and expressions will be correlated. We will use LBP codes to describe the images and take into account the distances between the points of the image distribution in binary space the face image as a whole. .In geometric feature-based systems, major face components and/or feature points are detected in the images. Then classifying this information into facial expression categories like prototypic facial expression such as fear, happy, sad or Action Units (AU) such as eye open or mouth stretched concatenated into single feature vector. This feature vector outlines a well-organized representation of face and This will be helpful in determining the resemblance among images.

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