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A Review-Emotion Identification of Human Face from Video Using Neural Network

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Abstract*—Emotion identification plays significant role for human beings to communicate their emotions. Automatic facial expression analysis is a flourishing area of research and it is also challenge .this paper discuss the application of neural network based emotion identification of human face feed forward neural network used as a classifier for classifying the emotions. the accuracy of system performance have evaluate on a public database. The experimental result shows the effectiveness of our scheme. The best average of emotion identification rate achieves 90.30%

***Key Words*— Emotion identification, Matching, Neural Network, Image, Correlation.**

I. INTRODUCTION

Facial expression is one of the most natural and direct means for humans to communicate their emotions. Emotion identification means finding the expressions of an image and recognizes which expression it is such as happy, sad, angry and neutral. Some application area related to face and its expression includes personal identification, access control, video calling and teleconferencing and human computer interaction. Automatic facial expression recognition has been used in various real life applications such as security systems, interactive computer simulations and computer vision. Face detection and face localization is the primary problem in the automatic identification system of facial expression, including the face into simple background and complex background. In 1971, Ekman and Frisen discovered six different facial expressions that are universally accepted as basic emotion include happiness, sadness, fear, disgust, surprise and anger along with neutral face. Facial expression recognition system solves the problem of face detection and feature extraction. Commonly three main steps are followed for expression recognition. First, detection of face boundary, second feature extraction and the last is facial expression recognition. Feature extraction referred to facial expression information. It is often useful to have a machine perform pattern recognition. In particular, machines which can read face images are very cost effective. A machine that reads passenger passports can process many more passports than a human being in the same time. This kind of application saves time and money, and eliminates the requirement that a human perform such a repetitive task. This document demonstrates how face recognition can be done with a back propagation artificial neural network.

II. LITERATURE REVIEW

Surbhi, Mr Vishal Arora et.al. [1], Introduce recognizing meaningful expression like angry, happy, sad, disgust, fear & neutral. The approach for facial expression recognizing system is based on neural network. The main issue building a facial expression recognition system is face detection and alignment, image normalization, feature extraction & classification. The face recognition refers to identifying, by computational algorithm, an unknown face image. This paper proposes the different techniques to extract the features such as angry, happy, fear, sad, disgust and neutral. The extraction feature provided us the different recognized output using back propagation method. The experimental result shows that back propagation algorithm or method can recognize the appropriate facial expression than other methods. The approach of facial expression recognition method involves the optical flow method, active shape model technique, principle component analysis (PCA) algorithm & neural network technique.

Damir Filko, Goran Martinovi et.al. [2], this authors proposes a system for human emotion recognition by analyzing key facial regions using principal component analysis and neural networks. The proposed system has been trained and tested on the FEEDTUM database where it achieved a relatively high average score of correct recognition and therefore showed promise for future development. The system was developed in MATLAB and its functionality is based on recognition of facial lines and features gained by the canny algorithm and classified by neural networks. Eight steps are required in system operation, which does not seem prompt enough and further optimization may need to be taken if it were to be used for video processing.

Hayet Boughrara Mohamed, Chtourou Chokri Ben Amar Liming Chen et.al. [3], this author presents a constructive training algorithm for Multi Layer Perception (MLP) applied to facial expression recognition applications. The developed algorithm is composed by a single hidden-layer using a given number of neurons and a small number of training patterns. When the Mean Square Error MSE on the Training Data TD is not reduced to a predefined value, the number of hidden neurons grows during the neural network learning. Input patterns are trained incrementally until all patterns of TD are presented and learned. The most frequently used texture features are Gabor filter, pixel intensities, Discrete Cosine Transform (DCT) features, skin color information, Haar-like features, Local Binary Pattern (LBP), and Local Phase Quantization (LPQ). Accordingly, feature extraction methods based on Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) , Regularized Discriminant Analysis (RDA) and Independent Component Analysis (ICA), have been used in order to enhance the performance of

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texture information. This paper proposes to use a biological vision-based facial description, namely Perceived Facial Images PFI, in the facial expression recognition problem.

Nisha Soni, Garima Mathur, Mahendra Kumar et.al. [4] they introduces the system of intelligence by removing redundant data from face images through image compression using Sobel Edge Detection (SED) and comparing this with the two-dimensional discrete cosine transform (2D-DCT) method for the better speed and efficiency. SED which is a popular edge detection method is considered in this work. There exists a function, edge. Which is in the image toolbox? In the edge function, the Sobel method uses the derivative approximation to find edges. Therefore, it returns edges at those points where the gradient of the considered image is maximum. The developed algorithm for the face recognition system formulates an image-based approach, using the Two-Dimensional Discrete Cosine Transform (2D-DCT) or SED for image compression and the Self-Organizing Map (SOM) Neural Network for recognition purposed, simulated in MATLAB. This paper mainly used the Sobel operator method to do edge detection processing on the images It has been proved that the effect by using this method to do edge detection is very good and its anti-noise performance is very strong too accuracy.

Nupur Choudhury, Rupesh Mandal, Smriti Priya Medhi et. al [5] This authors introduce the face recognition algorithms & process of developing a SOM in order to carry out the process of face recognition in case of human. In this paper we used the unsupervised algorithm as well as combination of SOM and Hirarchical SOM along with the aid of gabor filter were discussed in order to carry out efficient process of facial recognition. Theoretically it has found that the base on the use of karhunen- loeve transform, PCA methods allow extracting the most significant eigen face of the particular sample and the mean square error to it has also found to be minimum. In this paper we will also try to put forward and insight into SOM based face recognition application. The SOM technique provides an efficient mechanism for mapping higher dimensional input space into a much lower dimensional space. It provides mechanism for reduction of dimension and extraction of features in case of a face recognition algorithm.

Deepthi.S, Archana.G.S, Dr.Jagathy Raj.V.P et. al [6] This authors proposes a method using artificial neural networks to find the facial expression among the three basic expressions given using MATLAB (neural network) toolbox. In that the artificial neural network is used to recognize facial expression. An Artificial Neural Network often just called a neural network is mathematical model inspired by biological neural networks. A neural network consists of an interconnected group of artificial neurons, and it processes information using a connectionist approach to computation. In most cases a neural network is an adaptive system that changes its structure during a learning phase. Neural networks are used to model complex relationships between inputs and outputs or to find patterns in data. This paper has briefly overviewed automatic facial expression.2-D monochrome facial images are the most popular type of pictures used for automatic expression recognition. In this project expression recognition is done using neural networks. Neural networks tend to be black box, they will train and achieve a level of performance but we cannot easily determine how they are making the decision. Neural networks are invaluable for applications where formal analysis would be difficult or impossible, such as pattern recognition and nonlinear identification and control.

III. PROBLEM FORMULATION

Computer systems act as a crucial part in today's life and in the society. Humans are becoming more and more influenced with the enhancing technology as the leaders of this fast evolving technology. Main aim of computer vision is to achieve the power of visual recognition same as that of human beings. Face recognition has achieved much priority in current scenario in the computer vision system. Face recognition demands the evolution of executable technologies to support the development of robust face recognition system. So, the need of the time is to design a robust system that can protect our surrounding 100% securely from the intruders and all the problems related to recognition of human and the verification of face images can be solved.

There is a database of N portrait images and a query image. Find k images most similar to the given face image. The number k may be a constant (for example, 20 for a large database), it may be limited by a similarity threshold, or it may be equal to the number of all pictures of the same person in the database.

A. Input image normalization

Image normalization is the first stage for all face recognition systems. Firstly face area is detected in the image. We used template matching to localize a face. Then the eye (iris) centers should be detected because the distance between them is used as a normalization factor. We located the eyes in facial images of different size using the luminance.

B. Input Data Limitation

For robust work of the system, images must satisfy the following conditions:

- They are gray-scale or color digital photos.
- The head size in the input image must be bigger than 60x80pixels; otherwise the fiducially points may be detected with low accuracy.
- Intensity and contrast of the input image allow detecting manually the main anthropometrical points like eye corners, nostrils, lipping contour points, etc.
- The head must be rotated not more than at 15-20 degrees (with respect to a frontal face position). Ideally, the input image is a digitized photo for a document (Passport, driving license, etc.).

The face recognition problem can be formulated as follows: Given an input face image and a database of face images of known individuals.

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IV. PROPOSED SYSTEM

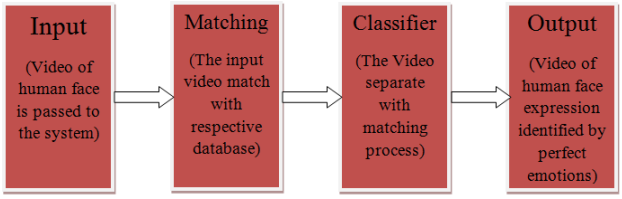

Fig. 1 Block diagram of emotion detection on human face using video & neural network

Emotions identification includes both measurement of facial motion and recognition of expression. The general approach to automatic facial expression analysis (AFEA) consists of in three steps as shown in figure 1 face acquisition, facial data extraction and representation, and facial emotion detection or classification. Basic Face acquisition is a processing stage to automatically find the face region for the input images or sequences. It can be a detector to detect face for each frame or just detect face in the first frame and then track the face in the remainder of the video sequence. To handle large head motion, the head finder, head tracking, and pose estimation can be applied to a facial emotion detection. After the face is located, the next step is to extract and represent the facial changes caused by facial expressions. The facial components or facial feature points are extracted to form a feature vector that represents the face geometry. With appearance-based methods, image filters, such as Gabor wavelets, are applied to either the whole-face or specific regions in a face image to extract a feature vector. Depending on the different facial feature extraction methods, the effects of in-plane head rotation and different scales of the faces can be eliminated by face normalization before the feature extraction or by feature representation before the step of expression recognition. Facial expression recognition is the last stage of automatic facial expression recognition systems. The facial changes can be identified as facial action units or prototypic emotional expressions.

A. Face Recognition

It is a one-to-one match that compares a query face image against a template face image whose identity is being claimed. To evaluate the verification performance, the verification rate (the rate, at which legitimate users are granted access) vs. false accepts rate (the rate at which imposters are granted access) is plotted, called ROC curve. A good verification system should balance these two rates based on operational needs.

B. Face Identification

It is a one-to-many matching process that compares a query face image against all the template images in a face database to determine the identity of the query face. The identification of the test image is done by locating the image in the database that has the highest similarity with the test image. The identification process is a “closed” test, which means the sensor takes an observation of an individual that is known to be in the database.

V. DISCUSSION

We have discussed about a fast, automatic system for face recognition which is a combination of a local video sample representation, a neural network, and a convolutional network for face recognition. The self-organizing map provides a quantization of the image samples into a topological space where inputs that are nearby in the original space are also nearby in the output space, which results in in variance to minor changes in the image samples, and the convolutional neural network provides for partial in variance to translation, rotation, scale, and deformation. Substitution of the Karhunen-Lo`eve transform for the self-organizing map produced similar but slightly worse results. The method is capable of rapid classification, requires only fast, approximate normalization and pre-processing, and consistently exhibits better classification performance than the Eigen faces approach on the database considered as the number of images per person in the training database is varied from 1 to 5. With 5 images per person the proposed method and Eigen faces result in 3.8% and 10.5% error respectively. The recognizer provides a measure of confidence in its output and classification error approaches zero when rejecting as few as 10% of the examples. There are no explicit three-dimensional models in our system, however we have found that the quantized local image samples used as input to the convolutional network represent smoothly changing shading patterns. Higher level features are constructed from these building blocks in successive layers of the convolutional network. In comparison with the Eigen faces approach, we believe that the system is able to learn more appropriate features in order to provide improved generalization. The system is partially in variant to changes in the video samples, scaling, translation and deformation by design.

Face recognition is a both challenging and important recognition technique. Among all the biometric techniques, face recognition approach possesses one great advantage, which is its user-friendliness (or nonintrusiveness). In this project, we have given an introductory survey for the face recognition technology. We have discussed issues such as the generic framework for face recognition; factors that may affect the performance of the recognizer, and several state-of-the arts face recognition algorithms. We hope this proposed project can provide the readers a better understanding about face recognition, and we encourage the readers who are interested in this topic to go to the references for more detailed study.

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