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Facial Expression Recognition

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Abstract - *Human face is considered to be the mirror of the heart & the emotions and expressions play a very prominent role in the delivery of one's feelings. It helps in non-verbal communication by the motion of specific muscles underneath the skin. On a regular basis, humans recognize and respond to situations on the basis of characteristic features and action points of the human face which are a major part of facial emotions.*

This paper proposes a survey and a methodology to understand and recognize the facial expressions along with an abstract view of the system which we are going to implement for increasing the speed and accuracy in FER (facial expression recognition) to use in feedback systems, investigation operations, human computer interactions, computer vision systems etc.

***Key Words*: Face recognition, Convolution Neural Network (CNN), Local Binary Patterns Histograms and Classifier.**

1. INTRODUCTION

Technology has become a crucial part of everyone's daily life now-a-days. With improvements in technology, the advancement in online systems has become exponential. A few years back it was a dream to achieve what has been already done. To further aid these systems and products, computing systems are used. An efficient facial expression recognition system can further improve these systems and the overall user experience by using in human-computer interactions, feedback systems, computer vision systems etc. We have proposed a method to increase the speed and accuracy of traditional FER systems using effective and suitable databases along with advanced classifiers. Our proposed system has the following components:

i) Image processing for grey-scaling and contrast stretching.

ii) Datasets and CNN for face recognition and localization.

iii) Local Binary Pattern Histograms and Classifiers for FER.

Improvement in this concept could result in betterment of various sectors such as the FMCG (fast moving consumer goods), medicine, education, business, agriculture when used in association with computing technology. Furthermore, they could be useful in obtaining subtle expressions of people with psychological disabilities such as autism or cerebral palsy.

2. LITERATURE SURVEY

Zhang et al. [1] researched over two types of features, one being geometry based features and other Gabor wavelet based features, for facial expression recognition. They identified that knowledge and template based methods are face detection strategies while local binary pattern phase correlation, haar classifier and AdaBoost are expression detection techniques.

Chen, J., Chen, Z., Chi, Z., & Fu, H. [2] they suggested that face reader is the premier for automatic Facial expression analysis and Affectiva, Emotiet etc are APIs for emotion detection. Automatic FER includes two aspects: facial feature representation and classifier problem.

Dalal and Triggs et al. [3] in 2005 studied Histogram of Gradient (HoG), SIFT, Local binary pattern (LBP) for facial expression representation. LBP is a simple texture operator that labels the pixels by using thresholding techniques. HoG provides numerical values to the appearance of gradient orientation in an image.

Happy, S. L., George, A., and Routray, A. et al [5] in 2012 suggested that use of LBP results in higher accuracy algorithms. Various tests conducted by standardized testing agencies found out that algorithms produce more than 93.3% accuracy if it implements Local Binary Patterns (LBP). It is also compatible with a significant number of classifiers, filters etc.

3. PROPOSED SYSEM

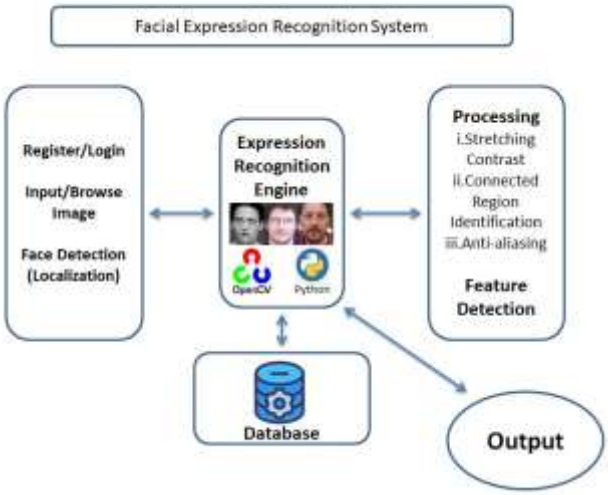

Fig 1.Block diagram of proposed system

3.1 Input Image

First, an image is taken as input by the use of a decent web-cam or chosen from a dataset.

3.2 Face Detection

Our proposed system will use the Haar classifier algorithm. The algorithm will scan the image and each section of the image is represented as the candidate for identification of a face. A candidate is rectangular window, which is cross checked for a characteristic feature of a normal human face. Characteristic features include eyes, nose, ears, moustaches, beard, hair styles, teeth, cheek bone elevations etc. A cascade is used to eliminate candidates that lack characteristic features. If one of the features is found, adjacent candidates are examined and combined. At the end of this step, the output is compared to a threshold result. If all the stages are passed, then the image is said to have a face.

3.3 Image Processing

This step requires implementation of three things:

Stretching contrast: Contrast is the difference in color, brightness and luminance. This makes it distinguishable from other images. In the process of contrast stretching, the minimum contrast section is darkened and the maximum contrast is brightened up, making the edge detection easier.

Connected Region Identification: Once a particular characteristic feature is identified, its connected regions are identified and labeled with the same value as that of the characteristic feature point. Each of these regions is detected using methods of Local binary patterns.

Grey Scaling and Anti-aliasing: The face localized in the foreground of the image, divided into several regions is converted to various shades of black, white and grey colors. The background, which is usually the blurred portion of the image is darkened to a black shade. By using Gaussian filters the entire image is anti-aliased pixel-by-pixel to produce a smooth and sharp input image.

3.4 Feature Detection

The resulting image obtained after previous steps gives us grey-scaled face with localized characteristics features. Each feature is now divided into 8 or more action points situated on the edge of the characteristic feature. The Euclidian distance between these action points is calculated. A mean of these distances is plot on the Bezier curve. The classifier analyses this Bezier curve to recognize the expression or the emotion which is presented as the output. The output can be used by various sectors in order to generate their required and suitable product.

4. FUTURE SCOPE

An efficient, fast and accurate Expression recognition system is most important aspect of the computer vision system and could be a major part of the Human-Computer System.

FER combined with AI (Artificial Intelligence) could result in world changing technological advancement in terms of innovation and invention.

5. CONCLUSION

The proposed survey provides an approach and methodology for classification and recognition of facial expression presented by humans. The provided method could be improved by using specifically designed datasets and advanced hardware systems. The proposed method is based on the learnings from the previously implemented approaches mentioned in the references. It provides a simple solution to a complex problem and focuses on feasibility in terms of real-life situations. Our future objective would be to test and compare various other approaches along with improved hardware to put forth an even faster and reliable system.

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