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INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

Vol. 02, Issue 05, May 2022, pp : 353-358

e-ISSN : 2583-1062

Impact Factor : 2.205

SENTIMENT ANALYSIS USING FACIAL EXPRESSION AND DEEP NEURAL NETWORK

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ABSTRACT

Human emotions are mental states of feelings that arise spontaneously rather than through the conscious effort and are accompanied by physiological changes in facial muscles which implies expressions in face. Human emotions are mental states of feelings that arise spontaneously rather than through the conscious effort and are accompanied by physiological changes in facial muscles which implies expressions in face. Facial expressions play a key role in non-verbal communication which appears due to internal feelings of a person that reflects on the faces. Some of critical emotions are happy, sad, anger, disgust, fear, surprise and mainly pain of emotion will detect. Using deep convolution neural network we providing better approach to predict human emotions frame by frame. In this FER-2013 database has been applied for training and testing purpose and the algorithm is based on python, tensor flow and OpenCV.

Keywords: Sentiment Analysis, Facial Expression, Open CV, Deep convolutional neural network and Human Emotions.

1. INTRODUCTION

Ever since computers were invented, people have wanted to build artificially intelligent (AI) systems that are mentally and/or physically equivalent to humans. Facial expression recognition is the process of identifying human emotion based on facial expressions. Humans are naturally capable of recognizing emotions. There is a universality in facial expressions of humans in expressing certain emotions. Human develop similar muscular movements belonging to a certain mental state, despite their place of birth, race, education, etcetera. Automated facial expression recognition has numerous practical applications such as psychological analysis, meical diagnosis, forensics (lie-detection), studying effectiveness of advertisement and so on. The ability to read facial expressions and then recognize human emotions provides a new dimension to human-machine interactions, for instance, smile detector in commercial digital cameras or interactive advertisements.

Nowadays, automatic personal identification in access control has become popular by using biometrics data instead of using cards, passwords or pattern. Most of the biometrics data have to be collected by using special hardware such as fingerprint scanner, palm print scanner, DNA analyzer. And, the target objects have to touch with the required hardware in the stage of data collection. The advantage of this system is that face recognition does not require to be touched with any hardware.

FACE RECOGNITION

Face recognition tends to be the most appealing biometric procedure as it is the most natural process for human identification, it is the least obtrusive method and yet it remains the most challenging modality. The first step in a biometric recognition or authentication system is face detection and feature extraction, which are necessary to locate the face position and obtain the face features in the image for further processing. The features obtained are then fed into the critical step of face recognition or authentication.

The recognition or authentication process remains a challenging endeavor for researchers due to the myriad of faces that can be considered and the variability in the circumstances and ways under which the images of these faces are taken Therefore, feature extraction and subject recognition are considered the two focal points of this research. The system to be built will elaborate on how the learning and recognition phases are integrated into one system as it seeks higher recognition accuracy and faster processing time.

2. PROBLEM IDENTIFICATION

Automatic human face detection from images is a challenging task due to the variances in the image background, view, illumination, articulation, and facial expression.

3. OBJECTIVES & CONSTRAINTS

Objective:

Our objective is to predict the expression of human face in real time as fast and as accurate as possible.

Constraints:

- Latency: Given an image, the system should be able to predict the expression immediately and transfer the result. Hence, there is a low latency requirement.
- Interpretability: Interpretability is important for still images but not in real time. For still images, probability of predicted expressions can be given.
- Accuracy: Our goal is to predict the expression of a face in the image as accurate as possible. Higher the test accuracy, the better our model will perform in real world.

4. RELATED WORKS

Human-Computer Interaction Systems allowing for more natural communication with machines. Such systems are especially important for elderly and disabled persons. Face detection has always been a vast research field in the computer vision world, considering that it is the backbone of any application that deals with the human face (e.g. biometric systems). The paper presents a vision & feature-based system for detection of long voluntary eye blinks and interpretation of blink patterns for communication between man and machine. Supplemented by the mechanism for detecting multiple eye blinks, this paper provides a complete solution for building intelligent hands-free input devices. Due to recent increase of computer power and decrease of camera cost, it became very common to see a camera on top of a computer monitor. The described technique uses off-the self-cameras that allow one for tracking nose features, eyebrows and head position robustly and precisely in both 2D and 3D coordinates. This tracking and monitoring allows user to give input to the computer machine and access the entire system in a hands free manner. [1]

A subspace algorithm called block independent component analysis (B-ICA) for face recognition. Unlike the traditional ICA, in which the whole face image is stretched into a vector before calculating the independent components (ICs), B-ICA partitions the facial images into blocks and takes the block as the training vector. Since the dimensionality of the training vector in B-ICA is much smaller than that in traditional ICA, it can reduce the face recognition error caused by the dilemma in ICA, i.e. the number of available training samples is greatly less than that of the dimension of training vector. Experiments on the well-known Yale and AR databases validate that the B-ICA can achieve higher recognition accuracy than ICA and enhanced ICA (EICA). [2]

Image transformation is required for color–texture image segmentation. Various techniques are available for the transformation along the spatial and spectral axes. For instance, the HSV–wavelet technique is shown to be very effective for image information mining in remote-sensing applications. However, the HSV transformation approach uses only three spectral bands at a time. In this letter, a new feature set, obtained by combining independent component analysis and wavelet transformation for image information mining in geospatial data, is presented. Experimental results show the effectiveness of the presented method for image information mining in Earth observation data archives. [3]

A survey of evolutionary algorithms designed for clustering tasks. It tries to reflect the profile of this area by focusing more on those subjects that have been given more importance in the literature. In this context, most of the paper is devoted to partitional algorithms that look for hard clusterings of data, though overlapping (i.e., soft and fuzzy) approaches are also covered in the paper. The paper is original in what concerns two main aspects. First, it provides an up-to-date overview that is fully devoted to evolutionary algorithms for clustering, is not limited to any particular kind of evolutionary approach, and comprises advanced topics like multi-objective and ensemble-based evolutionary clustering. Second, it provides a taxonomy that highlights some very important aspects in the context of evolutionary data clustering, namely, fixed or variable number of clusters, cluster-oriented or non-oriented operators, context-sensitive or context-insensitive operators, guided or unguided operators, binary, integer, or real encodings, centroid-based, medoid-based, label-based, tree-based, or graph-based representations, among others. [4]

A 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 introduction of a new image representation called the “Integral Image” which allows the features used by our detector to be computed very quickly. The second is a simple and efficient classifier which is built using the AdaBoost learning algorithm (Freund and Schapire, 1995) to select a small number of critical visual features from a very large set of potential features. The third contribution is a method for

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combining classifiers in a "cascade" which allows background regions of the image to be quickly discarded while spending more computation on promising face-like regions. A set of experiments in the domain of face detection is presented. [5]

5. EXISTING SYSTEM

Numerous scholars have used dissimilar methods for classifying facial expression. The active shape models are assessment of a multi-resolution method and hybrid approaches of Neural Network and Hidden Markov Model was proposed. This system used Extended Cohn Kanade (CK+) database. But these database gives a major limitations like

1. AU codes are well defined, but emotions labels are not as they refer to what was requested rather than what was actually performed

2. Lack of common performance metric against which to evaluate new algorithms

6. PROPOSED SYSTEM

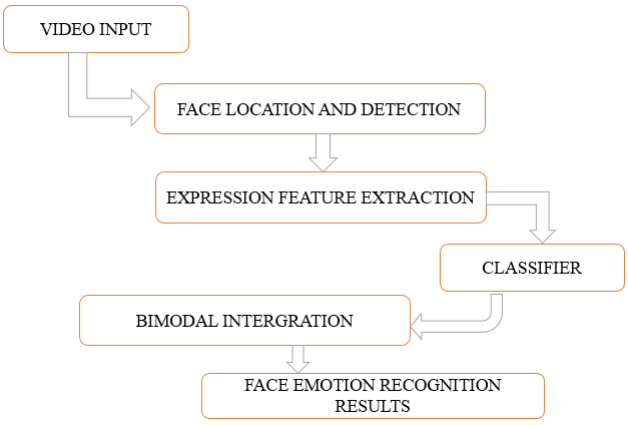
We present an automatic emotion recognition approach from different images of the human based on shape feature measurement. We present an approach for identifying and recognizing different facial expression of the human. The objective of the proposed system is to design an approach which automatically detects the face and identifies the different facial expression of the human. The proposed approach presents a very low degree of complexity, which makes it suitable for real-time applications.

For face detection, Viola-jones algorithm is used. The feature values are measured for the face image. Depending upon the selected features and the measured region properties of the human face, the different expression of the human was further classified using Multi-SVM. The proposed method is superior compared with other state-of-the-art approaches.

OpenCv python program is used to perform the face detection and this OpenCv is a video and image processing library so the limitations can be overcome. The viola jones algorithm is used to detect the faces on the grayscale image and then finds the locations on the colored image.

7. SYSTEM ARCHITECTURE

A system architecture is a conceptual model that specifies a system's structure, behavior, and other aspects. A formal description and representation of a system arranged in a way that facilitates reasoning about the system's structures and behaviors is known as an architectural description.



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8. ADVANTAGES

- Face of individuals is identified.
- It automatically identifies the expression/emotion of the human correctly
- It results in high accuracy even though lighting illumination problem occurs

9. DISADVANTAGES

- Inaccurate counting result.
- Time consuming process

10. MATERIAL AND METHODS

MODULE LIST

- Dataset collection
- Face Detection
- Feature Extraction
- Classification

A.DATA SET COLLECTION

The uses and importance of video data. Any piece of technology that has to recognize images that are in motion requires to be developed with unique and particular datasets which are video datasets.

B.FACE DETECTION/EXTRACTION

The Face image of the human is detected using viola-jones detection algorithm. The non-face area is not detected. Then we can extract the detected face area separately. This process is known as face extraction.

The Facial parts image of the human such as Face, Left Eye and Right Eye and Mouth is detected using viola-jones detection algorithm. The non-facial parts are not detected. Then we can extract the detected parts separately. This process is known as facial parts extraction.

C.SHAPE BASED FEATURE EXTRACTION

The enhanced image was given as the input for feature extraction stage. Here the technique based on region properties measurement is used for extracting the shape features of the image. This will extract the local feature descriptors from images. The main component that can be encountered as an attribute for face recognition is shape. Here the technique based on region properties measurement is used for extracting the shape features of the image. This will extract the local feature descriptors from images.

The main motivation behind the shape analysis is that different expression of the different face images may have different color or texture, but it is difficult to classify the emotions generated by the same person, since only the lip and eye movement will varied slightly. Hence we are going to measure the feature values which have been changed due to slight variation.

The main stages that involves finding shape feature is boundary, area pixel calculation, major axis length and minor axis length the enhanced grayscale image was given as the input for feature extraction stage. Here the region properties of the given image were measured and different features are extracted.

D.CLASSIFICATION

The different facial expression images were classified based on the extracted feature values from the shape features.

Finally the human emotions can be classified into six archetypal emotions: surprise, fear, disgust, anger, Neutral, and sadness, which are so-called six basic emotions. The neutral stage is also considered as one of the expression which was also measured.

ALGORITHMS USED

A.Viola-Jones Detection Algorithm

Face detection is the first step of the face recognition system. The performance of the entire face recognition system is influenced by the reliability of the face detection. By using face detection, it can identify only the facial part of an image regardless of the background of this image. In this system, Viola-Jones face detection method is used. Viola-Jones rescale the detector instead of the input image and run the detector many times through the image – each time with a different size. Viola-Jones has devised a scale invariant detector that requires the same number of calculations whatever the size. This detector is constructed using a so-called integral image and some simple rectangular features reminiscent of Haar wavelets.

B.Shape Based Feature Extraction

The enhanced image was given as the input for feature extraction stage. Here the technique based on region properties measurement is used for extracting the shape features of the image. This will extract the local feature descriptors from images. The main component that can be encountered as an attribute for face recognition is shape. Here the technique based on region properties measurement is used for extracting the shape features of the image. This will extract the local feature descriptors from images.

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C.Multi-SVM classifier

Finally, SVM classifier is made using the whole model of feature subset selection. The pattern classification is defined as the task to categorize any object within a given category called class. For this paper, the classification stage was made using a support vector machine (SVM). SVM classifier is used for classifying multiple classes, and then it was called as Multi-class SVM.

11. CONCLUSION

We have presented a complete and fully automated approach for facial expression identification by simultaneously utilizing the face surface and face subsurface features. We presented a new algorithm for the face identification and recognition, which can more reliably extract the face features and achieve much higher accuracy than previously proposed facial identification approaches. The proposed approach presents a very low degree of complexity, which makes it suitable for real-time applications. Depending upon the selected features and the measured region properties of the human face, the different expression of the human was further classified using SVM. The proposed method is superior compared with other state-of-the-art approaches and that the analysis of the general image quality of the face images reveals highly valuable information that may be very efficiently used to discriminate them from fake traits.

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