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FACIAL EXPRESSION BASED EMOTION DETECTION SYSTEM FOR ANALYSIS OF SENTIMENTS IN ELDERLY

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Abstract: This article addresses the use of extraction of characteristics for facial expressions in conjunction along a neural network to identify various sentiments (happy, sad, angry, fear, surprised, neutral etc..). The rapid advancement of artificial intelligence has made significant contributions to the field of technology. One of the most crucial aspects of human communication that aids in our understanding of what the other person is attempting to say is the expression on their face. Only one-third of the message is understood vocally, and the other two-thirds are understood nonverbally. There are numerous face emotion recognition (FER) systems in use today, however they are ineffective in real-world situations. Despite the fact that many assert that their system is nearly perfect. The testing data then examines the information and its classification report names the testing data and indicates how accurately it was classified. For better data categorization, many strategies are used, modifying the images using the Histogram of Oriented Gradients (HOG) and Discrete Wavelet Transform or passing the training images through a Gabor filter (DWT).The training images are first run through The Histogram of Oriented Gradients (HOG) produces the best results to date, with an average precision of 92%.

Keywords: Facial Expressions, Face Emotion Recognition (FER), Histogram of Oriented Gradients (HOG), Discrete Wavelet Transform (DWT).

I. INTRODUCTION

We are aware of how important emotions are to human existence. Human faces can reveal how someone is feeling or in what mood they are at various times or moments. When communicating, Humans can make thousands of different facial expressions that vary in complexity, intensity, and meaning. Subtle alterations in one or more distinct traits frequently signal emotion or intention.Its interpretation may change depending on whether one or more facial actions are present or absent. Additionally, despite having a similar overall morphology, various facial expressions can convey a variety of meanings depending ontheir intensity. to accurately capture the nuances of nonverbal communication through facial expression.

A facial expression recognition system uses a digital video camera to analyse the aspects of photos of people's faces and provide feedback. It analyses the entire facial structure, including the spaces between the margins of the eyes, lips,nose, and jaw. It is essential for recognising and detecting emotions in order to identify people as well as for non-verbal communication. When a user puts themselves in front of the camera, these dimensions are stored in a database and used as a comparison. Although this biometric has received extensive and maybe ardent promotion as a unique method of identifying potential, it hasn't yet gained widespread acceptance in high-level usage. Facial expressions serve as the interface between humans and computers. Emotions are always altering in response to events that are brought about by an impelling force.

II. LITERATURE SURVEY

A. Emotion detection and characterization using facial features:

In this paper, The training data is passed through a series of filters and processes and is eventually characterized through a Support Vector Machine(SVM), refined using Grid Search. The best result achieved so far is by passing the training images through Histogram of Oriented Gradients(HOG), followed by characterization by SVM, which gives an average precision of 85%.

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This paper uses Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA), both of which contribute to its accuracy

B. Automatic facial emotion recognition by northumbria university:

In this context, The overall system is equipped with horizontal vertical neighborhood local binary patterns for feature extraction. The proposed system is evaluated with multiple facial expression datasets and also compared with other state-of-the art models

In this paper, they have presented a novel variant of FA to enhance the performance of an automatic facial emotion recognition system.

C. Real-Time Facial Emotion Recognition System With Improved Preprocessing and Feature Extraction:

This paper aims to build an enhanced system that can analyse the exact facial expression of a user at that particular time and generate the corresponding emotion. Datasets like JAFFE and FER2013 were used for performance analysis.

Inclusion of preprocessing methods like cropping and intensity normalisation and feature extraction methods like HoG and facial landmarks improved the accuracy.

D. Facial Emotion Recognition Using Deep Convolutional Neural Network:

The main focus of this work is to create a Deep Convolutional Neural Network (DCNN) model that classifies 5 different human facial emotions. The model is trained, tested and validated using the manually collected image dataset.

The model has comparable training accuracy and validation accuracy which convey that the model is having a best fit and is generalized to the data.

III. EXISITING SYSTEM

In the referred models , they have used methodologies and algorithms to measure their model's accuracy like, Histogram of Oriented Gradients(HOG) ,Fisherface classifier and NN-based ensembles and SVM-based ensembles and thie accuracy rates are **85%**,**87%**,**91%** & **93.3%** respectively. The limitation of their models is that their model can process single subject's emotion at any given instance of time. So their model won't be able to process multiple subjects at once.

IV. PROPOSED SYSTEM

In addition to the CNN model, an unique method is proposed in this study for enhancing Emotion recognition in real time. To improve training accuracy, the proposed method employs additional feature extraction techniques. The fundamental architecture of the suggested system is depicted in Figure 1. Four modules make up it. Using a local binary patterns (LBP) cascade classifier, the first module uses a webcam to capture real-time footage while identifying faces. By seeing the image as a composite of tiny patterns, the detecting process was carried out. Pre- processing of the image is covered in the next module.

Face detection is the major use of Haar cascade. The method needs a large number of training datasets, where positive datasets are photos with faces and negative datasets are images without faces. Extraction of features from these photos is the next step. Haar characteristics are utilised for this. Each rectangle represents the image's bright and dark areas. These rectangles show a single value that was created by combining bright and dark patches.

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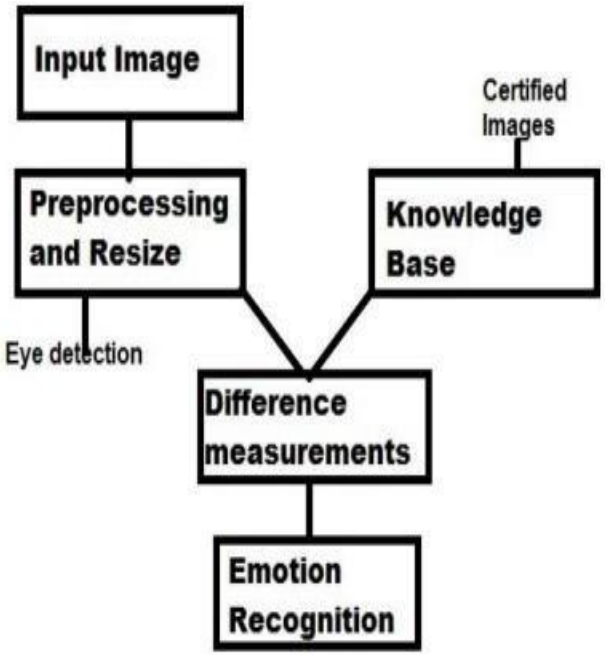

A. Feature Extraction

In order to improve human interpretations, feature extraction is a method that is used in both pattern recognition and image processing. It begins with measured datasets and builds matching values that are meant to be useful and facilitate learning. Reducing the number of assets needed to represent enormous amounts of data is the goal of feature extraction. Large numbers of variables are likely to result in errors while doing sophisticatedcalculations. From this point forward, we compute the issue using a general way of combining variables.

Images processing is one of the key areas of this application,where the algorithm locates and separates forms and points that contain features of an image or video in grey scale. It is essential for determining visual objects. Following a phase of determining a pixel's code value in an image's metrics, features are extracted. Based on it, the output is displayed after the characteristics are specifically retrieved from those Grayscale images. Predefined interfaces in software packages offer feature extraction and dimension reduction. The algorithms are openly accessible.

B. Classification of Extracted image

Valance points will be placed all over the face, and these points are used to calculate emotions and expressions. The separation and angle between these spots determine the type of emotion and the percentage (which runs from 0 to 100) of the user's facial expression. For instance, if the input is joy, the weighted sum of each individual emotion divided by the sum of all expressions yields the overall percentage. If the sum is more than the cut-off point, the corresponding emotions are shown. The points also compute degree ofconfidence, which determines the likelihood that population parameters are correct, in addition to valence metrics. The accuracy of emotion detection will increase with confidence level

a. Back Propagation Neural Network (BPNN)

Because of its simplicity and efficiency in utilising a large training data set, the multilayer back propagation neural network was used as one of the classifiers in the current work.

b. Support Vector Machine (SVM)

The multi-class Support vector machine is a potentially linear classifier that is based on the concept of decision planes, which define decision boundaries(SVM). An illustration that distinguishes between a group of items with different class memberships is called a decision plane. A hyperplane that separates pixels into various classes is made using the training data.

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c. k-Nearest Neighbor (k-NN)

To categorise test results using a distance metric, an ad hoc classifier known as the k-nearest neighbour (k-NN) algorithm is used. In the current work, the neighbourhood parameter "k"is used to identify images with a desired value range (k = 1, 2, 3). The selection of the "k" value, which is essential to the classifier's performance, is influenced by both the dataset andthe intended application.

V. CONCLUSION

Humans have the ability to displaying a ton of different facialexpressions admist conversation, depending on their mood, personality, behaviour, and many other aspects. Using a CNN-style neural network, we have explained how to identify human emotions in this research.

The features for the three-dimensional face model have been calculated. Haar Cascading was employed to categorise the features. In comparison to the existing techniques, our experimental findings demonstrate that the proposed hybrid model can identify face emotion from an image with an average accuracy of 86.10% and less than.30% model loss.

We can apply this technique in the future to recognise emotions in conversations and video calls on a variety of platforms, including social media platforms. On numerous social media platforms, including Twitter, Whatsapp, Messenger, and others, we can apply this technique. Using this technology, we can identify a person's mental health condition by identifying his or her emotions during chats or video calls, protecting him or her from the trauma.Consequently, the health industry can also benefit from our suggested technique.

ACKNOWLEDGEMENT

The old and illiterate will benefit from this endeavor. to minimise the gap between the elderly and their siblings or care takers, this emotion detection detection and monitoring technology is being developed. This prototype can assist in assessing the emotions of elderly. A benefit to the community of the elderly is carriernotification. The system will be thoughtfully designed to be user-friendly for everyone.

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