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FACE DETECTION AND FEATURE EXTRACTION FOR FACIAL EMOTION DETECTION

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Abstract : *Facial emotion Recognition has been a major issue and an advanced area of research in the field of Human-Machine Interaction and Image Processing. To get facial expression the system needs to meet a variety of human facial features such as color, body shape, reflection, posture, etc. To get a person's facial expression first it is necessary to get various facial features such as eye movement, nose, lips, etc. and then differentiate by comparing the trained data using differentiation appropriate for speech recognition. An AI-based approach to the novel visual system system is suggested. There are two main processes in the proposed system, namely Face detection and feature extraction.Face detection is performed using the Haar Cascade Method. The proper feature extraction method is used to extract the element and then used a vector machine to distinguish the final face shape. The FER13 data set is used for training.*

Keywords **-** *Emotion recognition, CNN, Machine learning, Python, AI*

1.INTRODUCTION

Mental illness has a profound effect on human performance, health, and quality of life. Getting early warning of depression or other mental illness is a challenge.

Generally, the availability of emotional information is required for emotional awareness .The elements of emotional information include a variety of physical or behavioral responses as well as changes in mood, including internal and external emotional factors.

Human emotion recognition plays an important role in the interpersonal relationship and for detecting user's state of mind. The automatic recognition of emotions has been an active research topic from early times,therefore, there are several advances made in this field. Emotions are reflected from hand,speech, gestures of the body and through facial expressions. Hence extracting and understanding of emotion is very essential for the interaction between human and machine communication[1].

Facial recognition (FER) has emerged as an important area of research over the past two decades. Facial expressions are one of the quickest, most natural, and powerful ways for people to communicate their intentions and emotions. The FER system can be used for many important applications such as driver safety, health care, video conferencing, virtual reality, and cognitive science etc.

Often, facial expressions can be divided into neutral, anger, disgust, fear, surprise, sadness and joy. Recent research shows that young people 'ability to read other people's feelings and emotions is diminished by the increased use of digital devices[2]. Therefore, it is important to develop an FER system that accurately detects facial expressions in real time.

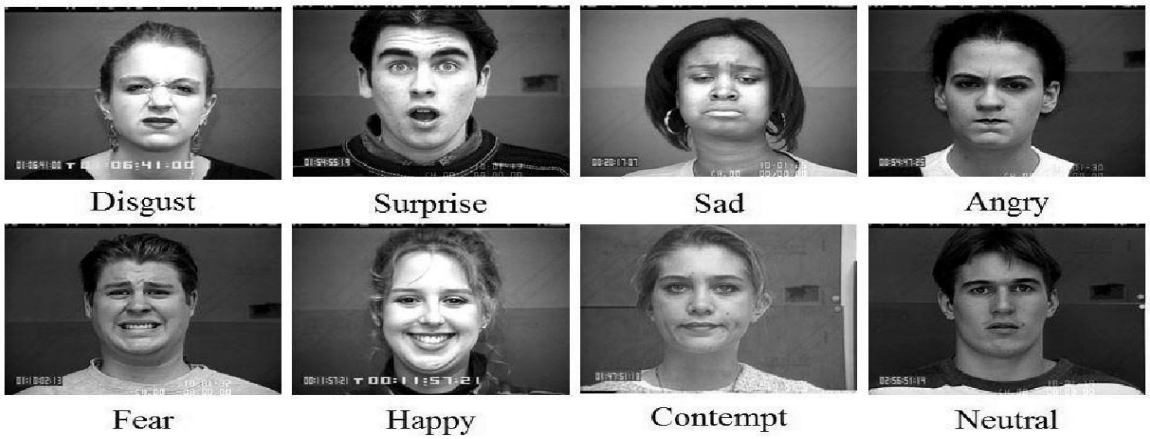

Fig 1.1 : 8 emotion database examples [3]

An important platform where we see the importance of emotionally acquiring through business promotions. Most businesses thrive on customer service in all products and services. If a smart installation program can capture and identify real-time feelings based on a user's photo or video, they can decide whether the customer liked or disliked the product or offer.

In recent years, in-depth learning has been a great success and is effective because of the effect achieved by its properties that allow for automatic release of features and isolation such as the convolutional neural network CNN and the repetitive neural RNN network[4]

2.METHODOLOGY

2.1 PROPOSED METHOD

Emotion Recognition System comprises of three principle steps. Initial step is to recognize the face area from the gained picture and afterward preprocessed in order to limit the natural and different varieties in the picture. The following stage is to remove articulation highlights which are then ordered in the third step. The classifier gives the yield of the articulation which is perceived. The flowchart is shown below:-

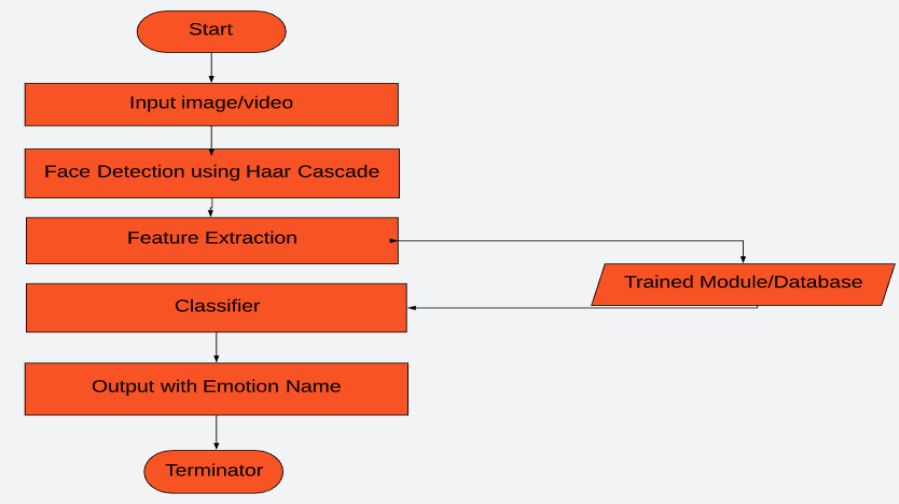

Fig 2.1: :Flowchart of the Proposed method.

2.2 Face Detection

Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001 proposed that Object Detection using Haar feature- elements based cascade classifiers is an efficient object detection method.

It is a machine learning based methododology where a cascade function is trained from a plenty of positive and negative images.Then it is used to detect objects in other different images.

Here we will work with face detection.The algorithm needs a plenty of positive images (images of faces) and negative images (images without faces) to train the classifier as per requirements. Then we have to extract features from it. For this, haar features shown in below image(Fig 2.1) are used. They are just like our convolutional kernel. Every facial feature represent a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle. [6]

A standard cascade classifier is a very effective way of Viola and Jones to get a face. In many cases, the task of finding an object with a solid structure can be addressed in this way, not just in the face. The cascade classifier is a tree-based technology, in which Viola and Jones used things like Haar to find a human face. [7]

The Haar-like features are shown in Figure

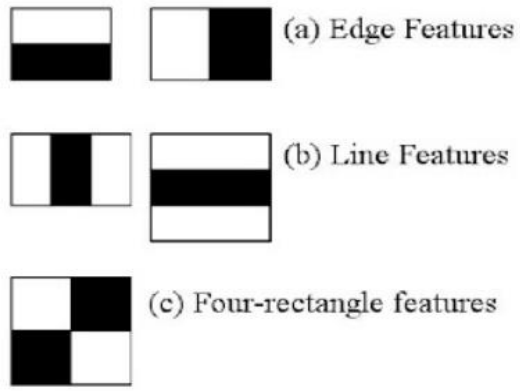

Fig 2.2: Haar like features

2.3 Feature Extraction

Facial feature extraction is the method of extracting facial features such as eyes, nose, mouth, etc. from a individual's face image. The extraction of a facial feature is very important in the implementation of processing techniques such as facial recognition, face tracking or facial expression recognition. [8]

Localization and detection of eye is important among all the facial features, from which locations of all different facial features are identified.

We use an algorithm called face landmark estimation for localization. There are lots of ways to do this, but we are going to use the approach invented in 2014 by Vahid Kazemi and Josephine Sullivan. [9]

Further,we will come up with 68 specific points (these are called landmarks) that exist on every face — the top of the chin, the outside edge of each eye, the inner edge of each eyebrow and many more. Further, we are going to train a machine learning(ML) algorithm to be able to find these 68 specific points on any face[10]

Fig 2.2: Facial Landmark Points[11]

3.Result and Discussion

Implementation is done on two basic things which is required to implement for facial emotion detection first one is face detection

For emotion detection first important thing is to detect face and with the help of face, emotion is detected. For face detection there are many methods are used but in our Proposed system Haar cascade classifier is used. Haar Cascade classifier is used to detect face from the image, feature from face or body. It is also used to detect eyes, smile, full body, half body etc. If face is detected the face detection part in image is shown by a rectangle

First required XML classifiers need to be loaded. Further,load our input image (or video) in grayscale mode. Then it will search for face, If faces are found, it returns the positions of detected faces as Rectangle(x,y,w,h) (Fig 3.1). Once we get thelocations, we can create a ROI for the face.

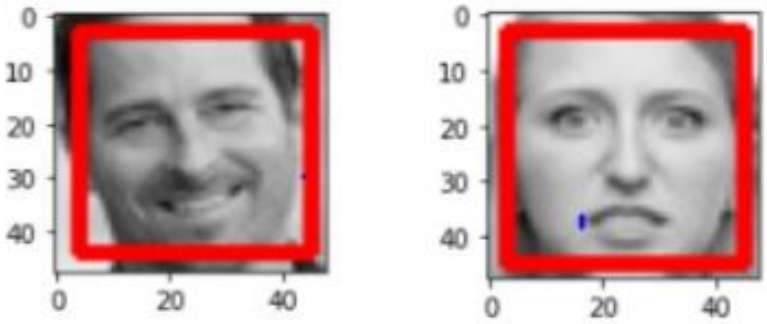

Fig 3.1 : Output of Face detetction

For Feature extraction process first face recognition library is loaded. Input image or video which is coming from the face detection part is loaded. Then facial landmark algorithm is applied on input image (or video). If feature extraction part is applied on the image it will show an output with 68 landmark points on the image. The facial feature parts are shown here are chin, eyes, eyebrows, nose and lips etc (Fig 3.2).

The facial landmark point is shown by drawing circle on image. Position of circle is return by circle (image, center, radius, color, thickness)

Fig 3.2 Output of Feature Extraction

4.CONCLUSION .

An image processing techniques is developed for extraction of facial landmark features .We successfully detected the face using Haar cascade classifier and then extracted the features. This can be further used for detection of facial emotion . Future work should entail investigating more accurate detection method that gives better computational efficiency.[12]

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