SYNOPSIS

Report on

Emotion Detection System

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Session:2022-2023 (4th Semester)

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(MARCH- 2023)

ABSTRACT

Emotion recognition plays a crucial role in the era of Artificial intelligence and Internet of things. It offers tremendous scope to human computer interaction, robotics, health care, biometric security and behavioral modeling. Emotion recognition systems recognize emotions from facial expressions, text data, body movements, voice, brain or heart signals. Along with basic emotions, attitude, control over emotions and power of activation of emotion can also be examined for analyzing sentiments. This paper identifies various supervised and unsupervised machine-learning techniques for feature extraction and emotion classification. Comparative analysis has also been made of various machine learning algorithms used in referenced papers. It tells the scope and applications of automatic emotion recognition systems in various fields. This paper also discusses various parameters to increase the accuracy, security and efficiency of the system.

Keywords: Sentiment analysis, emotion recognition, compound emotions.

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Introduction

Emotion recognition is the study of recognizing six universal expressions (anger, joy, fear, happiness, sadness and surprise as shown in Figure 1 using various computer science techniques. As emotions reflect one's state of mind by his/her unintentional actions that may or may not be paralinguistic. So, Emotions of a person are recognized using his/her behavioral characteristics such as voice, handwriting, facial expressions, brain signals (EEG), heart signals (ECG) etc. Behavioral characteristics are not only used to identify a person but also help to recognize emotions, thus these are also known as soft biometrics [16]. Soft biometrics can be classified as physical traits, behavioral traits and human adhered characteristics. Such as height, weight, skin color, eye color are physical traits, voice, gait, keystroke are behavioral traits and clothes, accessories are human adhered characteristics. Soft biometrics help semantic interpretation of a person's thoughts, feelings, actions and appearance to recognize emotions.

Literature Review

As described, there are five basic emotions: happiness, sadness, fear, anger and neutral which were recognized from multiple body movements such as head region, joints, upper and lower body movements, arm bound space to improve the accuracy of emotion recognition system. They have used video datasets to extract motion or kinetic features from speed, space, and symmetry of various body parts under three scenarios as walking, sitting and action independent cases. On extracted geometric and temporal features, ANOVA (Analysis of Variance) and MANOVA (Multivariant Analysis of Variance) were applied to compute relevance of extracted features and normalization of features. To fuse the features, score and rank level fusion techniques were used. As given in the paper, accuracy was 90% in walking, 96.6% in sitting and 86.66% in action independent cases were identified. Thus it can be seen that the feature extraction framework has better understanding of emotions than human beings. Future scope stated in the paper are 1) Along with the body movements, voice and facial expressions can also be taken to improve the performance because action independent scenarios give less accuracy 2) Enhancement in tools to improve communication between human and robots 3) Remote sensing of emotions in case of emergency 4) To implement better tools for training programs in medical rehabilitation centers. 5) Recognizing emotions from body movements is yet to be explored more.

Project / Research Objective

The aim the proposed work is to detect human faces from different images or videos at real time. This work will try to achieve some or all the following objectives:

The objectives of Face Recognition for Real-Time Applications are given below:

- Extract the important information in a face image.

- To enhance the Frame/sec for Face Recognition System, such that Recognition is done in Real Time.

- Presently, work on 30frames/sec Our motto is to achieve higher frames/sec or high Resolution frames/sec.

Many recent papers in the domain of emotion recognition and sentimental analysis were studied in this paper. It is observed that emotion recognition systems are high in demand to serve applications of artificial intelligence and internet of things. There is scope to build robust and reliable automatic recognition systems. Therefore, to improve the accuracy of emotion recognition systems, not only facial expressions or textual information would work but body movements are also need to consider. As body movements show kinetics and motion of body parts, which helps in detecting the emotions and sentiments of a person. Many papers have introduced naturalistic databases such as CIU handwritten database, AMFED+, iCV-MEFED (database defined 50 classes of emotions including neutral expression) given in the paper by Guo, 2018, RGB-3D and big data. These databases help building enough capable systems that can also recognize compound emotions or subtle emotions. Since it was a huge database, cloud storage & GPU (graphics processing unit) was required to make it secure and efficient.

Research Methodology

The general face recognition model is as shown in Figure. The general face recognition model contains two basic parts Enrollment and Recognition. The Enrollment part includes Registration phase in which first the image is captured, then the face detection algorithm for capturing the image is called. The captured image is then stored in database. The second part that is the Face Recognition which takes place when teacher captures the image of the class. First image is captured then face detection of all students takes place, after detecting pre-processing is done on that images. Each students face features are extracted from the database and then the classification is done accordingly.

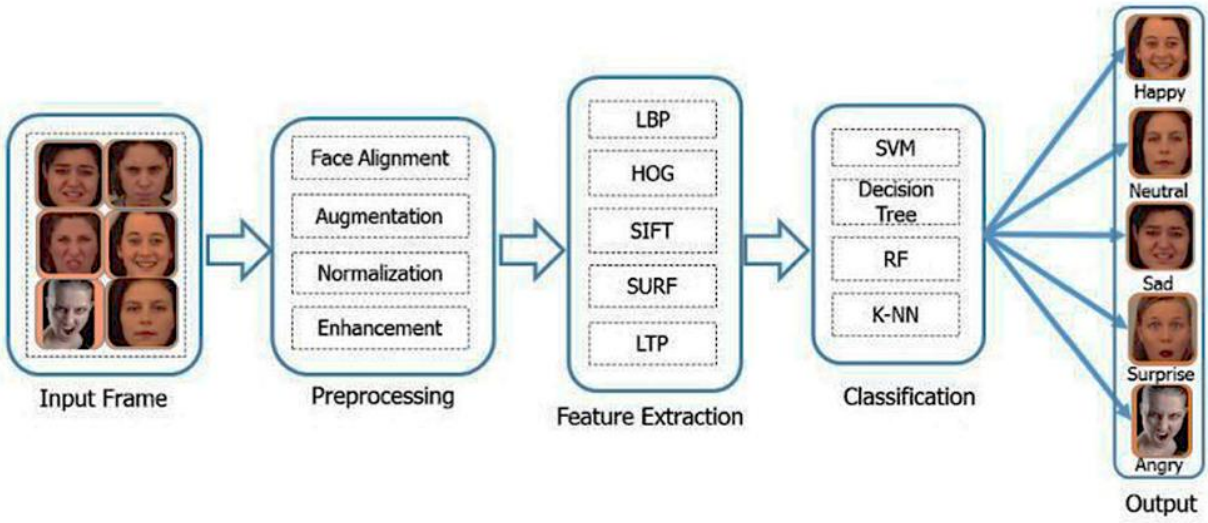

Figure 1. Facial emotion recognition (FER) process.

FACE DETECTION a. High-Level Language based Face Detection P Daesik Jang, Gregor Miller, Sid Fels, and Steve Oldridge et. al. give a new methods for a user oriented language model for face detection. Hear many open sources or commercial libraries to solve the trouble of face detection. There are still hard to use because they need explicit

knowledge on details of algorithmic techniques. They projected a high-level language model for face detection with which users may develop systems easily. Important conditions are mainly considered to classify the big trouble of face detection. The conditions recognized here are then represented as expressions in terms of a language model so that developers may use them to express various problems. Once the conditions have developed by users, the proposed associated interpreter interprets the conditions to find and classify the best algorithms to solve the represented problem with corresponding conditions. The purpose of this technique is to come up with a high level language model for face detection with which users will expand systems easily and even without specific knowledge of face detection theories and algorithms. By doing this, the problem of selecting algorithms and deciding complicated parameters for algorithms are isolated from development of face detection applications. FEATURE EXTRACTION: PCA is used to extract features from an image of human face. The Flow chart of PCA Algorithm Principal component analysis (PCA) algorithm is used to extract features from a cropped and resized face image. It is used as a tool in predictive analysis and in explanatory data analysis and is used to transform higher dimensional data into lower dimensional data. A bunch of facial images in a training set of size M x M areconverted into lower dimensional face images by applying principal component analysis technique. FACE RECOGNITION: In this stage the data taken from the images are simulated using a previously trained ANN. The input will be a vector array from the previous stage. The networks are trained with face descriptors as input. The number of network will be equal to the number of persons in the database. To understand the concept of Artificial Neural Networks, one should know how the natural neural network system in brain works. Natural Neural Networks system in the brain has neurons as the basic building blocks. All neurons are connected by a path to carry electrical signals referred to as synapses. They communicate through these paths and approximately there are 100 billion neurons in a brain. Each cell has inputs and outputs. FACE TAGGING: In the Face Tagging stage the result from the simulation is used by the recognition system to tag an appropriate name to the image of the person. The data is in binary form and hence this block is also responsible in evaluating the expression into a certain value and matching it to a person's name in the name list. However, if the interpreted value is not one of the values listed in the roster, then the name returned will be automatically predefined as "Unknown"

Project / Research Outcome

This paper provides survey of many research papers based upon emotion recognition, sentimental analysis, applications of emotion recognition systems and supervised & unsupervised machine learning algorithms required for automatic emotion recognition. It has been revealed that selflearning algorithm Convolution neural networks produces good results for naturalistic databases, also best fitted to reduce data over fitting and data imbalance. Along with that it finds various application areas like healthcare, virtual reality, robotics etc. So, future scope of the work is to increase the efficiency of emotion recognition systems in terms of accuracy, work has to be performed using RGB datasets formed under uncontrolled conditions, deep neural networks as emotion classifiers, compound emotions, micro expressions and multi modal behavioral systems such as body movements, facial expressions, voice etc. to form robust automatic recognition systems. In addition to that, security of system can be improved by using cloud storage resources.

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