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A Practical Implementation of Detection and Recognition of Human Faces with Facial Expressions

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Abstract:-

Facial expression is one of the most powerful and immediate means for human beings to communicate their emotions, intentions, and opinions to each other. Facial expressions recognition is a main area of interest within various fields such as computer science, medicine, and psychology. As well as important in human computer interaction, human robot interaction, digital entertainments, games, smart user interface for cellular phones and games. The main objective of this research paper will focused on design a software using Matlab that can be used to recognize human facial expressions of 2D face and detect image of face. This work will be done in three stages they are:- step1 Detection of human face image, step2 human face image is existing or not, and in step3 recognition of facial expression.

Keywords:-

Contour Model; Bayes estimate pre-processing; segmentation; Feature Extraction; Face Expression

I. INTRODUCTION :-

Humans have been using physical characteristics such as face, voice, gait, etc. to recognize each other for thousands of years. With new advances in technology, biometrics has become an emerging technology for recognizing individuals using their biological traits .[1] Recognition of facial expressions results in identifying the basic human emotions like anger, fear, disgust, sadness, happiness and surprise. These expressions can vary in every individual person.[1] Facial expressions are produced by movement of facial features[3] Facial Expression Recognition (FER) is a rapidly growing and ever green research field in the area of Computer Vision, Artificial Intelligent and Automation

There are many application which uses Facial Expression to evaluate human nature, feelings, judgment, opinion.[4] Facial expressions recognition technology helps in designing intelligent human computer interfaces. Facial expressions play an important role wherever Human-computer interfaces is required. Facial expressions recognition technology helps in designing intelligent human computer interfaces.[5] The system analysis has been an active research topic since 19thcentury. The facial expression recognition system was introduced in 1978 by Suwa et. al. The main issue of building a facial expression recognition system is face detection and alignment, image normalization, feature extraction, and classification.[7]

II. RELATED WORK

A.Face Detection :- Face detection is a computer technology that determines the locations and sizes of human in digital images. It detects face and ignores anything else, such as buildings, trees and bodies.

1) Identify and locate human faces in an image regardless of their ->Position, scale, in-plane rotation, orientation, pose (out-of-plane rotation) and illumination.

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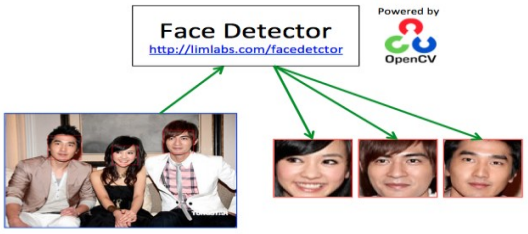

Fig1:-Face Detection

And in this project i am using different types of face images who have showing just like a human face images but truly it is not. Like some face images see in fig2.

B. Working Concept of Face Detection

Face-detection software is primed with a set of mathematical rules to describe the landmarks that identify a human face: typically two eyes, eyebrows, nose and lips. The image is first 'down sampled' by the software – to reduce the amount of information – and then it is analysed. By measuring the differences between the shadows created by facial features, a camera can identify whether or not they match the expected layout of a face. Using the differences in contrast and shadow created by the whiteness of eyes and teeth, a camera is able to tell when a subject is blinking or smiling and can alter its settings accordingly, if so programmed. The clever software is able to store information about the spacing of their unique facial features. In this step i am detecting only true faces.

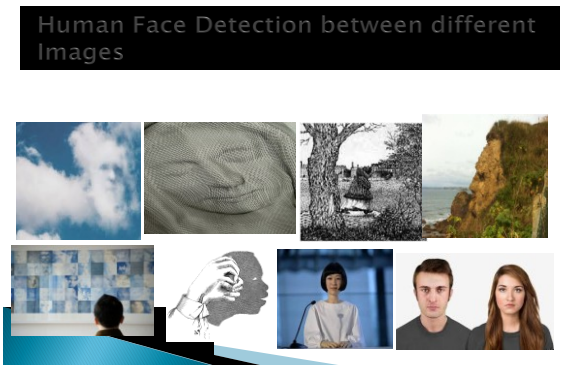

Fig2:-Face Detection between different images

C.Face Recognition :- Is Performing in 2 steps.

- A set of two task:
  - Face Identification: Given a face image that belongs to a person in a database, tell whose image it is.
  - Face Verification: Given a face image that might not belong to the database, verify whether it is from the person it is claimed to be in the database.

Fig 3 Face Recognition

D. Working Concept of Face Recognition

A facial recognition system is a computer application to automatically identifying a person from a digital image or a video frame. One way to achieve this is by comparing selected facial features from the image to a facial database . It is typically used in security systems and can be compared to other biometrics such as fingerprint or human iris . Currently, developers came up with the design that is capable of extracting and picking up faces from the crowd and have it compared to an image source - database. The software has the ability to know how the basic human face looks like in order specific proportions and angles of the defined facial features. Facial recognition software falls into a larger group of technologies known as biometrics. Biometrics uses biological information to verify identity. The basic idea behind biometrics is that our body contains unique properties that can be used to distinguish us from other person.

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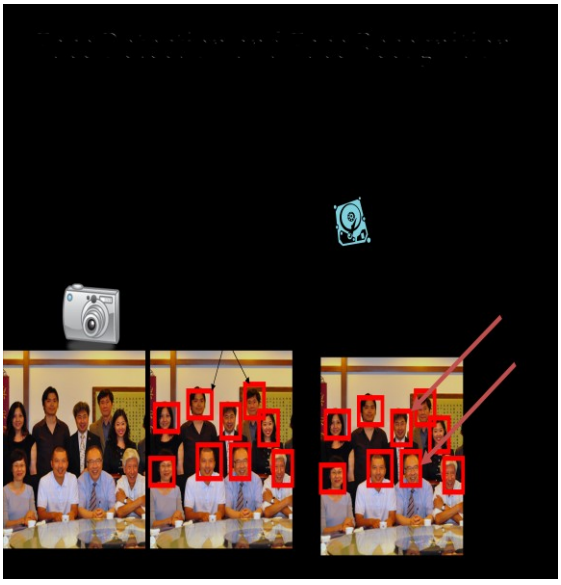

Fig 4 Face Detection & Face Recognition

E. What is Facial Expression

- Facial expressions are a form of nonverbal communication. They are a primary means of conveying social information among humans, but also occur in most other mammals and some other animal species.
- A facial expression is one or more motions or positions of the muscles beneath the skin of the face.

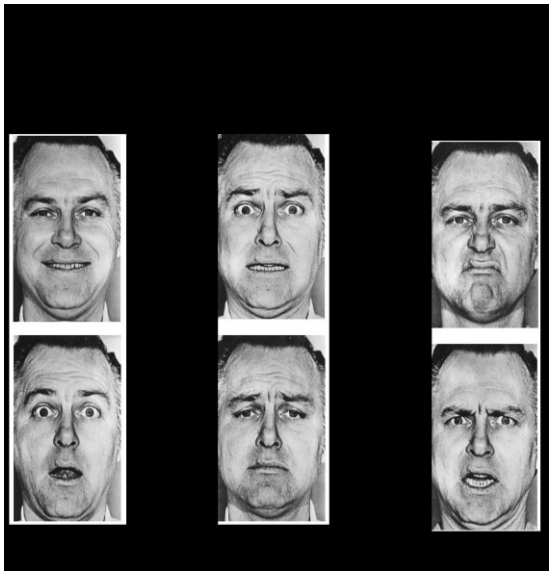

Fig 5 Facial Expressions on Faces

F: Working Concept of facial Expression Recognition

facial expression analysis refers to computer systems that attempt to automatically analyze and recognize facial motions and facial feature changes from visual information. Sometimes the facial expression analysis has been confused with emotion analysis in the computer vision domain. For emotion analysis, higher level knowledge is required. For example, although facial expressions can convey emotion, they can also express intention, cognitive processes, physical effort, or other intra- or interpersonal meanings. Interpretation is aided by context, body gesture, voice, individual differences, and cultural factors as well as by facial configuration and timing .In this project we report our experiments on feature-based facial expression recognition within an architecture based on Neural Network and image pre-processing and segmentation is primary step for recognition hence it is vital to put some efficient technique for the same. Henceforth we are using active contour model for segmentation and Bayes estimate pre-processing. For Feature Extraction the Principal Component Analysis will be used. After extracting the features the eigenvectors will be generated this will be further fed into the Neural Network for Expression Recognition.

Fig 6 Recognition of Facial Expressions

III. Conclusion :- In this paper implemented the face recognition system using Principal Component Analysis and Eigenface approach. The system successfully recognized the human faces and worked better in different conditions of face orientation .These approaches provide a practical solution to the problem of facial expression recognition and can work well in constrained environment. The eigenface approach

thus provides a practical solution that is well fitted to the problem of face recognition. It is fast, relatively simple and has been shown to work well .The neural network approach is based on face recognition, feature extraction and categorization.

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