

Facial Gesture Detection and Eye Tracking during virtual interview.

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Abstract- Human emotions & facial expressions play an effective way of non-verbal communication. This is because humans reveal and convey a lot of evident information visually rather than verbally. Face detection and tracking is the process of determining whether a face is present in an image or not. Face plays an important role in social communication. This is a depiction of human personality, emotions, and thoughts. According to the psychological research nonverbal part is the most informative channel in social communication. The proposed system will verify the accuracy of responses given by the candidate using the Jaccard String Similarity Algorithm. The system will simultaneously track the eye movements of a candidate to detect whether the candidate is focused or distracted.

Keywords: Facial Gesture Recognition, Face Detection, Eye-tracking, Posture tracking

I. INTRODUCTION

Facial gestures represent our social interactions and visible speech signals clarify whether our current focus of attention is important, funny or unpleasant. E.g. one smiles to greet someone. It is because we understand emotions and react based on that expression which enriches the interactions. Computers are “emotionally challenged”.

Face is a subject of study in many areas of science such as psychology, behavioural science, medicine and finally computer science. Over the last few decade lots of work done in facial Expression detection and recognition as it's a best way for person identification. Facial emotion recognition is one of the issues of computer vision. Emotions which can be classified like fear, happiness, joy, sadness, aggressiveness can be recognized using computer vision. Emotional expressions at face are related to the movements or positions of the muscles under the skin and are a form of nonverbal agreement.

Face detection gets difficult due to the variety of information found in the face images.

For example, some of the conditions that should be accounted for, when detecting faces are:

- Occlusion: Faces may be blocked by other objects partially.
- Presence or absence of beards, mustaches, and glasses.
- Facial expression: Facial expression directly affects a person's face appearance.
- Pose: Frontal, 45 degrees, profile, upside down.
- Orientation (In-Plane Rotation): Face appearance directly varies for different rotations about the camera's optical axis.
- Imaging conditions: Distribution and intensity of lights and camera characteristics like it's resolution.

FACIAL GESTURE RECOGNITION:-

Face detection determines a face within an image. Luckily human faces do not greatly differ from each other; we all have noses, eyes, foreheads, chins and mouths; and all of these compose the general structure of a face. It is a concept of two-class classification: face versus no face.

Generally, face comprises of bones, facial muscles and skin tissues. When these muscles contract, facial features are deformed. Facial expressions are the fastest means of communication while conveying any type of information. It is a computer application for identifying the facial expressions of any person either using an image or a video clip or the person itself.

Track eye-ball movements and detect the posture of candidate during the interview. Display the results of test along with confidence level of the candidate and also detect any misbehaviour during the test. Object-class detection aims to find the locations and sizes of all objects in an image belonging to a given class. It can be understood as:



Figure: Face Gestures

Face Gesture Identification:

In this the system it compares the given individual to all the other individuals and gives a ranked list of matches.

Facial Expressions:

Facial expression is the change in the positions of the muscles beneath the skin of the face. These movements express the emotional state of the person to observers. It is a form of non-verbal communication. It plays a communicative role in interpersonal relations. The common ones are:

Verbal part contributes about 7% of the message, vocal – 34% and facial expression about 55% to the effect of the speaker’s message.

EYE TRACKING:-

Eye tracking is the process of measuring where we look, which is known as our point of gaze. These measurements are carried out by an eye tracker that records the position of the eyes and the movements they make. Eye tracking is used across a range of different research fields, and for various different applications within the commercial realm too.



Figure: Expression detection through eyes

Remote Eye Tracking:-

- Record the eye movements at a distance.
- Allow the respondent to be seated in front of the device without attachment.

Our system is designed to conduct virtual interviews of multiple candidates simultaneously which will reduce the time required for conducting interviews personally. In the online environment face to face interaction with participants is replaced by computer-screen. There is a possibility of the candidate trying to cheat during the test by using other devices or by communicating with any other candidate. The proposed system will detect this misbehavior of the candidate.

Face Landmarks-

The process of extracting key points from a given face image is called face landmark localization.

Normally, 66 landmarks can be extracted which helps in detecting distinctive features in a human face automatically.

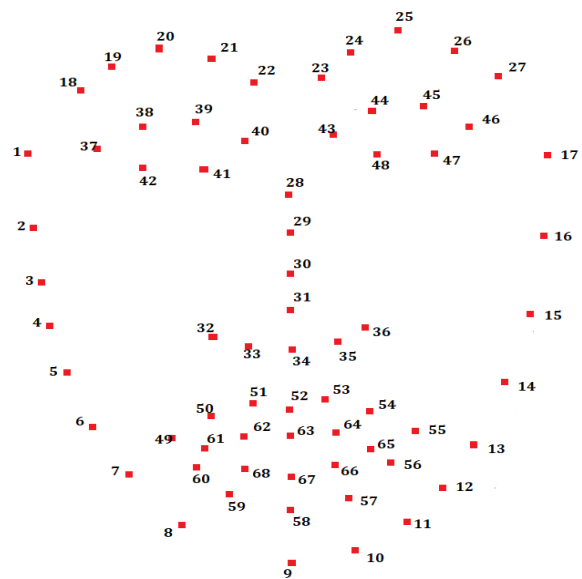


Figure: Face Landmarks

Out of 66 face landmarks we extract the 12 eye landmarks for tracking the eye movements during the interview process. These 12 landmarks are further used to calculate aspect ratio using the Euclidian distance. This is used to find the distance between eye landmarks and detect the expression of a person.

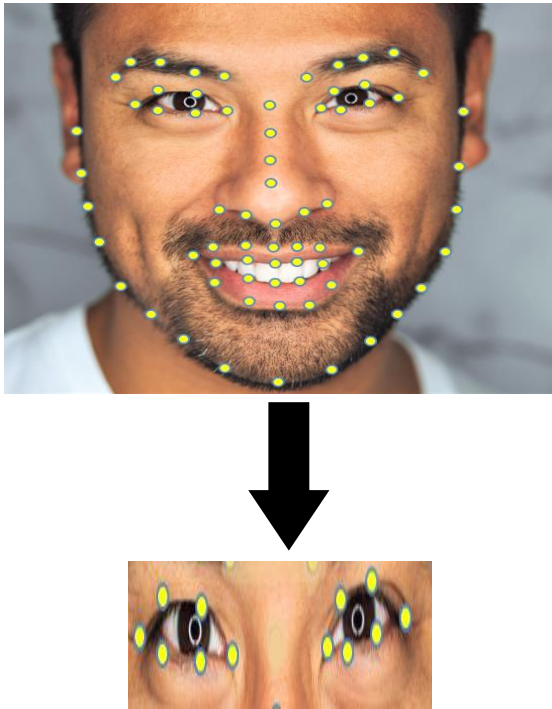


Figure: Extracting eye landmark

Pose / Posture:-

People usually express emotions with head motion or posture spontaneity. Current research primarily focuses on the frontal view of face images, with very limited head motion or posture change. The accurate expression analysis in conjunction with facial action, reflect a person's real emotion. The head motion and resulting occlusion makes it difficult to track facial features and pose accurately.

II. LITERATURE REVIEW

Marryam Murtaza[2] presents automation of face recognition, which is one of the most occurring confusions in diverse of potential relevance. Adjoining of dynamic expression in the face causes a broad range of discrepancies in recognition systems. Facial expression exposes the sensation or passion of any person and can also be used to judge his/her mental views. This paper is based on a complete survey of face recognition conducted under changing facial expressions.

Gesture tracking and recognition

Kjeldsen & Kender, 1996 human hand motion consists of the global hand motion and local finger motion. Hand motion capturing deals with finding the global and local motion of hand movements.

Two types of indications are often used in the localization process: color cues and motion cues. Alternatively, the combination of color, motion and other cues, like speech or gaze, is used.

Dolly Roney focuses on face detection and emotion selection which is one of the current topics in the security field which provides a solution to various challenges[3]. Beside traditional challenges, there are other challenges in captured facial images like changing poses, different light intensity, expressions for face recognition and different frequencies of sound for emotion recognition. For any face and emotion detection system database is the most important part for the comparison of the face features and sound frequency components.

Shruti Bansal studies that human emotions are conveyed by the way they behave, act, pose, facial expressions and speech. Researches have been carried out to find out the relation between these mediums and emotions. [4]Automatic recognition system of the emotion represented on a face is proposed by this paper. A solution based on Bazier curve in combination with image processing is used in classifying the emotions. Input to the system is colored images. Then, extraction of a set of selected feature points is done using Image processing based feature point extraction method.

Devi Arumugaml explored that human emotional facial expressions play an important role in interpersonal relations. This is because humans express themselves and convey a lot of evident data visually rather than verbally. Humans recognize facial expressions virtually without any effort or delay but in the case of reliable expression recognition by machine, it still remains a challenge as of today. Machines must be first taught to understand facial gestures to automate recognition of emotional state. In this paper we developed an algorithm which is used to identify the person's emotional state through facial expression such as angry, disgust, happy [17].

Krishna Kudiri introduced Human to human social communication in real-life is possible through different modalities like facial expressions, speech and body poses. While dealing with human emotions in real-life, facial expressions play an important role. Non-verbal data towards emotions is provided by facial expressions. It also gives emotion of the person with respect to his goal. On the other hand, Problems are created while detection emotions of a person because speech and body poses are mostly language and culture dependent respectively [18].

Facial Features Relevant to Expression Analysis

Facial analysis includes a number of processing steps that attempt to detect or track the face, to locate characteristic facial regions such as eyes, mouth and nose, to extract and follow the of facial feature movements such as characteristic points in these regions or model facial gestures using anatomic information about the face.

Emotion	Gesture Class
Joy	Hand clapping with high frequency
Sad	Hands over the head
Anger	Lift of hand, Eyebrows raised
Fear	Hands over the head
Disgust	Lift of hand at low speed
Surprise	Raise hands

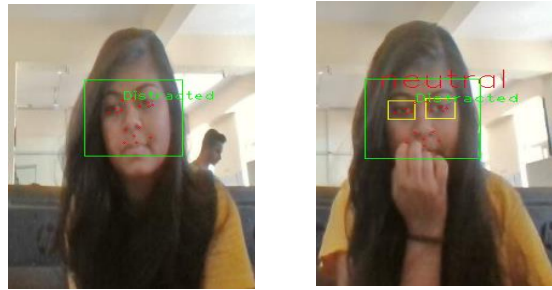


Figure: - Distracted

These images depicts that the interviewee is distracted.

III. PROPOSED SYSTEM

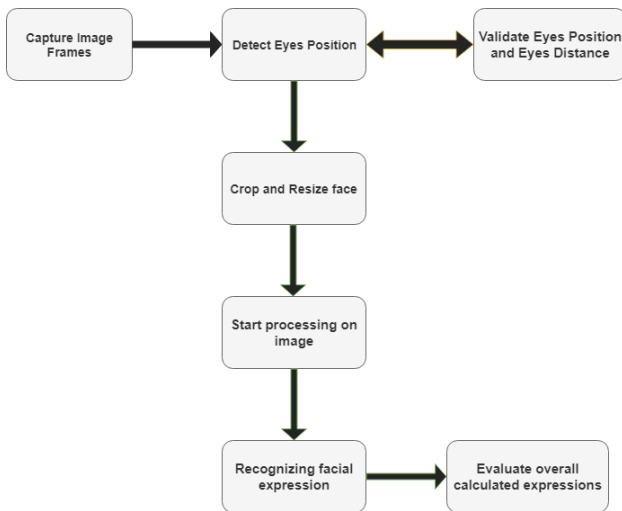


Figure: - System Architecture

The first and foremost step for recognizing facial expressions is detecting faces. To convert an image into a normalized pure facial image for feature extraction the steps involved are detecting feature points, rotating to line up, locating and cropping the face region according to the face model. Expression classification is performed by a classifier, which often consists of models of pattern distribution along with a decision procedure.

IV. RESULT AND DISCUSSION:-

In Eye Posture Tracking System the fetch data contains components like;

- Start Camera
- Stop
- Clear

It also has check emotion check box that can check the emotions.

It also has the live camera window for video meeting.

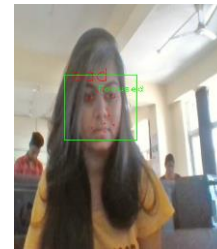


Figure: - Focused

The Review Answer contains Question and the answer section for the student and that answer is further analyzed and result is displayed.

Applications:

Health care, Games, E-learning, Education System.

V. ADVANTAGES

1. Easy feedback without manual work
2. Avoids proxy feedback.

VI. APPLICATIONS

1. Computer-aided Detection of a Shopper's Intent to Purchase.
2. Detection of the emotion of students for evaluation of teacher's performance.

VII. CONCLUSION

This Paper is investigating various face detection, feature extraction and expression classification methods and techniques we conclude that effective facial expression recognition can be achieved using various algorithms and feature extraction techniques. Eye-ball tracking process is also elaborated in detail as it plays an important part to convey the message non-verbally. Various classifiers have been discussed. Hence, the extension of this work will review all above-mentioned techniques and methods to detect the postures.

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