

## Boredom Calculator - Facial Expression Detection: Survey

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**Abstract**— Human emotional facial expressions play an important role in interpersonal relations. This is because humans demonstrate and convey a lot of evident information visually rather than verbally. Although humans recognize facial expressions virtually without effort or delay, reliable expression recognition by machine remains a challenge as of today. To automate recognition of emotional state, machines must be taught to understand facial gestures.

**Key words:** Facial Expression Recognition, Face Detection, Human Face

### I. INTRODUCTION

Face plays significant role in social communication. This is a 'window' to human personality, emotions and thoughts. According to the psychological research nonverbal part is the most informative channel in social communication.

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

Emotions are feeling or response to particular situation or environment. Emotions are an integral part of our existence, as one smiles to show greeting, frowns when confused, or raises one's voice when enraged. It is because we understand other emotions and react based on that expression only 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 specific issues of computer vision. Emotions which can be classified like fear, happiness, joy, sadness, aggressiveness are recognizable facial expressions 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.

The variety of information in these face images makes face detection difficult. For example, some of the conditions that should be accounted for, when detecting faces are:

- Occlusion: faces may be partially occluded by other objects.
- Presence or absence of structural components: beards, mustaches and glasses.
- Facial expression: face appearance is directly affected by a person's facial expression.
- Pose (Out-of Plane Rotation): frontal, 45 degree, profile, upside down.
- Orientation (In Plane Rotation): face appearance directly varies for different rotations about the camera's optical axis.

- Imaging conditions: lighting (spectra, source distribution and intensity) and camera characteristics (sensor response, gain control, lenses), resolution.
- Facial feature extraction (for local face recognition).

Facial expression recognition is composed of three major steps:

- 1) Face detection and preprocessing of image.
- 2) Feature extraction.
- 3) Expression classification.

#### A. Basic Terminologies

##### 1) Face Detection

Face detection is to determine that a certain picture contains a face we need to be able to define. 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.

Face detection can be regarded as a specific case of object class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. It can be understood as:



Fig. 1: Face Detection

##### 2) Face Identification

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

##### 3) Face Verification

In this the system compares the given individual with who that individual says they are and gives a yes or no decision.

##### 4) Facial Expressions

Facial expression is one or more motions or 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:

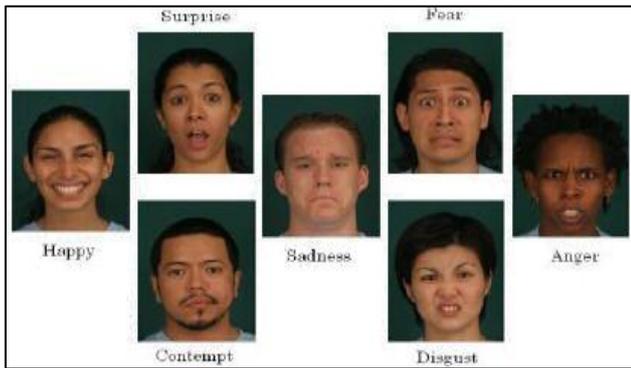


Fig. 2: Facial Expressions

## II. LITERATURE REVIEW

“Dan Duncan”, et.al introduced convolutional neural network for classifying human emotions from dynamic facial expressions in real time. They have used transfer learning on the fully connected layers of an existing convolutional neural network which was pretrained for human emotion classification. A variety of datasets, as well as their own unique image dataset, is used to train the model. An overall training accuracy of 90.7% and test accuracy of 57.1% is achieved. Finally, a live video stream connected to a face detector.

“Saumil Srivastava,” et al discusses a novel method for Facial Expression Recognition System which performs facial expression analysis in a near real time from a live web cam feed. Primary objectives were to get results in a near real time with light invariant, person independent and pose invariant way. The system is composed of two different entities trainer and evaluator. Each frame of video feed is passed through a series of steps including haar classifiers, skin detection, feature extraction, feature points tracking, creating a learned Support Vector Machine model to classify emotions to achieve a tradeoff between accuracy and result rate. A processing time of 100-120 ms per 10 frames was achieved with accuracy of around 60%. We measure our accuracy in terms of variety of interaction and classification scenarios.

“Marryam Murtaza”, et.al introduces automatic face recognition is one of the most emphasizing dilemmas in diverse of potential relevance like in different surveillance systems, security systems, authentication or verification of individual like criminals etc. Adjoining of dynamic expression in face causes a broad range of discrepancies in recognition systems. Facial expression not only exposes the sensation or passion of any person but can also be used to judge his/her mental views and psychosomatic aspects. This paper is based on a complete survey of face recognition conducted under varying facial expressions. In order to analyze different techniques, motion-based, model-based and muscles-based approaches have been used in order to handle the facial expression and recognition catastrophe. The analysis has been completed by evaluating various existing algorithms while comparing their results in general.

“Dolly Reney” et al focuses on face detection and emotion selection is the one of the current topic in the security field which provides solution to various challenges. Beside traditional challenges in captured facial images under

uncontrolled settings such as varying poses, different lighting and expressions for face recognition and different sound frequencies for emotion recognition. For the any face and emotion detection system database is the most important part for the comparison of the face features and sound Mel frequency components. For database creation features of the face are calculated and these features are store in the database.

“Shruti Bansal”, et.al discusses that human emotions are conveyed by different medium such as behaviors, actions, poses, facial expressions and speech. Multitudinous researches have been carried out to find out the relation between these mediums and emotions. This paper proposes a system which automatically recognizes the emotion represented on a face. Thus, a Bezier curve based solution together with image processing is used in classifying the emotions. Coloured face images are given as input to the system. Then, Image processing based feature point extraction method is applied to extract a set of selected feature points.

“Surbhi” et al primary focus on social intercourse, playing a major role in conveying identity and emotion. Human face recognition plays an important role in many user authentication applications in the modern world. Facial expression recognition can be utilized for automated analysis of human emotion. The system is commenced on convolving a face image after preprocessing the image at different scales and orientations. A given images of a face, identify or verify the emotion of person in the scene using a stored database of facial image properties. Available collateral information such as race, age, gender, facial expression, or speech may be used in narrowing the search (enhancing recognition).

“Devi Arumugam” et al Human emotional facial expressions play an important role in interpersonal relations. This is because humans demonstrate and convey a lot of evident information visually rather than verbally. Although humans recognize facial expressions virtually without effort or delay, reliable expression recognition by machine remains a challenge as of today. To automate recognition of emotional state, machines must be taught to understand facial gestures. 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

“Krishna Mohan Kudiri.”, et.al introduced Human to human social communication in real-life is possible through different modalities like facial expressions, speech and body poses. However, facial expressions plays important role while dealing with human emotions in real-life than the other modalities. It is because facial expression provides non-verbal data towards emotions. And also gives emotion of a person towards his goal. On the other hand, speech and body poses are mostly language and culture dependent respectively which creates problem while detection emotions of a person. Thus in order to deal with the above issues, this research work focused on facial expressions instead other modalities. To improve detection performance of the system, proposed Relative Sub-Image Based features is used. Support Vector Machine with radial basis kernel is used for classification.

“Sarvani Ghosh”, et al Facial expressions play a major role in Face Recognition Systems and image processing techniques of Human Machine Interface. There are several techniques for facial features selection like

Principal Component Analysis, Distance calculation among face components, Template Matching. This algorithm describes a simple template matching based facial feature selection technique and detects facial expressions based on distances between facial features using a set of image databases. The algorithm involves three stages: Pre Processing, Facial Feature Extraction and Distance Calculations. Then, identify whether a human is smiling or not using the measurement of Euclidean distances between pairs of eyes and mouth region of that face quality requires new tools for size and color measurement and capturing the fruit side view image, some fruit characters is extracted by using detecting algorithms.

“S. Sharmila,” et al describe that Student engagement has been a key topic inside the educational training. The three specific styles of engagement of the students in a class are: behavioral, emotional, and cognitive. The time period behavioral engagement is commonly used to describe the scholar’s willingness to participate within the getting to know system. Emotional engagement describes a scholar’s emotional attitude toward learning. Cognitive engagement is a chief part of overall learning engagement. From the facial expressions the involvement of the students in the magnificence can be decided. Commonly in a lecture room it’s far difficult to recognize whether the students are able to understand the lecture or no longer. So that you can know that comments from will be collected manually from the students. However those feedbacks given by using the students will now not be correct. Hence they will no longer get proper comments. This hassle can be solved by means of the use of a facial emotion evaluation. From the facial expression the emotion of the students may be analyzed.

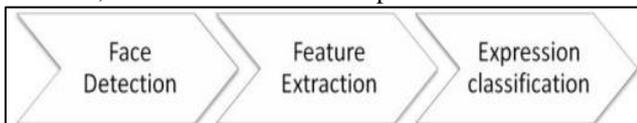
### III. EXISTING SYSTEM

#### A. Facial Expression Detection

Generally, face is a union of bones, facial muscles and skin tissues. When these muscles contract, warped facial features are produced. 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.

#### B. Procedurals Steps

Facial expression recognition involves three steps Face detection, feature extraction and expression classification.



The pre-processing step for recognizing facial expressions is face detection. The steps involved in converting a image to a normalized pure facial image for feature extraction is detecting feature points, rotating to line up, locating and cropping the face region using a rectangle, according to the face model. Expression classification is performed by a classifier, which often consists of models of pattern distribution, coupled to a decision procedure.

#### C. Applications

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

### IV. ADVANTAGES

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

### V. APPLICATIONS

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

### VI. CONCLUSION

This survey is investigating various face detection, feature extraction and expression classification methods and techniques we conclude that the effective facial expression recognition can be achieved using various algorithms and feature extraction techniques. Various classifiers have been discussed. Hence, the extension of this work will review all above mentioned techniques and methods to detect the faces.

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