

# Facial Expression Identification System

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**ABSTRACT** - A facial expression identification systems are usually a computer base applications which is used to identify and verify a person situation or the mood. There are number of applications which are using for facial expression identification.

This research presents a facial expression recognition system where the identification and classification is performed on the seven basic expressions: happy, surprise, fear, disgust, sad, anger and a neutral state. This system consists of four main parts image acquisition, Pre – Processing, Feature extraction and finally the Classifying image. This application is developed with both OpenCV and the Web based approach, for the final implementation use JavaScript base to enhance the performance of the system. Application is tested with both real time and prebuild video streams.

**Key words:** Facial expression, Image Processing, Feature Extracting, Classify Images

## 1. INTRODUCTION

Most Facial Expression Recognition and Analysis systems focus on the binary occurrence of expressions, often either basic emotions .In reality, expressions can vary greatly in intensity, and this intensity is often a strong cue for the interpretation of the meaning of expressions [1].

Even though people are equipped with number of electronic devices there is no accepted way to measure the mood of them by utilizing features of Cameras and sensors without having proper intention people waste their time and engaged with harmful activities (decision making) which is not suitable for their current situation. There are lot of applications develop on face identification for protecting critical application domains. But if we can integrate facial expression identification into those systems it will help to enhance the protection on critical domains by doing better predictions about the situation of the system users.

Humans used to communicate using both verbal and nonverbal communication mechanisms. For nonverbal communication mainly use facial expressions and body gestures. Nonverbal communication mechanisms mainly use to deliver the emotions. According to Mehrabian (1981) underscored that para-lingual and facial expressions alone communicated 93% of people's feelings and attitudes [2]. Affective computing has been an area of recent interest in computer science and psychology. At the same time, this is a rapidly growing field of research, due to the constantly

increasing interest in applications for human behaviour analysis, and technologies for human-machine communication and multimedia retrieval. Currently we can see affective computing is take into account when developing interactive e-learning materials (Intelligent Tutor System), marketing (Online shopping).

Most of the time people waste their time without proper intention because of the lack of awareness about their mood. When someone is in happy mood there productivity level is high, but when they are in stress their productivity is very less comparing to the previous state. Brain activity pattern of the user is directly come out as facial expressions. Hence if we can identify the situation by analysing the image and alert the user it will be very helpful for them to change their mood. Many software development companies use different mechanisms to reduce the stress of their employees. This kind of a system will be useful for them to monitor their employees' situations and help them to get rid from the stress.

## 2. LITERATURE REVIEW

This research effort is based on implementing facial expression identification system which is use image processing techniques to achieve the research goals. Nowadays facial expression recognition (FER) becomes one of the most important subject in the fields of human-computer interaction, which has wide range of applications such as Telecommunication, Medical, Human Computer Interactions (HCI) and Biometrics.

Computer systems which has the ability of communicate & response to the user actions & based on emotional state of human's faces are considered as the ideal human computer interaction systems. As the result of that automatic recognition of human's facial expressions has been active research area for last several years. Here we discuss about the various approaches taken by different researchers to implement facial expression identification systems. While doing the literature review we have noticed that the entire research process can be divided into three major categories, such as:

1. Image acquisition
2. Image pre-processing
3. Feature Extraction
4. Classification & recognition

### 3. METHODOLOGY

#### 3.1. IMAGE/VIDEO ACQUISITION

There are more than 300 crisply identified emotions by researchers and they state any emotion is composition of 6 primary emotions according to the Pallet theory .Anger, disgust, fear, happiness, sadness and surprise are considered as these primary or basic emotions & also referred to as archetypal emotions [4]. In the implementation we basically target on identifying selected emotions from this primary emotion set.

#### 3.2. PRE - PROCESSING

In our first implementation we have used image gray scaling, histogram equalization and face detection using OpenCV library to enhance the image quality into the expected level for feature extraction.

After the literature review we have identify some existing image processing techniques used to detect and classify the facial expression by feature extraction. Here we have used two approaches for the implementation:

1. OpenCV implementation
2. JavaScript implementation

In our second approach we have used pre-build generalized model which has the capability of extracting the features in images/videos and process will be like;

1. Read the image.
2. Load Face cascade (Cascade Classifier > load)
3. Detect faces (detect Multi Scale)
4. Draw circles on the detected faces
5. Show the result.

After developing a model which can predict a facial expression by analysing extracted features we utilize popular facial image database for the testing purposes. For face detection and major facial feature location identification we have used the famous the Viola-Jones object detection framework JavaScript implementation which is called as Haar.js (Feature Detection Library for JavaScript)[5][6].

#### 3.3. FEATURE EXTRACTION

When we come to this step we have the basic details about where the eyes, nose and mouth locate in the image. As the next step we need to identify the exact feature, for that we have used Constrained Local Model (CLM)[7].

### 3. RESULTS AND ANALYSIS

In the final implementation we basically target on 4 main emotions and output the emotion composition amount for the selected facial expression.

- Anger
- Sad
- Happy
- Surprised

This application has the capability of measuring emotional state of given video input & the real time input taken from the web cam.

When consider the above two ways of giving inputs, we have noticed that application has the higher accuracy when it deals with the real time video input which get though the web cam, because video /image quality directly effect on the emotion prediction process.

When it come to the video/image input which is not real-time, output is completely depends on the image quality. To avoid improper prediction in that context we need to put some constrains on the application user.

### 4. CONCLUSIONS

Facial Expression Identification System helps us to get a conclusion that our second approach (JavaScript Implementation) is accurate and effective than our first approach (Open Cv Implementation).

In our second approach I have notice that implementation can done in two ways:

- Comparison mode
- Generalization mode

In this approach we have used generalized dataset where it consist with mean values of feature points in different emotional state. Our conclusion is that generalized mode is accurate when we have to deal with real-time input sets.

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