

# **EmoSense: An Advanced System for Human Emotion Detection**

**A Major Project Synopsis Submitted to**



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## 1. Abstract

Humans share a universal and fundamental set of emotions which are exhibited through consistent facial expressions. An algorithm that performs detection, extraction, and evaluation of these facial expressions will allow for automatic recognition of human emotion in images and videos. Emotion recognition, one of the crucial non-verbal means by which this communication occurs, helps identify the mood and state of the person. Human machine collaboration becomes more natural if communication happens through the non-verbal means, such as emotions. Machines can offer us more help if they are able to perceive and recognize human emotions. Of the several approaches to emotion recognition, facial expression and speech-based methods are prominent. According to some psychologists, communication occurring through facial expressions account for about 55% of communication

## 2. Introduction of the Project

It would be beneficial if the machines are able to understand human emotions, enabling communication to take another step forward. There are several ways in which this emotion recognition can happen and primarily the focus is on speech and facial-based emotion recognition. There are also many techniques to achieve these facial and speech-based emotion recognitions including deep learning and classical machine learning algorithms. Humans obviously prefer natural ways of communication with machines using the languages that we developed over the years. Besides language that we speak, the indirect natural communication between humans are emotions which form a logical means of messaging emotion recognition can be captured through different mechanisms such as speech, facial expression, body gesture, etc. Facial expressions communicate a lot without any voice. Facial expressions are caused by movement of facial muscles in various positions resulting in various emotions and mood. Facial expressions are key to conveying feelings, attitude, intentions, etc. and these are pivotal in recognizing the emotions. Emotion recognition through facial expression is becoming popular due its various applications like robotics. Though deep learning approach is another viable alternative, non-neural network-based techniques like HOG and KNN require less compute and yet provide reasonable efficiencies in determining the human emotions. We can generalize the emotion detection steps as follows:

- 1) Dataset preprocessing
- 2) Face detection
- 3) Feature extraction
- 4) Classification based on the features

## 3. Objective

The objective of this project is to recognize human expressions and emotions to justify it as they are sad, happy or angry.

- To develop a facial expression recognition system.
- To experiment machine learning algorithm in computer vision fields.
- To detect emotion thus facilitating Intelligent Human-Computer Interaction

## 4. Scope

The scope of this system is to tackle with the problems that can arise in day to day life. Some of the scopes are:

- The system can be used to detect and track a user's state of mind.
- The system can be used in mini-marts, shopping center to view the feedback of the customers to enhance the business,

- The system can be installed at busy places like airport, railway station or bus station for detecting human faces and facial expressions of each person. If there are any faces that appeared suspicious like angry or fearful, the system might set an internal alarm.
- The system can also be used for educational purpose such as one can get feedback on how the student is reacting during the class.
- This system can be used for lie detection amongst criminal suspects during interrogation
- This system can help people in emotion related -research to improve the processing of emotion data.
- Clever marketing is feasible using emotional knowledge of a person which can be identified by this system.

## 5. Study of Existing System

Research in the fields of face detection and tracking has been very active and there is exhaustive literature available on the same. The major challenge that the researchers face is the non-availability of spontaneous expression data. Capturing spontaneous expressions on images and video is one of the biggest challenges ahead. Many attempts have been made to recognize facial expressions. Zhang et al investigated two types of features, the geometry-based features and Gabor wavelets based features, for facial expression recognition. Appearance based methods, feature invariant methods, knowledge based methods, Template based methods are the face detection strategies whereas Local Binary Pattern phase correlation, Haar classifier, Ada Boost, Gabor Wavelet are the expression detection strategies in related field. Face reader is the premier for automatic analysis of facial expression recognition and Emotient, Affectiva, Karios etc are some of the API's for expression recognition. Automatic facial expression recognition includes two vital facial feature representation and classifier problem.

The size of the block for the LBP feature extraction is chosen for higher recognition accuracy. The testing results indicate that by using LBP features facial expressions recognition accuracy is more than 97%. The block LBP histogram features extract local as well as global features of face image resulting higher accuracy. LBP is compatible with various classifiers, filters etc.

## 6. Project Description

Human emotions and intentions are expressed through facial expressions and deriving an efficient and effective feature is the fundamental component of facial expression system. Face recognition is important for the interpretation of facial expressions in application such as intelligent, man-machine interface and communication, intelligent visual surveillance, teleconference and real-time animation from live motion images. The facial expressions are useful for efficient interaction .

It is found that it is insufficient to describe all facial expressions and these expressions are categorized based on facial actions .Detecting face and recognizing the facial expression is a very complicated task when it is a vital to pay attention to primary components like: face configuration, orientation, location where the face is set

## 7 .Methodology/Planning of the Project work

Methodology includes the steps to be followed to achieve the objective of the project during the project development.

The facial expression recognition system is trained using supervised learning approach in which it takes images of different facial expressions. The system includes the training and testing phase followed by image acquisition, face detection, image preprocessing, feature extraction and classification. Face detection and feature extraction are carried out from face images and then classified into six classes belonging to six basic expressions which are outlined below

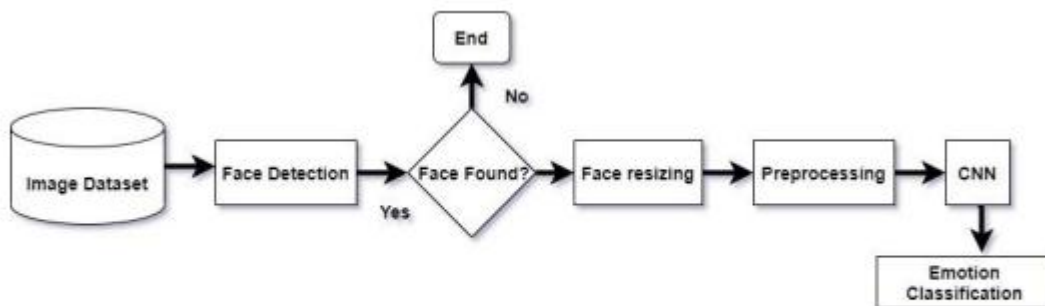
Images used for facial expression recognition are static images or image sequences. Images of face can be captured using camera.

Face Detection is useful in detection of facial image. Face Detection is carried out in training dataset using Haar classifier called Voila-Jones face detector and implemented through Open cv. Haar like features encodes the difference in average intensity in different parts of the image and consists of black and white connected rectangles in which the value of the feature is the difference of sum of pixel values in black and white regions

Image pre-processing includes the removal of noise and normalization against the variation of pixel position or brightness

Selection of the feature vector is the most important part in a pattern classification problem. The image of face after pre-processing is then used for extracting the important features. The inherent problems related to image classification include the scale, pose, translation and variations in illumination level .The important features are extracted using LBP algorithm.

SVM is widely used in various pattern recognition tasks. SVM is a state-of-the-art machine learning approach based on the modern statistical learning theory. SVM can achieve a near optimum separation among classes. SVMs is trained to perform facial expression classification using the features proposed. In general, SVM are the maximal hyper plane classification method that relies on results from statistical learning theory to guarantee high generalization performance



## 8. Limitations

The Given system for emotion detection are limited to six basic expressions (joy, sad, anger, disgust, fear, surprise).

Given system accuracy can be improved by retraining of models and combining multiple models together. still the detection system requires high end specification of hardware and requires more computing power

## 9. Conclusion

This project proposes an approach for recognizing the category of facial expressions. Face Detection and Extraction of expressions from facial images is useful in many applications, such as robotics vision, video surveillance, digital cameras, security and human-computer interaction. This project's objective was to develop a facial expression recognition system implementing the computer visions and enhancing the advanced feature extraction and classification in face expression recognition

## 10. References

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