Emotion Recognition System Using Local Binary Pattern

Rajat Kumar, Gursahaj Singh, Kapil Joshi

Abstract: ***The Facial Emotion Recognition system is an method of recognizing the emotions of a person. In this method image that is being captured is compared with dataset that are available in the database and then after that the emotion of the image is being recognized, and the emotion that are recognized are displayed with the help of machine on the screen of the computer. This system is based on image processing and machine learning. For designing a robust facial feature descriptor, we apply the Local Binary Pattern. Local Binary Pattern is a simple and effective operator which can labels the pixels of an picture by comparing the neighborhood of every pixel and store the result as an binary number. The histogram will be formed by using the operator label of LBP. The objective of this paper is to introduce the use and applications of facial emotions and expressions. In day to day conversation facial emotions play important role, It is a non-verbal form of communication. There has been many big researches enhance the detection of human emotions using computers and machines. In this paper, we include introduction of emotion recognition system, phases of emotion recognition system and implement the whole part of it.***

Keywords: Facial Expression, Local Binary Pattern, Facial Emotion Recognition

I. INTRODUCTION

A Face expression [1] of an human is the visible result of the state, activity, workload, personality and psychopathology, intensions [3] of a human and performs a important role in relationships [2][6]. There has been lots of studies for a long time and getting the progress recent years. Detecting the expression of human with a high quality is still difficult due to the difference [6] and complexities in face expressions because of the different shapes and size of face. Human beings can detect emotions with some ways for example movements, gestures as [3][10], face expressions and language [5]. The system can be very convenient in nonverbal method of communication with each other for people. The most important thing that is, how better the system can detects [5] or recognize the expressions of faces [7] from the picture. In a regular basics humans can detect [1] emotions by shapes of faces characteristics, features of human face displayed as a part of a face expressions. To a happy face the movement is associated with an smile or an upward movement of the edges and corners of the lips [7-9]. Similarly in other emotions they are differentiated by other different movements and actions or to a expression [9][14].

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Research in the auto recognition of face expressions has some problems in detecting the representation of characteristics of these actions of faces and expressions [7].This system classify facial expression of the person into the emotions like anger, disgust, fear, happiness, sadness and surprise. Main and important purpose of this system is efficient or good interaction or communication between humans and machines using the movements of faces, the face expressions etc. The detection and classification of facial movements' expressions can be used in a way for the interaction between the human and machine [4][6][8]. This system intensity vary from a one person to another person and also varies with age, gender, size and shape of the human face, the expressions and emotions of the same person do not remain same and constant with the time these expression keep changing at some time or after some time.

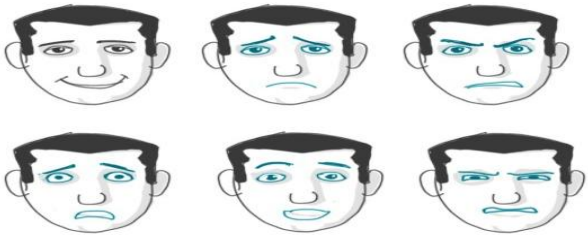


Figure 1:- Six basic Facial Expressions

Our objective is to make a emotion recognition system using machine learning approach in computer fields and to detect human emotions with the set of Intelligent Human-Computer Interaction.

II. SCOPE AND APPLICATIONS

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 see the state of mind an user. 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 [2][4][6][8] of each person. If there are any faces that appeared suspicious, 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 or how is there performance in class. This system can be used for lie detection amongst criminal suspects during interrogation. This system can help many people in emotion related research to improve the processing of data emotions that is currently present.

This system can be used in hospitals to detect the mind state of the patient.

III. LITERATURE REVIEW

Research in the fields of face detection and recognition has been very active and there is lot of literature available. The major problem that the researchers face is the non-availability of spontaneous or continuous expression data. Capturing spontaneous expressions on images and video is one of the biggest challenges. Many attempts have been made to recognize facial expressions. Zhang et. al. [7] (2012) investigated two types of features, the geometry-based features and Gabor wavelets based features, for facial expression recognition.

Mainly the problem is to detect the live faces of the human. There were many problems at that stage because of the different sizes of face and the movement of the face, so there has to be a good facial dataset collection and a good system that can also detect the spontaneous images. So the algorithm that we are using in this system is more efficient and reliable for this purpose. There were many problems that were faced by the researchers but by using the efficient algorithm they overcome all the problems and errors.

IV. METHODOLOGY

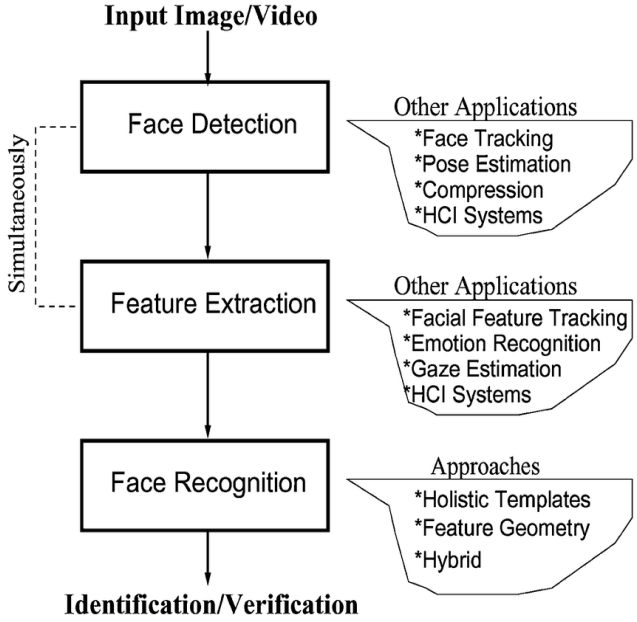


Figure -2: System diagram of Emotion Recognition System

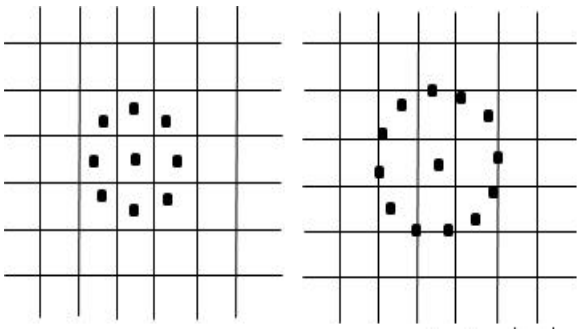
UNIVERSAL EMOTION DETECTION:

Table -1: Universal Emotion Identification

Emotion	Definition	Motion of facial part
	Anger is one of the most dangerous emotions. This emotion may be harmful so, humans are trying to avoid this emotion. Secondary emotions of anger are irritation, annoyance, frustration, hate and dislike.	Eyebrows pulled down, Open eye, teeth shut and lips tightened, upper and lower lids pulled up.
Anger Fear	Fear is an emotion of danger. It may occur because of some danger of physical or any harm. Secondary emotions of fear are Horror, panic, worry.	Eyebrow down, inner eyebrow up, mouth open, jaw down
Happiness	Happiness is most desired expression by human. Secondary emotions are cheerfulness, pride, comfort, hope, enjoyment.	Open Eyes, mouth edge up, open mouth, lip corner pulled up, cheeks raised, and wrinkles around eyes.
Sadness	Sadness is opposite emotion of Happiness. Sad emotions are suffering, hurt, despair, pitty and hopelessness.	Outer eyebrow down, inner corner of eyebrows raised, mouth edge down, closed eye, lip corner pulled down.
Surprise	This emotion comes when unexpected things happens. Secondary emotions of surprise are amazement, astonishment.	Eyebrows up, open eye, mouth open, jaw dropped

V.LOCAL BINARY PATTERN (LBP)

LBP is the feature extraction technique. The LBP operator points the pixels [8][13] of an picture with decimals, which are known as Local Binary Patterns or Local Binary Pattern codes that encode local structure around each pixel. Every pixel is compared with its neighbors in 3 X 3 neighborhoods by minimizing the center pixel value [2]. In the result, negative values that are obtained are encoded with zero and other values with one. For every pixel, a binary number is created by joining all the given binary numbers in a clockwise direction, which begins from the top-left neighbor of its own [1]. The related decimal value of the generated binary value is then used in labeling [13] the pixel that is given. The obtained binary values or we can say that binary numbers are referred to be the LBPs or LBP codes.



(P=6,R=2.0) (P=14,R=1.7)

Figure -3: Two examples of extended LBP

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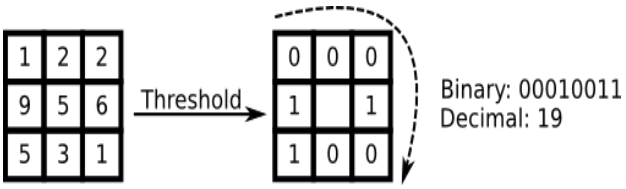

Figure 4:- The Basic LBP Operator

VI. EXPERIMENTAL RESULTS ANALYSIS

Table 2: Experimental results for emotion detection

Labels	Angry	Disgust	Fear	Happy	Neutral	Sad	Surprise
Angry	240	0	0	0	0	1	0
Disgust	1	160	0	0	0	0	0
Fear	2	1	200	0	0	0	1
Happy	20	30	165	94	1	10	0
Neutral	1	1	11	0	104	0	0
Sad	1	1	1	1	0	216	0
Surprise	10	14	139	1	0	9	50

VII. TERMINOLOGIES

Image Acquisition-

Images or pictures that are used for emotion expression recognition are static images. Images of the human faces are captured using the camera.

Face detection-

Facial Detection is very useful in detection of face image. Facial Detection is carried out in face detector and implemented through Opencv. It encodes the difference in the intensity in different parts of picture and made up of black and white related rectangles in which value of the feature is the difference between sum of pixles value of the white and black regions.

Image Pre-processing-

Image pre-processing includes the removal of noise and normal pictures against the difference of pixel position and the brightness.

1. Color Normalization
2. Histogram Normalization

Feature Extraction-

Selection of the feature of the human face is the most important part in a movement classification problem. The image of face after pre-processing is then used for extracting the important features

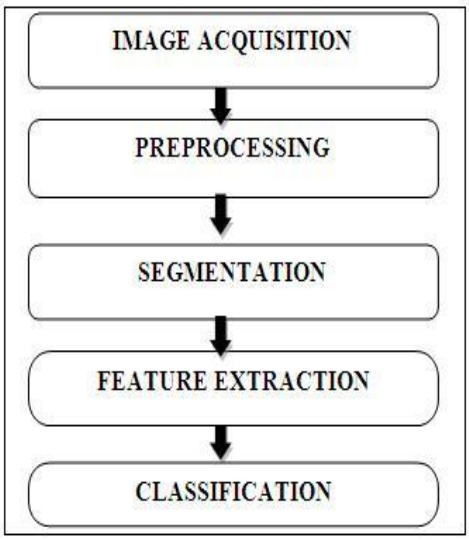

Figure 5:- Facial Expression Recognition System

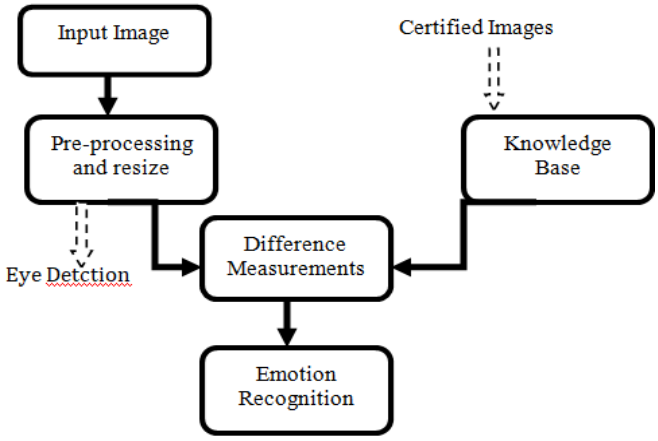

Figure 6:- How Emotion Recognition System works

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VIII. CONCLUSION

We have analysed emotions of Human using Emotion recognition system using pre-processed images or data sets that are stored in the system.

In 'Emotion recognition using linear binary pattern or images, first images are analysed and compared with the facial datasets so that the image that is being analysed can be converted into the desired result. The results of the detection are 29 to 75 percentages correct and true and from which when by using Fuzzy logic 70 to 80 percentages of emotions were detected. In this paper there are also some ideas or methods that can be used to sense the human emotions and also by reading and comparing the human faces with the picture or the data which is being stored in the knowledge base database. In this paper by using a system that is well trained by neural networks, we have achieved grate and some accurate results.

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