



A PROPOSED FRAMEWORK FOR EFFECTIVE EMOTION RECOGNITION FROM REAL TIME DATA

Jason Elroy Martis* & Dr. Balasubramani**

* Department of ISE, NMAM Institute of Technology, Nitte, Karnataka

** Professor, Department of ISE, NMAM Institute of Technology, Nitte, Karnataka

Abstract:

This Paper gives a view of the technological advancement in the field of Human Computer Interaction (HCI) with the aid of Human emotions and facial recognition by continuous Observation, to be implemented in a real time ecosystem. It also proposes an idea on how to recognize an emotion effectively from real time data.

Index Terms: Human Computer Interaction (HCI)

1. Introduction:

The bond of Humans with computer dates back from its inception. At prima-facie it was meant to be treated as a calculating device, but the technology improves at a lightning pace^[1], it has become an absolute necessity for the humans to have more intricate interaction with computers. This is where the concept of Human Computer Interaction (HCI) found its emergence. This has paved the path for humans to understand computers. Instead of having a system which is uni-modular this technology provides man-machine interaction. In human body the face is said to be the index of the mind. Indeed facial analysis is the way to deal with the fundamentals at the ground level. What a man feels in his mind and the way to decode is achieved reading his facial expression; hence, in a deeper sense it is the way to decode the creation of god in a natural way by means of continuous observation and evaluation of emotions. This demands the need for use of a behavioral model.

2. Classification of Emotions:

Emotion is a state of feeling that results in physical and psychological changes that influence our behavior.

A. Positive and Negative Emotions: The way humans react to situations differs in accordance to circumstances^[2]. The emotion displayed by humans is broadly divided into two basic categories:

- **Positive Emotions:** Positive emotions affect our brains in ways that increase our attention, awareness, and memory. They may be considered as any feeling where there is lack of negativity, such that no pain or discomfort is felt.
- **Negative Emotions:** Negative emotions warn us of threats or challenges that we may need to deal with. Too many negative emotions can make us feel overwhelmed, anxious, exhausted, or stressed out.

These are further classified into six basic emotions, they being:^[3]

- ✓ Happy: Enjoying or marked by joy or pleasure.
- ✓ Surprise: A sudden unexpected event.
- ✓ Fear: An emotion experienced in anticipation of some specific pain or danger.
- ✓ Disgust: Strong feeling of dislike.
- ✓ Anger: The state of being angry.
- ✓ Sad: Experiencing or showing sorrow or unhappiness.

B. Mixed Emotions: There are several other emotions that are combinations of emotions. In recent findings, scientists have concluded that there are emotions that contain a combination of six basic emotions^[3].

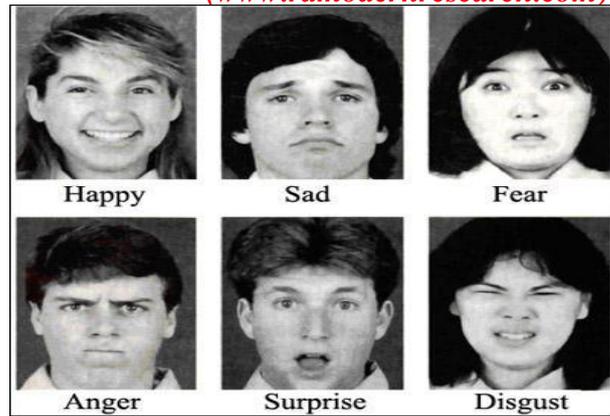


Figure 1: Six basic Emotions

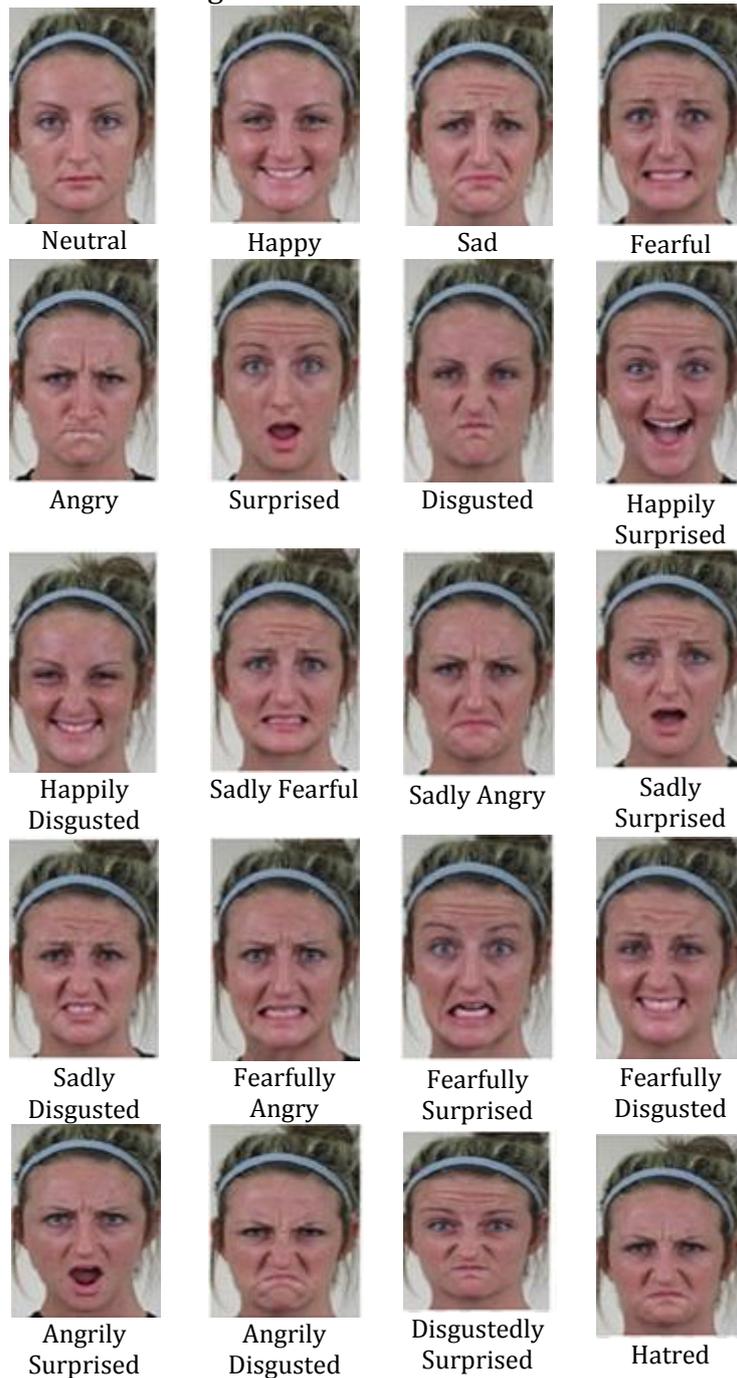




Figure 2: 21 Types of Emotions [4]

3. Features of Emotions:

Every emotion is associated with certain facial expression that makes us recognize the mood of the person [5]. This special characteristic gives us a unique identity to expressions and also provides an insight to how mechanism of detection of facial recognition of emotion works [6].

A. Classification of Emotion Based on Prominent Facial Features:

As we already know that emotion is a state and the way man expresses is through facial expression. When we take all the emotions into account they rather show changes in the prominent facial region and these are:

- ✓ Mouth and lip Region
- ✓ Forehead Region
- ✓ Eye and the eyebrow Region

The variation of these constitutes the feature highlight of a particular emotion.

Emotion	Lips					Eyes			Eye Brows			Forehead		Special Features
	Mouth		Curve			B	S	N	H	L	N	Cl	UC	Extra Features
	O	C	U	D	N									
Happy	✓		✓				✓				✓	✓		Wrinkles On eye brows
Sad		✓		✓			✓				✓			Chin Area is Visible
Fearful	✓				✓	✓					✓		✓	Wrinkles below eyebrows
Angry		✓			✓		✓			✓		✓		Enlargement of nose
Surprise	✓				✓	✓			✓				✓	Mouth wide open
Disgust		✓			✓		✓			✓		✓		Chin is Prominent
Happily Surprised	✓		✓			✓			✓				✓	Wrinkle near the eye
Happily Disgusted	✓		✓				✓			✓			✓	Wrinkles near eyebrows
Sadly Fearful	✓				✓	✓					✓		✓	Chin is prominent
Sadly Angry	✓			✓			✓			✓		✓		Ridges below eyebrow
Sadly Surprised	✓				✓						✓		✓	Mouth wide open
Sadly Disgusted	✓				✓		✓			✓			✓	Chin is Prominent
Fearfully Angry	✓				✓			✓			✓	✓		Length of lip is maximum
Fearfully Disgusted	✓				✓			✓			✓		✓	
Fearfully Surprised	✓			✓	✓				✓				✓	
Angrily Surprised	✓				✓	✓					✓	✓		Ridges below the eye
Angrily Disgusted		✓		✓			✓			✓		✓		Chin Prominent
Disgustedly Surprised		✓			✓	✓					✓		✓	Chin prominent
Hatred		✓		✓			✓			✓		✓		Ridges near eye
Awed	✓				✓	✓			✓				✓	Eye Wide open

Figure 3: Emotions and Their Individual Characteristics

The terminology is used as follows

- Mouth State:
 - Open (O)
 - Close (C)
- Lip Curve
 - Lips above normal Position (U)
 - Lips below normal Position (D)
 - Lips are Neutral (N)
- Eye Size
 - Eye Size Large (B)
 - Eye size Small (S)
 - Eye Size Neutral (N)
- Eyebrow Position
 - Above Normal (H)
 - Below Normal (N)
 - Normal (N)
- Forehead
 - No wrinkles (Cl)
 - Wrinkles (UC)

Based on the above analysis a person is said to be happy hen the following features are observed

Mouth → Open, Lip Curve → Up, Eyes → Small, Eyebrows → Neutral, Forehead → Clear, Wrinkles near eyebrows and so on.

The above figure shows how the basic emotions can be diversified from each other. It clearly shows that mixed emotions i.e., the combination of two basic emotions have certain characteristics in common ^[10]. These features can be studied further closely telling us that by carefully analyzing a face one can clearly make out the mood of the person.

4. Problems & Proposed System:

The Current Problem of proposed systems is that they do recognize expressions by classifying images on a basis of comparing images. This approach makes the task tedious and slower when it comes to real time emotion recognition.

To Innovate and facilitate a new engine for the detection of expression from real time data. It uses modern ideas and is open source. It also addresses the needs of emerging research areas within a specified context.

This proposed engine is to be designed to take advantage of the spatial 3D scene which is rendered into points. These points are then pushed on to the engine which internally classifies the expression based on the following approach

- ✓ A Pattern based technique for detection of mood
- ✓ An Algorithmic Approach for expression based detection.
- ✓ A Stored time frame of the expression which can be used to detect the expression.

The engine functions as a box that accepts input spatial points, classifies the expression as mentioned above and gives the output as an event if only there is a subsequent change in the expression. This gives a terminal advantage to even predict the next expression based on past examples.

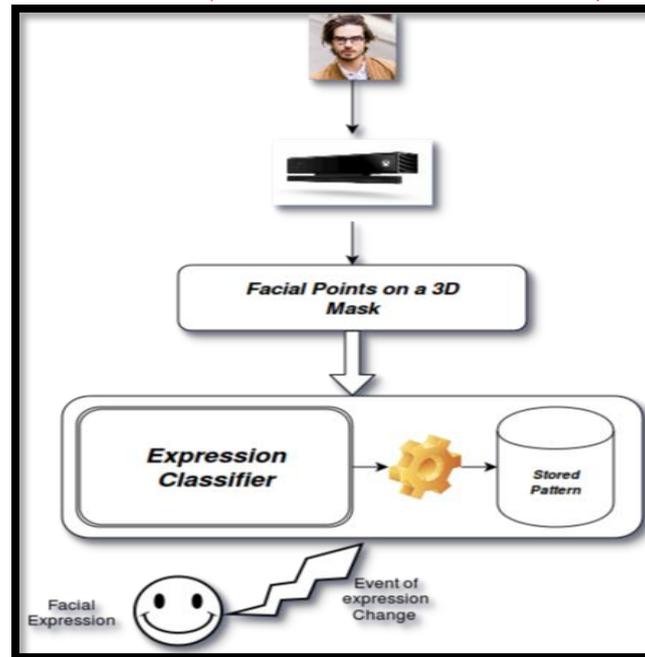


Figure 4: A Block diagram of the Proposed System

5. Conclusion and Future Work:

There is constant evolution in the field of HCI. The main aspect of these findings can be used to teach the machine to be more interactive than before. There could be a development of engine with the help of this technology that tracks the mood of the employee during a meeting or in the workplace so that the company can provide a better platform for job satisfaction of the employers by taking care of their need. The use of this technology may be limited for now, but someday our own computers could understand our problems and solve them.

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