Chapter 5: Human Face Emotions Recognition And Applications

5.1 INTRODUCTION

In the twentieth century, the world has come across with many technological innovations. Among the developing technologies the machine vision (vision sensors) and bio sensors play important roles in several areas of applications from industry to medical. While vision sensors are mostly suitable in detecting and categorizing the changes on the surface of human body, the bio-sensors measure and classify the activities from inside such as human emotions. It is an usual practice to recognize human emotions in six categories as shown in Fig. 43. They are Anger, Fear, Surprise, Disgust, Joy and Sad. Ekman and Friesen developed the most comprehensive system for synthesizing facial expression based on what they call as action units [59].

In the early 1990's, the engineering community started to use these results to construct automatic methods of recognizing emotions from facial expressions through still and video images [90]. The classification of emotion as shown in Fig.43 can be grouped into two. They are pleasant and unpleasant emotions. The joy, surprise and fear are brought under pleasant expressions and the rest are under unpleasant emotions. These groups are determined on certain similarities of the features of the face by using artificial intelligence techniques.

Human faces are accepted as the most expressive means for communicating and recognizing emotions. They can act as visual interfaces to understand emotions by other people through interacting with a computer. Face emotion presents an abstract means of description of facial expressions by utilizing concepts included in the MPEG-4 standard. It has been recently used in online-gaming [94]. Facial animation is a great means of improving human computer interface applications and especially in computer games, since it provides a powerful and universal means of expression and interaction.

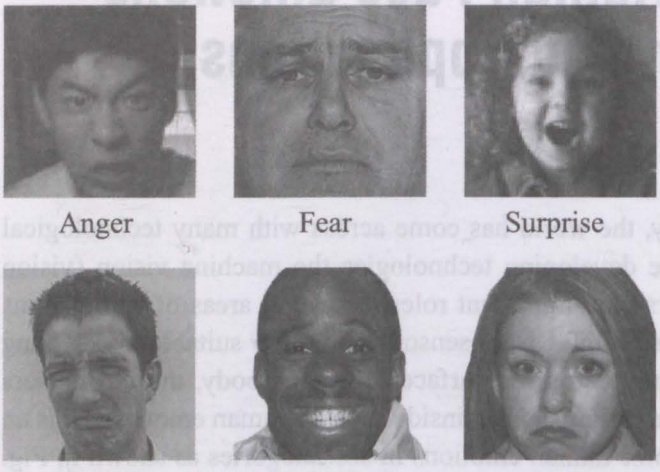

Fig.43 Six Basic Facial Emotions.

The general process flow for facial emotion recognition consists of data acquisition, feature extraction, recognition and classification. This is shown in Fig.44. Acquisition of data is carried out in two phases, such as image data acquisition and bio-sensor data acquisition. The face image acquisition is carried out using a still or video camera; the bio-sensor data are acquired by time based signals.

Feature extraction part has a few stages within it, such as image preprocessing (modifying the image readable by the computer) and edge detection of various face elements. The locations of face elements such as the eye, eye brow and mouth in the face are identified by the edge detection; these identified features are extracted for classification. Classification is a stage where the extracted features are studied for ascertaining emotions. The recognized emotions can be used for any specific applications such as emotion controlled robots.