Feature Extraction and Classification Stage on Facial Expression: A Review

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***Abstract*—Human facial expression becomes an important technology in recent years. As information technology and networks have grown, identification and authentication have become more frequent in people's daily lives, especially using biometric technology. Human facial recognition involves face detection, feature extraction, and classification. A lot of experiments showed that there are various techniques for extracting facial features and classifying facial expressions. This paper reviews and analyze the various optimization techniques on extract feature and classification stage for human facial expression recognition. This review will compare two kinds of extract features methods and one classification method. The first technique of extracting features is the optimization technique using the K-Mean algorithm, which helps to increase recognition accuracy. The second extract feature is an optimization technique using improved Gradient Local Ternary Pattern (GLTP) which is beneficial for computational resources efficiency. Lastly, the optimization technique for image classification using a three-staged Support Vector Machine (SVM) is very helpful for increasing accuracy and eliminating error. The modified GLTP is able to obtain an accuracy of 97%.**

Keywords—Human Expression Recognition, Face Detection, Feature Extraction, Classification, Optimization Technique

I. INTRODUCTION

In a social environment, human facial recognitions are tremendously important. Identification and authentication have become more common in people's daily lives as information technology and networks have advanced [1]. Artificial intelligence has raised the bar for innovation while also opening up new avenues for human-computer interaction [2]. Some researches try to obtain a high accuracy of human facial expression recognition. These researches will be beneficial for several objects such as identification and authentication, surveillance, computer gaming, augmented reality, etc [3]. Human facial expression is employed in real-time applications such as driver safety monitoring, medical imaging, robotics interaction, forensics, and deception detection. Human facial expression recognition can be composed of three key processes, face detection, facial feature extraction and facial expression classification [4]. In the face detection process, faces are detected in the backdrop and extracted. The human face consists of eyebrows, eyes, nose and mouth. The facial feature extractions are divided into two primary categories: appearance and geometric [4]. A filter method is implemented on the face for extracting changes in specific emotions. While, appearance-based utilized Local binary patterns (LBP), local directional patterns (LDP), and local ternary patterns (LTP). Lastly, expression classification is the final stage of the human facial expression recognition system to obtain the categorization of expressions for example happy, sad, surprise, anger, fear, disgust, and neutral [1].

Facial feature extraction and facial expression classifier are the two primary components of human facial expression recognition, which will be discussed more in this paper with optimization techniques to solve some problems like computational resources and recognition's accuracy. In addition, this study demonstrated the benefit of various human facial expression recognition techniques as well as a performance analysis of various human facial recognition strategies. The literature review in this work focuses solely on image-based techniques, with no mention of video-based techniques. Human facial expression recognition systems are typically used to address issues such as lighting fluctuations, position variations, lighting variations, and skin tone variances.

II. RELATED WORK

The high-level overview of the human facial expression recognition system is depicted in Fig. 1.

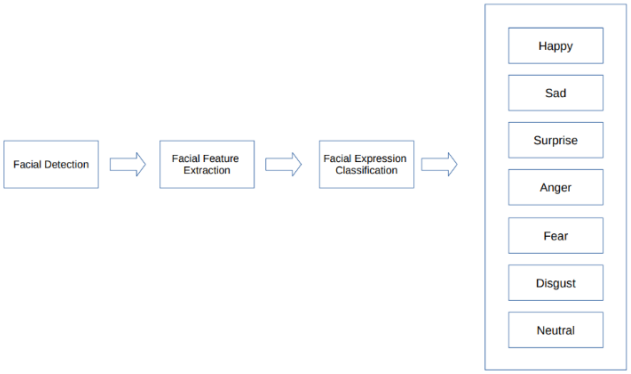

Fig.1. Overview human facial expression recognition process