

Image Based Facial Expression Recognition Using Local Neighborhood Difference Binary Patterns

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Abstract. Recently, automatic facial expression recognition (FER) has gained enormous interest among the computer vision researchers because of their potential deployment in a number of industrial, consumer, automobile and societal applications. There are a number of techniques available in the literature for FER, among them many appearance-based methods such as local binary pattern (LBP), local directional pattern (LDP), local ternary pattern (LTP), gradient local ternary pattern (GLTP) and improved local ternary pattern (IGLTP) have been shown to be very efficient and accurate. In this paper, we have proposed a new descriptor called Local Neighborhood Difference Binary Pattern (LNDBP). This new descriptor is motivated by the recent success of local neighborhood difference pattern (LNDP) which have been proven to be very effective in image retrieval. The basic characteristics of LNDP as compared to the traditional LBP is that it generates binary patterns based on a mutual relationship of all neighboring pixels. However, in the case of LBP the mutual relationship does not exist, here only the neighboring pixels are compared with the central pixel to generate the binary pattern and hence there is a loss of information which is well captured by LNDP. Therefore, in order to utilize the benefit of both LNDP and LBP, we have proposed LNDBP. We have also employed a dimensionality reduction technique to reduce the dimension of the LNDBP features. The reduced features are then classified using kernel extreme learning machine (K-ELM) classifier. In order to validate the performance of the proposed method, experiments have been conducted on two different FER datasets. The performance has been observed using well-known evaluation measures such as accuracy, precision, recall, and F1-Score. The proposed method has been compared with some state-of-the-art works available in literature and found to be very effective and accurate.

Keywords: Facial Expression Recognition (FER), Local Neighborhood Difference Pattern (LNDP), Principal Component Analysis (PCA), Kernel Extreme Learning Machine (K-ELM).

1 Introduction

Recently, automatic facial expression recognition (FER) has gained enormous interest among the computer vision researchers because of their potential deployment in a number of industrial, consumer, automobile and societal applications. For example, such a technology could be embedded inside a robot for providing home services like talking to children and taking care of elderly people. In addition, FER based technol-

