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Robust Face Recognition Under Partial Occlusion Based on Local Generic Features

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ABSTRACT

Face recognition has drawn significant attention due to its potential use in biometric authentication, surveillance, security, robotics, and so on. It is a challenging task in the field of computer vision. Although the various state-of-the-art methods of face recognition in constrained environments have achieved satisfactory results, there are still many issues which are untouched in unconstrained environments, such as partial occlusions, large pose variations, etc. In this paper, the authors have proposed an approach which utilized the local generic feature (LGF) to recognize the face in the partial occlusion by fusing features scale invariant feature transform (SIFT) and multi-block local binary pattern (MB-LBP). It also utilizes robust kernel method for classification of the query image. They have validated the effectiveness of the proposed approach on the benchmark AR face database. The experimental outcomes illustrate that the proposed approach outperformed the state-of-art methods for robust face recognition.

KEYWORDS

Local Generic Feature, MB-LBP, Partial Occlusion, Robust Kernel Method, SIFT

INTRODUCTION

The face recognition task in the computer vision system can be described as follows: Given an input face image and a database of face images of known individuals, how can we verify or determine the identity of the person in the input image? A robust face recognition system is used in a biometric application for verifying and identifying an individual of interest. Researchers from the areas of image analysis, computer vision, machine learning, pattern recognition, and many others are working cooperatively, inspired not only by the fundamental challenges but also by various real-life applications in which person of interest identification is required. The interest of researchers is also increased by the fact that with the rising public concern for security, the need for identity verification such as face recognition is more apparent. Also, advance technology, such as in mobile devices and digital cameras made face recognition more important and easier to approach. The various state-of-art methods of face recognition in constrained environments have achieved satisfactory results. There are still many issues which are untouched in unconstrained environments, such as partial occlusions, large pose variations, etc.

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In this paper, we have proposed an approach which utilized the Local Generic Feature (LGF) to recognize the face in the partial occlusion by fusing features Scale Invariant Feature Transform (SIFT) & Multi-Block Local Binary Pattern (MB-LBP). It also utilizes a Robust Kernel method for classification of the query image.

The following is the organization of this paper. In Section 2, we have briefly described the related work. In Section 3, the proposed model for robust face recognition is described. Section 4 shows the result and discussion of experimental results on standard datasets. Finally, section 5 elaborates the conclusion and future scope.

Related Work

There are various state-of-art approaches proposed in the literature for automatic and robust face identification. Yuan et al. (2016) proposed face identification under occlusion using an occlusion dictionary and support vector discrimination dictionary. The support vector machine scheme is used to train the non-occlusion dictionary, guaranteeing that the resulting dictionary can not only express testing samples from the same class but also can reduce the interference of samples of different classes. Huang et al. (2017) proposed kernel extended dictionary (KED) for face recognition, which shows efficient and effective direction for fusing KDA and Sparse Representation based Classification (SRC). Duan et al. (2017) proposed a partial face recognition approach which is approximated a transformation encoding based on non-rigid graphical structure and computing the correspondence between edges & node.

Liao et al. (2013) proposed a face recognition system under partial occlusion approach without proper alignment. They design the face representation method based on multi-key point descriptor without alignment, where the feature vector size of a face is determined by the original information of the facial image. Ying Wen (2017) proposed a robust face recognition system based on discriminative common vector dictionary. The discriminative common vector technique has utilized the feature of variations of fisher's linear discriminate analysis for smallest query sample. Cheheb et al. (2017) proposed an approach to solve the partial occlusion present in face recognition system using a single sample per person (SSPP). First, image is divided into multiple patches and local binary patterns are applied as a texture descriptor on each block separately. Then, a kernel principle component analysis is applied to dimensionality reduction of the resulting descriptors. Wu et al. (2016) proposed an approach known as SRC based occlusion pattern (OPSRC). They find contiguous occlusion region from the testing sample to construct an occlusion pattern. An occlusion dictionary is constructed by the addition of all facial image's occlusion pattern. The original dictionary and occlusion dictionary are solved together. If the occlusion is detected in the query sample, and then applied the similar occlusion to the entire facial feature in the dictionary.

Liu et al. (2016) introduced artificial occlusions into the training set. Then a class-specific dictionary is created by the incremental training set, and a dense hybrid and sparse representation framework that represent sparse corruption and noise and without a class-specific dictionary. Tan et al. (2017) introduced KLS-GSRC by fusion of kernel trick, group sparsity, and data locality. Then nonlinear & structure feature is combined in the training and test set that is a more discriminative representation and better exploited. McLaughlin et al. (2017) proposed a new approach for robust face recognition that is reliable to illumination variation and partial occlusion. The method was based on a single training sample per person. They introduce a new approach for comparison of the facial image similarity that is based on largest matching area (LMA) at each facial image location. LMA optimizes the accuracy of lighting conditions and at the same time, it improves the discriminative power between different individual.

Alrjebi et al. (2017) proposed a technique to overcome the issue of face recognition under partial occlusions. The given method is based on color image representation utilizing more than three color components in each patch rather than on whole face image. Xiaolin Chen et al (2016) gives a method