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Novel approach to pose invariant face recognition

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Abstract

Face verification in the wild, remains a challenging problem. This paper makes two contributions: first, for improving face recognition in the wild, at least in terms of pose variations, we propose a method for aligning faces by employing single-3D face model as reference produced by FaceGen Modeller. Second, we develop a novel face descriptor based on Gabor Filters. The proposed descriptor relies on combination of Gabor magnitude and Gabor phase informations into an unified framework, which is capable to overcome standard representations in the most popular benchmark "Labeled Faces in the Wild" (LFW). This compact descriptor has a better recognition performance, reaches an accuracy of 97.29% on the LFW dataset.

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Keywords: Face Recognition, Gabor Filter, Pose Correction, Support Vector Machine, RBF Kernel, LFW;

1. Introduction

In face verification, images are presented in pairs and the task is to verify if they belong to the same or different persons. Face verification has recently gained lot of popularity owing to few public benchmark datasets being available. Fig. 1 shows example of such a task. Applications of this task are in search and authentification domains

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such as entertainment, human machine interaction, homeland security, and video surveillance, access control to user authentification schemes in e-commerce, e-health, and e-government services. There are many challenges in dealing with this applications listed such as variation in illumination, variability in scale, location, orientation and pose. Furthermore, facial expression, facial decorations, partial occlusion and lighting conditions change the overall appearance making it harder to recognize faces. Fig. 2 shows some examples of these types of challenges. Face recognition is really a series of several related problems: face detection, face normalization, feature extraction, and feature matching. As a human, your brain do all of this tasks automatically and instantly. Computers are at least not yet able of this sort of high-level generalization, so we have to teach them how to do each task in this process separately. To do so, we need to build a pipeline where we solve each step of face recognition separately and pass the result of the current step to the next step (see figure 3).

Fig. 1: Examples of similar and dissimilar pairs

Fig. 2: Examples of visual challenges

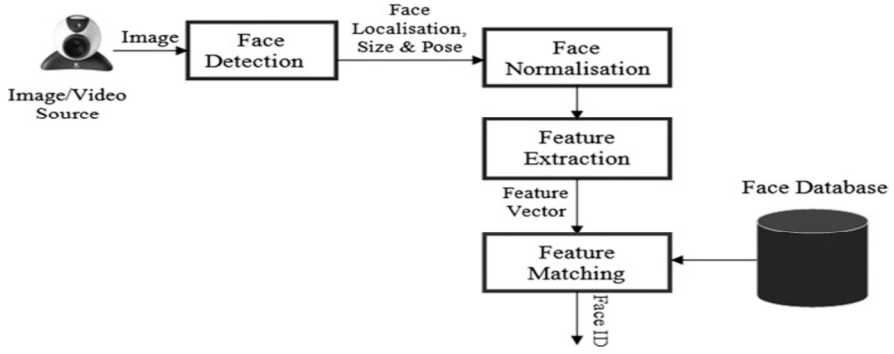

Fig. 3: Pipeline of a typical face recognition system

The main objective of this work is to propose a reliable framework insensitive to challenges listed above, in particular capable to “identify faces from a side view” as well as when the person is directly facing the camera in the