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Survey on Video Based Face Recognition using PPCA-SIFT Algorithm

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Abstract: *In an unconstrained video, one has to explore identity information of all the images to recognize people. The method is based on video-dictionaries that contain the identity cues which include both face and body. Video-dictionaries are sparse representation and dictionaries for still images. It is designed to encode pose and illumination information. An algorithm called Pore Principal Component Analysis Scale Invariant Feature Transform (PPCA-SIFT) is used to extract the pore scale facial features. This method can achieve excellent accuracy even if the faces undergo large variations in illumination, expression and pose.*

INTRODUCTION

Face recognition is widely used in various real time applications like finding lost children by using the images taken from the cameras at public places and theft at ATM machines. The system operates in two modes: (1) Face detection (2) Feature extraction (3) face recognition. Face detection method takes a frame that consist of a facial features of an individual from a video sequence. Face recognition involves one-to-many matches that compare a captured image against all the images in the database to determine the identity of the captured face.

Based on the characteristics of images, there are three categories in face recognition: (1) Still-to-Still recognition (2) Video-to-image face recognition (3) Video-to-Video face recognition. The paper is done on video-to-image face recognition. Video based face recognition is a very challenging problem affected from low quality facial images, scale variations, illumination changes, pose variations and motion blur.

Description

Video-based face recognition systems consist of three modules: (1) Face detection module (2) Feature extraction module (3) Face recognition module

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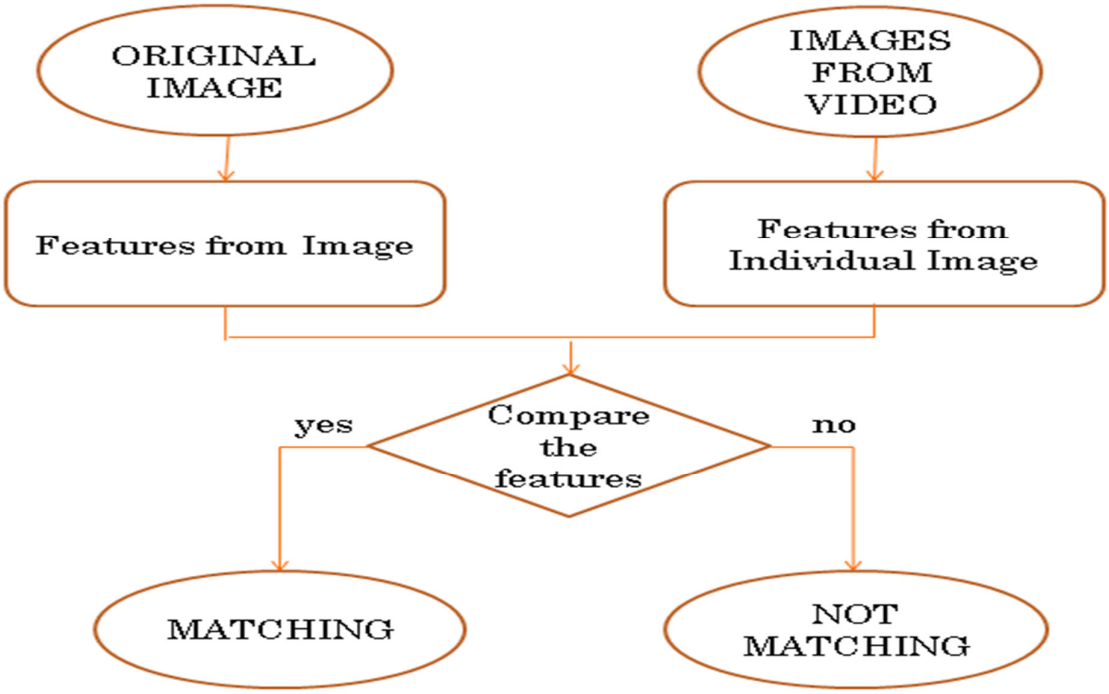

Face Detection

Face detection is the first stage of face recognition. In this module, system takes a frame of the video sequence and performs some image processing techniques to find face region of a person. The process of operating the still images by the system is known as face localization. The process of operating the video sequence by the system is called face tracking. The performance of face detection is based on complexion, motion, head shape, facial appearance or a combination of these parameters. Face detection technique is used to find exact location of faces in the current frame and thus initiating face and facial feature tracking.

Feature Extraction

Feature extraction is a main module for face recognition. Once the face is detected, facial features are needed to be extracted. Two types of features can be extracted: (1) Geometric features (2) Appearance features. Geometric features represent the shapes and location of facial components like eyebrows, eyes, nose and mouth. The appearance based features represent the complexion changes of the face like wrinkles.

Face Recognition

The face recognition methods are divided into two categories: (1) Frame-based recognition (2) Sequence-based recognition. The Frame-based recognition method is based on still images and sequence-based recognition method is based on unconstrained video images. Sequence-based recognition uses the temporal information of the sequence to recognize the expressions for one or more frames.

Pore-Scale Facial-Feature Detection

In a scale facial feature detection, an image is transformed into large collection of feature vectors, each of which is invariant to image translation and scaling. Pore-scale facial features include pores, wrinkles and hair, which usually present in the whole face. Most of the pore-scale facial features are blob-shaped features. In order to generate a sufficient number of correspondences between two face images, a large number of reliable feature points should first be detected on each of the two faces. PSIFT detector estimates the adaptive threshold based on a cropped skin region in the cheek instead of the whole face image. The comparison is performed between the key points detected from two faces. Matching accuracy depends on maximum of matching key points.

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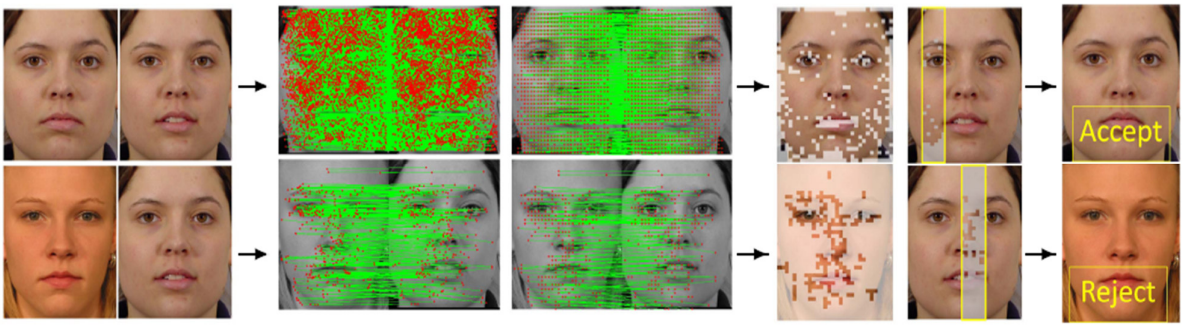

Example of two images | keypoint extraction | comparison of keypoints | matching analysis

Algorithm for Matching Operation

Transform the matched keypointpairs to initially matching block pairs
for each block B' of the W'*S' blocks do
for each initially matched block B do
NB=0
for each of the nu neighbors U do
Compute the location of U'perfect based on B,B' and U
if distance(U'U'perfect)<R then
nB= nB+1
U' is a parellel supporting block
end if
end for
if nB>=ntthen
B' is aggregated
end if
end for
end for

Conclusion

The main objective of this paper describes a survey of video-based face recognition. PPCASIFT feature can efficiently reduce the computational time of the matching process and also eliminates illumination changes, pose variations and image blur. In future video-based face recognition has made great challenge and to adopted in real application like verifying for criminal records and identifying a criminal at public place, knowing in advance if some unknown person is entering at the border checkpoints.

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