Face recognition is one of the most passive, convenient, natural, friendly, and noninvasive types of biometrics. It can be used even in situations with large concourse of unaware visitors. Robust face recognition and analysis can find applications in a wide variety of context such as security and surveillance, human computer interaction, video games, virtual reality, video conferencing, access control, network login, ATM.

Changeability and privacy are important factors for the widespread deployment of biometric technology due to the limited number of biometric traits that human possesses, as well as the fact that biometric data reflects the user’s physiological and/or behavioral characteristics. One objective of our research is to advance the state of the art in face recognition, and develop methods for changeable and privacy preserving biometric template generation.

Our sorted index number based approach improves the recognition accuracy comparing with traditional appearance based approaches, and can be applied in conjunction with random transformations for producing biometric templates with strong changeability and privacy protection.

Our random projection based approach is data-independent, easy to implement, and does not require the computationally complex procedure for training. It is capable of providing changeable and privacy preserving face recognition, while achieving recognition rate that is comparable to existing approaches.

Another objective of our research is to introduce robust techniques for recognizing expression-variant faces from one image per person. The proposed approach synthesizes other expressions of the input image by effectively projecting it to expression-specific subspaces. The synthesized images are then used to retrain discriminant feature extraction system.

The introduced solution is an appearance-based method and is computationally simple. It does not need prior knowledge of the input’s facial expression and is compatible to the facial expressions that are unknown by the training system. For the recognition of a probe with an arbitrary expression from a gallery set of various expressions, the proposed method decreases the verification error rate by 40% to 46% at the false acceptance rate of 0.1%. The development of such system shows high potential for surveillance and human-compute-interaction applications that have uncontrolled facial expression.

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