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FACE RECOGNITION BASED ON FLDA, CPCA AND IMPROVED HMM

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Abstract. *A new face recognition algorithm which is bases on Fisher Linear Discriminant Analysis (FLDA) , Complex Principal Analysis (CPCA) and maximum model distance (MMD)-based Hidden Markov Models (HMM) is presented. This algorithm can get a better recognition rate and increase the robustness of the structure to a certain extent. FLDA and CPCA are used to get the effective features of the face images. Improved HMM is used to train those features and obtain a optimized HMMs. Compared with other face recognition algorithms on the ORL face database, this method is positive.*
Keywords: Face recognition, FLDA, CPCA, HMM, MMD

1. **Introduction.** Face recognition can date back to the 19th century, and now it has been a hot topic of computer vision and pattern recognition. Since 1960s', with the developing of computer technology and image manipulation, face recognition was well developed. The wide array of possible applications of face recognition has led to a continuous search for more precise algorithms and techniques. Roughly speaking, face recognition algorithms can be categorized as follows: geometric and statistical algorithms. The geometric algorithm is played in handling simple images with less influence of sunshine, illumination and complexion. The statistical algorithm [1, 2, 3, 5, 10] is a common recognition method in which the face images are taken as eigenvectors to catch and describe entire face information. But its dimensions of eigenvectors are high and makes computation be complex, so how to decrease the dimension is the key to the statistical algorithm. FLDA is a common method to reduce the dimension and can effectively abstract the different features. In 1996, PCA and FLDA were combined by Swets and Weng [1], in 1997, Belhumeur put forward Fisher faces [2], they both reduced the dimension, brought PCA in low-dimension space, and got better results. In 2003, Gao Xiumei [3] presented a novel face recognition method based on complex principal component analysis. She combined PCA features and FLDA features by complex space, then used CPCA to extract new features in the complex space, the result is positive. HMM was first presented by Baum [4] in 1970's, then CMU'Baker and IBM'Jelinek used it to do speech recognition. HMM is a duplicate Markov stochastic process, its state is unobservable, we can see it only by completing that process. In 1994, F.Samaria [5] brought HMM into face recognition and got a recognition rate. Their scheme used grey level pixel values of the face image for training and recognition. In 2006, Yang Guoliang showed a improved HMM [6], he described a new approach for HMM training which based on IMMD and that method effectively increased recognition rate.

2. **FLDA, CPCA and Improved HMM.**