

# The Study of Face Recognition Based on Multi-Class Support Vector Machines and LDA Algorithm

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## ABSTRACT

Face recognition has been broadly applied in the areas such as public security, access surveillance, medical diagnosis, and intelligent life in the recent years. Hence, it deeply influences the living style of the human being. There are many Biometric identification techniques such as fingerprints, retina, iris, palm prints, and face recognition, but the face recognition with non-intrusive features is widely accepted by the public. Additionally, video conference, image content indexing and medical diagnostics are also the most important applications of the face recognition. Feature extraction and classification are the two most issues in the face recognition. For feature extraction, it uses the subspace transform technique to map the high dimensionality of the original image space into a lower one. This study uses the methods, including Principle Component Analysis (PCA), and Linear Discriminant Analysis (LDA) to extract the feature spaces. As to the classification in face recognition, the classifiers such as Euclidean distance, cosine distance, and support vector machine are applied. When using SVM and the Olivetti Research Lab (ORL) face database, the average recognition rates for PCA, LDA, and D-LDA are 87.4%, 89.9%, and 84.3%, respectively. But for other classifiers, the average recognition rates show a declined tendency. Further investigating the effects of different illumination and view angles on the recognition rates, the MIT-CBCL face database is employed. The average recognition rates of PCA, LDA, and D-LDA reach 85%, 97%, and 83%, respectively, when using SVM as a classifier with 100 training samples. But when only 10 training samples are used, the recognition rates decrease to 84%, 73%, and 72%, respectively. Clearly, the PCA outperforms the LDA when less training samples are available. The results indicate that the proposed wavelet-based LDA method with SVM as a classifier outperforms the other methods, implying that SVM has high performance in data classification.

Keywords : Face recognition ; Wavelet transforms ; Linear discriminant analysis(LDA) ; Support Vector Machine(SVM)

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