多類支持向量機混合LDA演算法之人臉辨識研究

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摘 要

近年來，由於人臉辨識系統被廣泛地應用在「治安保全」、「門禁監控」、「醫療診斷」與「智慧生活」等方面，因此對於人類生活產生相當程度之影響。在眾多的生物辨識技術(Biometric Identification Technique)中，包含指紋、視網膜、虹膜、掌紋與人臉辨識等，其中因人臉辨識之非侵入性，最具優勢。此外視訊會議、影像內容檢索與醫學影像處理等方面，亦是其重要之應用領域。　　特徵擷取(Feature Extraction)與分類比對(Classification)是人臉辨識的兩大主題。在特徵擷取階段，即是指利用子空間轉換技術(Subspace Techniques)，將高維度之原影像空間投影至較低維度之影像空間，本文採用的方法有：主分量分析法(Principle Component Analysis；PCA)，與線性鑑別式分析法(Linear Discriminant Analysis；LDA)等方法。在分類比對方面，則採用歐式距離、餘弦距離、與支持向量機分類器等。 當以SVM為人臉分類器，若以ORL為測試之人臉資料庫，PCA、LDA與D-LDA之平均人臉辨識率分別可達87.4%、89.9%與84.3%。當進一步採用其它分類器時，其平均人臉辨識率均有下降之趨勢。此外，本文為了測試不同光線與角度對人臉辨識之影響，採用MIT-CBCL做為測試之人臉資料庫。同樣地，當以SVM做為人臉分類器時，PCA、LDA與D-LDA之平均人臉辨識率在測試樣本充分的清況下(樣本數=100)，分別可達85%、97%與83%。但在樣本數不足之情況下(樣本數=10)，其辨識率分別下降為84%、73%與72%。由此可知，在測試樣本不足之條件下，顯然PCA具有比LDA更高之人臉辨識率，在本文探討的九種人臉辨識方法當中，可知以「小波轉換＋LDA演算法則+SVM分類器」之人臉辨識率為最高，這顯示出SVM在人臉分類上具有相當優異之性能。此外當訓練類別或樣本數增加時，雖然可以提高人臉辨識率，但相對地其訓練時間也延長許多。

關鍵詞 : 人臉辨識 ; 小波轉換 ; 線性鑑別式分析法 ; 支持向量機

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