摘要

作为人脸识别领域中的关键技术，特征选择和分类器设计是该领域中的研究重点之一。设计出一套行之有效的特征选择机制以及合理的分类器将提高整个人脸识别系统的性能。本文从特征表述、特征选择和分类器设计这三个角度出发，实现了一个完整的人脸识别算法。

本文首先对人脸识别技术的整体框架作了一个简要的描述，并对人脸识别技术中的关键技术---特征表述、特征选择和分类器设计作了简要分析，强调了在这三方面工作的意义。同时对当前存在的关键问题：光照问题、姿态问题和遮挡问题作了简单的介绍，针对存在的问题，选用对光照变化、姿态变化和遮挡都较鲁棒的局部特征作为人脸描述特征。

其次，介绍本课题的具体实现流程。第一步，对本课题中涉及到的主要工具：Gabor 特征和 AdaBoost 做了介绍；第二步介绍了本课题的工作重点，基于 IntraPersonal，ExraPersonal 空间概念，利用 AdaBoost 对 Gabor 特征进行选择并且构造强分类器；然后对得到的 Gabor 特征序列进行分析，探求区别不同人脸的特征存在的规律，为特征选择提供方向上的指导。

最后，基于 AdaBoost 选择的 Gabor 特征进行人脸识别。首先从分类器角度出发，介绍了基于 AdaBoost 构建的强分类器进行识别和利用 PCA 降维，然后利用 LDA 作线性判别分析的方法。然后对基于 AdaBoosted Gabor 特征的 LDA 方法作泛化能力评测，与不经过特征选择的 LDA 方法做对比，得到泛化能力和与特征维数的一个初步结论。

Abstract

As the key technologies of face recognition, feature selection and classifier design are always the hot points of FR research. It is normal to improve the performance of one face recognition system if it takes an effective schedule to select feature and build the classifier. Therefore, the target of this paper is to build one whole face recognition algorithm from three aspects: feature description, feature selection and classifier design.

In the first part of this paper, the frame of face recognition is described. And then the key technology such as feature description, feature selection and classifier design are introduced briefly, and it is emphasized that more work should be done on these areas. In the following, the variance of illumination, pose and the dodge, which are the key problems of face recognition, are introduced simply. Based on these problems in face recognition area, local feature is taken to describe the faces for its robust to illumination variance, pose variance and dodge.

Then, the flow chart of the method in this paper is proposed. Firstly, Gabor filter and Adaboost are introduced which are the main tools in the method. Then Based on the concept of IntraPersonal and ExtraPersonal space, AdaBoost is taken to select the effective Gabor features and to build the strong classifier. In order to find the law of the distribution of Gabor features which discriminate different people most effectively, some analysis is done on the sequence of Gabor features. As the result, the direction of how to select features can be found.

Finally, the strong classifier built by AdaBoost is taken to recognize different faces. Based on the AdaBoosted Gabor features, LDA is taken on to train model and then to classify different faces. In the following, some experiment was done to test the generalization ability of the method using LDA and Gabor features selected by AdaBoost, and this method is compared with the method using LDA and Gabor features without selection. From the experiment result, we can draw this conclusion that the generalization ability is in inverse proportion to the number of Gabor features.

Key words: Gabor features, AdaBoost, Bayesian, Liner Discriminate Analysis, Misalignment