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# Pose and Illumination Variable Face Recognition via Sparse Representation and Illumination Dictionary

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## Abstract

This paper addresses the problem of face recognition under pose and illumination variations, and proposes a novel algorithm inspired by the idea of sparse representation (SR). In order to make the SR early designed for the pose-invariant face recognition suitable for the case of pose variation, a multi-pose weighted sparse representation (MW-SR) algorithm is proposed to emphasize the contributions of the similar poses in the representation of the test image. Furthermore, when some illumination variations are added to the images, it is more reasonable to take advantage of the results of pose variable recognition and avoid the traditional SR method that adds all kinds of images with pose and illumination variations in the training dictionary. Here, a novel idea of the proposed algorithms is adding a general illumination dictionary to the training dictionary, and that once the illumination dictionary is designed, it is common for the other face databases. Extensive experiments illustrate that the proposed algorithms perform better than some existing methods for the face recognition under pose and illumination variations.

*Keywords:* Face recognition, sparse representation, dictionary learning, illumination dictionary

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## 1. Introduction

The strong adaptability, high security, and noncontact smart interaction of face recognition make it of great potential in applications like public security, intelligent access control, and criminal investigation, thus it increasingly becomes a hot topic in the field of pattern recognition and computer vision. With decades of development, the automatic face recognition technology has made a tremendous progress, and been able to achieve a satisfactory recognition performance under some ideal conditions, but there is still much work to do in the practical applications. For example, the illumination, pose, and the age of people often

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