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# Multiple Representation Based Sample Diversity for Face Recognition

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**Abstract:** Proper representation plays a significant role in pattern recognition fields, effective representation of an image makes it easier to distinguish from images of other classes and can improve the accuracy of classification. In this paper, to obtain appropriate representative samples of a face, we propose a novel method to represent an original sample. We crop the original image into a number of non-overlapping blocks, and perform certain operation for each block with certain arithmetic, then merge them and obtained a new representation of the original sample. Furthermore, we integrate original samples and its corresponding block representation, which provide more local information of images and allow higher accuracy to be achieved. The extensive experiments demonstrate that our proposed method is robust and obtain better accuracy for face recognition in comparison with previous methods.

**Key words:** Multiple representation, sample diversity, image block, face recognition, collaborative representation

## 1. Introduction

Face recognition is widely applied owing to important theoretical research value and its wide range of applications [1-4] associate with government, military, security, banking, attendance and so on. It is the fact that the key challenge of face recognition is that images of the same person may be scarce. When the sufficient training samples are provided for modeling, the state-of-the-art face recognition approaches such as linear regression based classification (LRC), sparse representation based classification (SRC) [5-7] and collaborative representation based classification (CRC) [8] are able to achieve good performance. In order to address the problem of lack of samples, many methods have been proposed to incorporate existing methods. Among them, producing multiple representations of an image from original samples to expand the size of the set of the training samples is an intuitive and effective approach [9].

Image representation plays a significant role in computer vision [10], getting more

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