Author's Accepted Manuscript

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www.elsevier.com/locate/sigpro

PII:S0165-1684(14)00390-9DOI:http://dx.doi.org/10.1016/j.sigpro.2014.08.026Reference:SIGPR05548

To appear in: Signal Processing

Received date: 25 April 2014 Revised date: 7 August 2014 Accepted date: 16 August 2014

Cite this article as: Ping Li, Jiajun Bu, Bin Xu, Zhanying He, Chun Chen, Deng Cai, Sparse fixed-rank representation for robust visual analysis, *Signal Processing*, http://dx.doi.org/10.1016/j.sigpro.2014.08.026

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ACCEPTED MANUSCRIPT

Sparse fixed-rank representation for robust visual analysis

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Abstract

Robust visual analysis plays an important role in a great variety of computer vision tasks, such as motion segmentation, pose and face analysis. One of the promising real-world applications is to recover the clear data representation from the corrupted data points for subspace segmentation. Recently, low-rank based methods have gained considerable popularity in solving this problem, such as Low-Rank Representation (LRR) and Fixed-Rank Representation (FRR). They both learn a low-rank data matrix and a sparse error matrix. Each new data representation is learnt using the whole dictionary covering all data points. However, they neglect a common fact that each point can be represented by a linear combination of only a few other points w.r.t. to a given dictionary, which has been shown in sparse learning. Motivated by this, we explicitly impose the sparsity constraint on the learnt low-rank representation. To be more efficient, we adopt a fixedrank scheme by minimizing the Frobenius norm of the new representation. Hence, in this paper we propose a novel Sparse Fixed-Rank Representation (SFRR) approach for robust visual analysis. Specifically, we model the corruptions by enforcing a sparse regularizer. This way, we can obtain a new data representation with both low-rankness and sparseness robustly. Furthermore, we present a generalized alternating direction method (ADM) to optimize the objective function. Extensive experiments on both synthetic and real-world data bases have suggested the effectiveness and the robustness of the proposed method.

Keywords: fixed-rank representation, sparse learning, robust recovery, subspace segmentation, outlier detection.

 $Preprint\ submitted\ to\ Signal\ Processing$

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