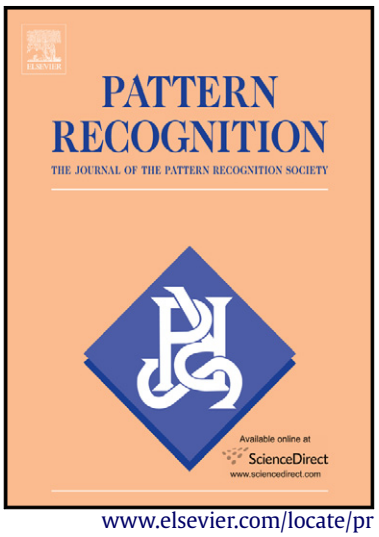

www.elsevier.com/locate/pr

Combined Sparse and Collaborative Representation for Hyperspectral Target Detection

Wei Li, Qian Du, Bing Zhang

PII: S0031-3203(15)00203-4
DOI: http://dx.doi.org/10.1016/j.patcog.2015.05.024
Reference: PR5441

To appear in: *Pattern Recognition*

Received date: 13 January 2015
Revised date: 4 May 2015
Accepted date: 28 May 2015

Cite this article as: Wei Li, Qian Du, Bing Zhang, Combined Sparse and Collaborative Representation for Hyperspectral Target Detection, *Pattern Recognition,* http://dx.doi.org/10.1016/j.patcog.2015.05.024

Combined Sparse and Collaborative Representation for Hyperspectral Target Detection

Wei Li [1,*], Qian Du [2], Bing Zhang [3]

[1] *College of Information Science and Technology, Beijing University of Chemical Technology, Beijing, 100029 China (e-mail: liwei089@ieee.org)*

[2] *Department of Electrical and Computer Engineering, Mississippi State University, MS 39762 USA (e-mail: du@ece.msstate.edu)*

[3] *Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, Beijing 100094 China (e-mail: zhangbing@ceode.ac.cn)*

[*] *Corresponding author; Phone Number: +86-010-64413467; Fax Number: +86-010-64434726*

Abstract

A novel algorithm that combines sparse and collaborative representation is proposed for target detection in hyperspectral imagery. Target detection is achieved by the representation of a testing pixel using a target library and a background library. Due to the fact that sparse representation encourages competition among atoms while collaborative representation tends to use all the atoms, the testing pixel is sparsely represented by target atoms because the pixel can include only one target; meanwhile, it is collaboratively represented by background atoms since multiple background atoms may be present in the pixel area. The detection output is simply generated by the difference between the two representation residuals. Experimental results demonstrate that the proposed algorithm outperforms the existing target detection algorithms, such as adaptive coherence estimator and pure sparse representation-based detector.

Keywords: Target Detection, Hyperspectral Imagery, Collaborative Representation, Sparse Representation.