

OCTOBOS: OverComplete sparsifying TransfOrm with BLOck coSparsity learning Software

OCTOBOS is a formulation and an algorithm that adaptively learns a structured overcomplete sparsifying transform with block cosparsity, or equivalently a union of square sparsifying transforms, and simultaneously clusters the data via sparse coding, as described in the following two "OCTOBOS" papers:

- [1] B. Wen, S. Ravishankar, and Y. Bresler. "Structured overcomplete sparsifying transform learning with convergence guarantees and applications." International Journal of Computer Vision (IJCV), pp. 1-31, 2014.
- [2] B. Wen, S. Ravishankar, and Y. Bresler. "Learning overcomplete sparsifying transforms with block cosparsity." IEEE International Conference on Image Processing (ICIP), pp. 803-807, 2014.

THESE PAPERS SHOULD BE CITED IN ANY PUBLICATION OR PRESENTATION THAT USES ANY OF THE OCTOBOS SOFTWARE PACKAGE IN THIS DIRECTORY, OR ANY FUTURE VERSION CREATED FROM IT.

- **OCTOBOS** is a collection of Matlab functions that implement the OCTOBOS algorithm presented in the above paper.
- **OCTOBOS** includes
 - A collection of the OCTOBOS Matlab functions.
 - Example data that enable to replicate the example of the results presented in the OCTOBOS paper.
- If you have any questions on OCTOBOS, you are welcome to contact the authors.

ACKNOWLEDGEMENTS

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The development of this software was supported in part by the National Science Foundation (NSF) under grants CCF 06-35234 and CCF 10-18660.

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DOCUMENTATION

OCTOBOS Description: OCTOBOS is a formulation that adaptively learns a structured overcomplete sparsifying transform with block cosparsity, or equivalently a union of square sparsifying transforms, and simultaneously clusters the data via sparse coding.

The following is a very brief description of the MATLAB files, which can be used to simulate the various experimental scenarios in our OCTOBOS Papers [1, 2]. Please read the specific MATLAB files for detailed information about them.

MAIN AND SIMULATION CODE:

1. OCTOBOS_imagedenoising.m - accepts gray-scale image with additive Gaussian noise and simulation parameters as inputs, and generates the learned OCTOBOS, as well as the denoised image estimate by OCTOBOS.
2. OCTOBOS_imagereconstruction.m - accepts a gray-scale image and simulation parameters as inputs, and generates the learned OCTOBOS, as well as the sparse representation reconstruction by OCTOBOS.
3. OCTOBOS_texturesegmentation.m – accepts a gray-scale image / texture and simulation parameters as inputs, and generates the learned OCTOBOS, as well as the segmented images by OCTOBOS.

PARAMETER SETTINGS:

All the above matlab files have various parameters that need to be carefully/optimally set at the time of use. Examples of parameter values are given by the Matlab functions “OCTOBOS_imagedenoise_param.m”, “OCTOBOS_imagereconstruction_param.m”, and

“OCTOBOS_texturesegmentation_param.m” (some example values can also be found in our OCTOBOS Paper [1, 2]), but these may not necessarily provide the best or even acceptable performance for your data.

DATA:

The folder – demo_data - contains the sample data that are used for our demo scripts. These demo data are also used in our OCTOBOS papers [1, 2].

The full data that can be used to reproduce our results in [1, 2] can be provided upon request.