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# Intelligent Nonconvex Compressive Sensing Using Prior Information for Image Reconstruction by Sparse Representation

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## Abstract

Image reconstruction by sparse representation, which is based on the fact that natural images are intrinsically sparse under some over-completed dictionaries, has shown promising results in many applications. However, due to the down-sampled measurements, the results of image reconstruction by sparse representation are sometimes not accurate enough. In this paper, we propose a novel intelligent nonconvex compressive sensing (INCS) algorithm using prior information for image reconstruction by sparse representation. First of all, the over-completed dictionary of Ridgelet is used to introduce the sparse level for each image block. Then we use the nonlocal self-similarity property and joint sparsity to obtain the basic prior information to guide the reconstruction, which contributes a lot to improving the reconstruction accuracy and reducing the computational complexity. To enhance the guidance accuracy of prior information, the property that natural image blocks spatially nearby share the similar structures is exploited to extract more information to enrich the basic prior information. Under the guidance of prior information, the intelligent optimization algorithm, which performs superiorly in solving combinatorial optimization problems and global searching, is utilized to solve the nonconvex  $l_0$  minimization problem essentially. By means of the prior information and the intelligent searching strategy, the proposed INCS can not only improve the reconstruction accuracy significantly but also reduce the computational complexity to accel-

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