Reviewer's report

Title: Local Sparsity Enhanced Compressed Sensing Magnetic Resonance Imaging in Uniform Discrete Curvelet Domain

Version: 3  Date: 27 February 2015

Reviewer: Sayedmohammadreza Sorouchmehr

Reviewer's report:

Minor Essential Revisions:

This paper describes a compressive sensing approach for reconstruction of undersampled magnetic resonance (MR) images based on dictionary learning over the low frequency coefficients of discrete curvelet transform and a composite reconstruction model incorporating different regularization on curvelet coefficients. The results of this method have been reported on three MR images which show its better reconstruction performance compared with four CS MRI techniques.

In general, manuscript appears to be technically sound. But before it is accepted, the following comments should be addressed:

1) In the abstract the goal of the paper should be clearly defined. For example in the "Background" (1st page) the authors should briefly discuss the drawbacks that state-of-the-arts have. Also, in the "Method" (1st page) it is not clear what the goal is.

2) As mentioned in the paper, dictionary learning is employed to enhance the sparsity of lowpass sub-band of UDCT. What is the effect of dictionary size (number of dictionary atoms) on the sparsity and reconstruction performance?

3) It is stated in page 7 that double sparse representation can be obtained by multiplying the pseudo-inverse of dictionary with patches of UDCT lowpass coefficients. However, K-SVD algorithm used by authors, learn the overcomplete dictionary in a synthesis framework and multiplying the pseudo-inverse of the learned synthesis dictionary with the signal may not provide sparse representations.

4) As mentioned in line #252, the minimization problem in equation (8) is solved by its decoupling into five independent sub-problems. What are these sub-problems? What is the advantage of your minimization approach over the alternating minimization with respect to the three variables #,x,#_R?

5) There is no definition for parameter µ used in equation (9).

6) Why the reconstruction model of (7) does not have any sparse regularization for representations #_R?

7) How does the parameter # of the reconstruction model is set in the noiseless tests?
8) The abbreviations must be close to the words/phrase. For example in the first page and UDCT.

9) In the second page, the sentence starting with "Further" in line 18 should be rewritten.

10) In the 2nd page, line 22: "has" should be replaced with "have".

11) In page 4, line 58: what are "c" and "m"?

12) In page 5, line 100: "is operator" should be changed to "is an operator"

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.