Additional Results: J. K. Pant, W.-S. Lu, and A. Antoniou, "New Improved Algorithms for Compressive Sensing Based on ℓ_p Norm," *IEEE Trans. Circuits and Syst. II* (in press).

This document provides additional experimental results for the above paper.

In Experiment 6, the basic ℓ_p-RLS algorithm was compared with the stable sparse approximation using the ℓ_q optimization (StSALq) algorithm [6]. The two algorithms were run using the settings of Experiments 1 and 2. The ℓ_p-RLS algorithm was run many times with a different value of parameter λ in each time, and $\lambda = 2 \times 10^{-3}$ was found to yield the best PoRIs. Similarly, for the StSALq algorithm, $\mu = 4000$ was found to yield the best PoRIs. Under these circumstances, the two algorithms were found to offer practically the same performance. The average CPU time obtained over 1000 runs is plotted versus the signal length, N, in Fig. 6(b). As can be seen, the average CPU time required by the StSALq algorithm is one to two orders of magnitude larger than that of the basic ℓ_p-RLS algorithm and is due to the fact that the former method requires the repeated use of matrix inversion as we stated in Section II-B.

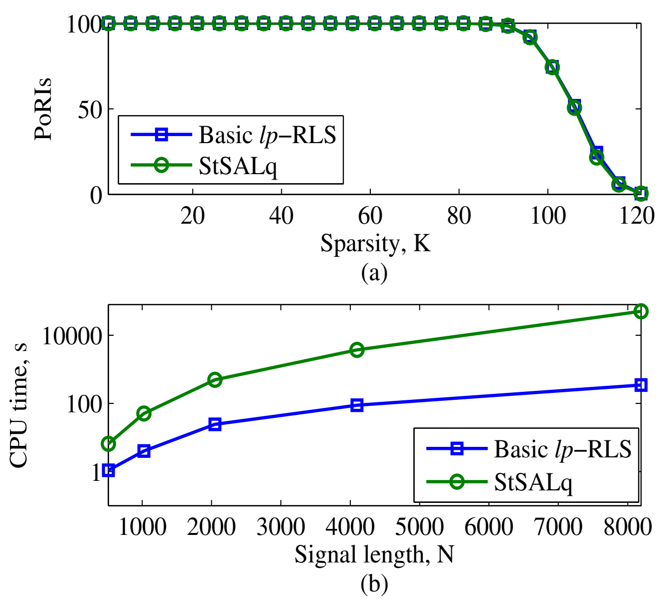

Fig. 6. (a) PoRIs versus sparsity for basic ℓ_p-RLS and StSALq algorithms, (b) Average CPU time versus signal length for basic ℓ_p-RLS and StSALq algorithms (Experiment 6).

In Experiment 7, the sensitivity of the SNR in the improved ℓ_p-RLS algorithm to variations in the variance of the measurement noise was tested. The signal length, number of measurements, sparsity value, and variance were set to $N = 512$, $M = 200$, $K = 90$, and $\sigma^2 = 10^{-3}$, respectively. The variance was then varied over the range 0.4×10^{-3} to 1.5×10^{-3}, i.e., a total variation of $\pm 150\%$. The average SNR is plotted versus the noise variance in Fig. 7. As can be seen, there is only a moderate variation in the SNR over this fairly large variation in the variance.

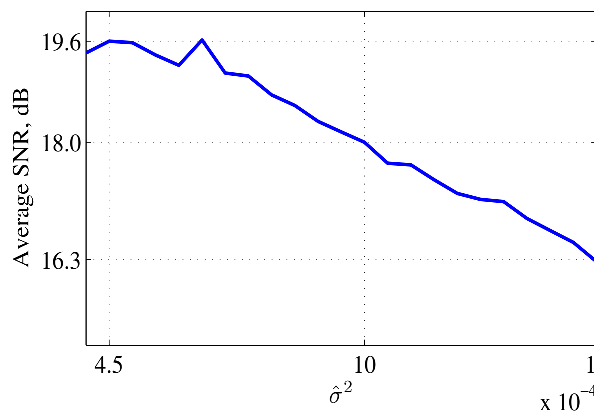

Fig. 7. Average SNR for the improved ℓ_p-RLS algorithm (Experiment 7).

The proposed algorithms require the variance of the noise. State-of-the-art techniques for the estimation of the variance of the noise are available in the literature, for example, in [1], [2], and [3].

References

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