Accelerated parallel magnetic resonance imaging with multi-channel chaotic compressed sensing

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Abstract: Fast acquisition in magnetic resonance imaging (MRI) is considered in this paper. Often, fast acquisition is achieved using parallel imaging (pMRI) techniques. It has been shown recently that the combination of pMRI and compressed sensing (CS), which enables exact reconstruction of sparse or compressible signals from a small number of random measurements, can accelerate the speed of MRI acquisition because the number of measurements are much smaller than that by pMRI per se. Also recently in CS, chaos filters were designed to obtain chaotic measurements. This chaotic CS approach potentially offers simpler hardware implementation. In this paper, we combine chaotic CS and pMRI. However, instead of using chaos filters, the measurements are obtained by chaotically undersampling the k-space. MRI image reconstruction is then performed by using nonlinear conjugate gradient optimization. For pMRI, we use the well-known approach SENSE - sensitivity encoding -, which requires an estimation of the sensitivity maps. The performance of the proposed method is analyzed using the point spread function, the transform point spread function, and the reconstruction error measure. ©2010 IEEE.
Author Keywords: Compressed sensing; Deterministic chaos; Fast acquisition; MRI; Parallel imaging; SENSE

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