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Geometric distortion artifact remedy in DWI: A novel comprehensive approach

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Abstract

Geometric distortion represents a major obstacle obscuring considerable parts of the frontal and temporal lobes of the brain & hence reducing the efficacy of functional brain imaging. It is a complex artifact characteristic for echo planar pulse sequences (EPI) in general and Diffusion Weighted Imaging (DWI) and Diffusion Tensor Imaging (DTI) in particular. Analyzing this complex artifact may help find a remedy strategy. Many articles already dealt with this issue and this article is meant to build over the other works so as to reach to a simple comprehensive way to significantly reduce this type of artifact. EPI is an MRI acquisition technique that samples all or multiple lines of the K-space each TR period for a single spin echo (SE) or gradient echo (GRE) pulse sequence where it uses fast gradients to produce an echo train and thus reduce the sampling time and the radiofrequency specific absorption rate (SAR). An EPI trade off is its sensitivity to the off-resonance artifacts, especially the phase shift artifacts, because of gradients. After the initial RF excitation pulse, spins that are processing off-resonance gradually accumulate an increasing phase error that builds over the echo train causing geometric distortion in the phase encoding direction. The longer the sampling time, the greater is the distortion. This study aims at reducing the sampling time, thereby minimizing distortion.

Biography

Gamal Fathalla M. Mahdaly has acquired his BSc in Biophysics in 1983, MSc in Biochemistry in 1986 from faculty of Science, Cairo University & MSc in Basic Medical Sciences from faculty of Medicine, Cairo University in 1989. He has devoted himself to teaching CT & MRI physics where he began in 1985 as CT/MRI lab Specialist at Al-Azhar University, then as consultant CT/MRI biophysicist at As-Salam International Hospital. He established Experta Medica in 2005. EM provides consultations for both vendors & centers & performs clinical applications on behalf of GE & delivers customized CME. He is a member for GLG councils. His text books in CT & MRI were recommended by the WHO, being the first radiology literature in Arabic.