

Temporal Acceleration Methods

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Reconstruction of a time series of images with undersampled acquisition is a widely used means for accelerated imaging. A variety of undersampling schemes have been developed to exploit inherent frame-to-frame correlation in dynamic imaging. An overview and comparison of a number these methods are presented.

Various methods that exploit temporal correlation include viewsharing [1] and sliding block reconstructions [2], methods that rely on reference data for high spatial frequencies and only update the center of k-space [3], general temporal filtering (UNFOLD [4]) or interpolation, hybrids between parallel imaging and temporal methods such as TSENSE [5] & TGRAPPA [6], and hybrid methods incorporating a priori training data (ktBLAST & ktSENSE [7]). A number of these methods are applicable to real-time imaging.

The concept of bandwidth sharing is illustrated by means of temporal spectra (i.e., fft of images series along the time dimension). Temporal acceleration methods may be compared based on effective bandwidth, transient response, and degree of alias artifact suppression. Transients may arise due to rapid change to the image content such as contrast enhancement or interactive scan plane manipulation which may be problematic for approaches that use reference or training data. Hybrid methods that incorporate parallel imaging improve suppression of transient artifacts.

Low latency, real-time imaging is achievable provided that the effective temporal filter bandwidth is sufficiently wide[8].

- [1]Fredrickson,etal.MRM.1996:621-25. [5]Kellman, et al, MRM 2001:846-52.
[2]Doyle, et al, MRM 1995:163-70. [6]Breuer, et al, MRM 2005:981-85.
[3]D'Arcy, et al,NRM Biomed 2002:174 [7]Tsao, et al, MRM 2003:1031-42.
[4]Madore, et al, MRM 1999:813-28. [8]Kellman, et al, MRM 2000:933-9.