Corrections to Accelerated Propeller Acquisition to Maintain Contrast and Reduce T2 Decay Artifacts

S. Chang[1], A. Gaddipati[1], E. Bayram[1], and M. R. Hartley[1]
[1]GE Healthcare, Waukesha, WI, United States

Introduction

FSE T2 Periodically Rotated Overlapping Paralleling Lines with Enhanced Reconstruction (PROPELLER) [1] has been shown to be very effective in reducing artifacts associated with rigid body motion. A drawback of FSE PROPELLER is longer scan time compared to conventional FSE scan. In order to reduce scan time, accelerated imaging techniques with multi-receiver coils has been proposed for FSE T2 PROPELLER [2,3]. However, the contrast change with an accelerated conventional sequential view ordering is problematic in preserving T2 weighting for longer effective TEs. In this work, a similar contrast is achieved by using a custom view order to keep the same effective TE as the un-accelerated acquisition with same echo spacing. Using custom view order results in image artifacts due to magnitude modulation in K-space in phase encoding direction caused by T2 decay across views within a PROPELLER blade [4]. This work reduces the image artifacts using a T2 decay correction.

Method

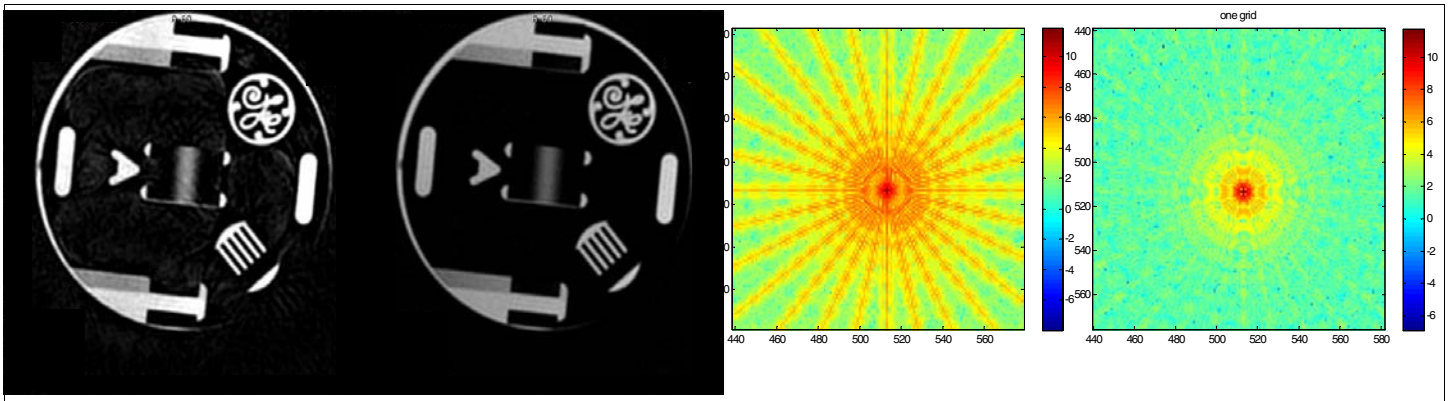
Table 1 illustrates how to maintain the same effective TE by showing view ordering of a 36-view blade including a full blade view order, conventional accelerated blade view order and custom accelerated blade view order. Views 15 to 22 are auto calibration lines. Comparison tests were done on a 1.5T GE Signa scanner, with a DQA phantom and an 8channel torso coil using the custom accelerated view order as in table 1 (TR/TE=2500/129, ETL=22, acceleration factor = 1.6, matrix size=256×256, slice thickness=5mm).

Full blade view order	01 02 03 04 05 06 07 08 09 10 11 12 13 14 **15 16 17 18 19 20 21 22** 23 24 25 26 … 35 36
Conventional accelerated view order	01 03 05 07 09 11 13 **15 16 17 18 19 20 21 22** 23 25 27 29 31 33 35
Custom accelerated view order	01 35 03 33 05 31 07 29 09 27 11 25 13 23 **15 16 17 18 19 20 21 22**

Table 1. View ordering illustration

Results

Figure 1 (a) and (b) show the reconstructed images of the raw data from a DQA Phantom with custom accelerated view order. Without T2 decay correction as show in (a), there are visible image artifacts. By applying T2 decay correction, the artifacts are reduced significantly, as show in (b). The image artifacts of (a) are characterized by the point spread function, as show in Figure 1 (c). The point spread function of the image with T2 decay correction (b) is plotted in Figure 1 (d), which is less spatially spreading than the one without T2 decay correction.



(a) **(b)** **(c)** **(d)**

Figure 1: a) Propeller image without t2decay compensation b) image with t2decay compensation. Figures c) and dare point spread functions corresponding to images a & d, respectively.

Conclusions:

In this work, a strategy for combining a parallel imaging acceleration techniques with PROPELLER is proposed. This enables either faster acquisition while preserving the same T2 contrast or more robust motion correction with the same scan time. Image artifacts are significantly reduced by applying T2-decay correction.

Reference:

[1] J. G. Pipe, MRM pp963-969, 1999
[2] J. G. Pipe et al, ISMRM 2005, #2235
[3] M. Blaimer et al, ISMRM 2006, #5
[4] X. Zhou, JMRI, pp803-807, 1993