AbstractID: 11665 Title: Improving the temporal resolution of dynamic MRI by deformable alignment of the peripheral k-space.

## Introduction

Dynamic MRI may be used to image motion that is needed for accurate radiotherapy treatment planning. The tradeoff between temporal and spatial resolution has been a major issue affecting the use of dynamic MRI. Here we propose to improve temporal resolution by reconstructing high spatial resolution components with deformably registered motion data. Dynamic MRI with increased temporal resolution without scarifying spatial resolution for several sites are presenting.

## Methods and Materials

High and low spatial resolution components of the image typically move similarly, i.e. share most of the motion vector information. The motion vectors can be obtained by deformable registration of the central k-space, and applied to the high spatial resolution data. This allows one to acquire the peripheral k-space at a lower temporal resolution than the central k-space therefore increase the overall sampling rate. We tested the possible gain by this method for 2- dimensional dynamic MRIs (SIEMENS 3T Verio) of swallowing, breathing and peristalsis.

## Results

The mean error in the displacement vectors obtained using only the central 20% of k-space vs. using the full k-space was less than 0.5mm, which reduced to 0.2mm if 50% of the radius is used. Peristalsis motion with sudden changes shared least information between central and peripheral k-space. The reconstructed images with as low as central 20% of the k-space radius are very similar to images reconstructed with full k-space. The resulting probability distance histograms and regions of interest show minimal variation.

## Conclusion

Temporal resolution can be improved considerably without compromising the spatial resolution if the low-resolution vector information is used to construct high spatial resolution data as demonstrated in this work. The deformable registration accuracy is highly critical for the overall performance of the method.

**Conflict of Interest:**
This work is supported partially by Siemens Healthcare.