Bachelor's thesis:
FOV Estimation from the Sinogram and Grid Optimization

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Overview:

The aim of the Bachelor's thesis is to estimate the field-of-view (FOV) in radial magnetic resonance imaging (MRI) and to optimize the reconstruction grid based on that estimate.

In radial MRI, data in Fourier space (k-space) is acquired along radial lines. This leads to data that is similar to CT data and therefore allows easy calculation of the sinogram. This sinogram contains information about the location and the rotation of the imaged object. The goal is to estimate the field-of-view that is necessary for reconstruction by determining object extent and position from this sinogram. Based on this estimate, the reconstruction can be improved by shifting and rotating the object so that a minimal grid can be used.

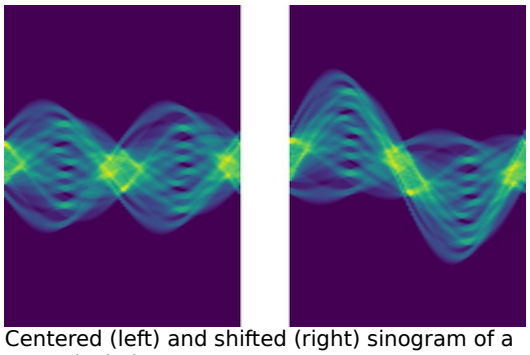
This work will be implemented in the Berkeley Advanced Reconstruction Toolbox (BART), developed at the Institute of Biomedical Imaging. BART is a tool for computational MRI imaging written in C which is widely used in the MRI community. In addition to basic operations on multidimensional arrays (such as vector math and Fourier and Wavelet transforms), it implements a number of different reconstruction algorithms.

Specific Tasks:

- Become acquainted with MRI and BART
- Develop a theory and method of estimating object location and extent from a sinogram
- Implement and test this method on synthetic and real datasets
- Implement the grid optimization based on the estimated information about the object
- Document the resulting changes to BART

Recommended Knowledge:

- C programming
- Basic git workflow
- Uniform and non-uniform Fourier transforms



Centered (left) and shifted (right) sinogram of a numerical phantom.

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