Version 2

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Processing of Radial K-space DW-MRI Data V.2

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ABSTRACT

The protocol includes reconstruction of diffusion weighted images from radial k-space data and using a 3-parameter fit to derive metrics of ADC and kurtosis index.

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1 Image reconstruction

Radially acquired diffusion-weighted images (DWIs) are reconstructed using the following steps:

1. Apply zero-order phase correction to each radial spoke using the average phase offset at the center slice of the lowest b-value image
2. Zerofill k-space by a factor of 2 to double field of view
3. Multiply signal of each point by its respective area on a Voronoi diagram of the points (including added zerofill points) in k-space
4. Re-grid each radially defined point to its nearest Cartesian coordinate using its Kaiser-Besel index
5. Apply Fourier transform to now Cartesian-defined k-space

This process can be easily done using the **DWI Processing resources [link]**.
To use this, place both **DWI_shell.ipynb** and **DWI_processing_functions.py** in the same directory (your working directory). The **readme.txt** file outlines specific file formats, function inputs, and outputs.

Quickly, once all files are formatted according to **readme.txt**, the first cell defines all image and reconstruction parameters:

```
############## Parameters to change ####################
input_file = 'fid'  # k-space data
# Acquisition data
xres_ro = 128  # total readout points stored
views = 403  # number of radial views
# angl = (math.sqrt(5)-1)/2 * PI # golden angle in radians
angl = 2*PI/views  # used by Steve Pickup
# Image data
xres = 96  # actual number of points collected
yres = 96
slices = 16
bvalues = 5
b_array = np.array([10,535,1070,1479,2141])  # b-values
```

Each cell should then be run consecutively.

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