Distortion Correction toolbox user's manual

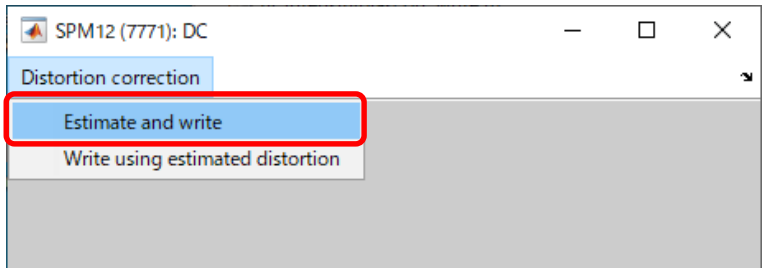
Distortion Correction toolbox is an open source toolbox for SPM designed to correct for a geometric distortion of MR images mainly due to gradient nonlinearity. This toolbox automatically detects fiducial structures (1.0, 1.5 and 3.0 cm spheres) in a phantom image, calculates the displacements between the designed and observed positions, and estimates the deformation field to correct for the displacements. The deformation field is inter- and extrapolated throughout the field of view, and can be applied to human head images acquired using the same pulse sequence, to obtain distortion corrected images. The deformation is modeled using polynomial function, and users can select the manual input or automatic optimization using Bayesian Information Criterion for the order of the polynomial approximation. Intensity inhomogeneity can also be corrected using a second order polynomial function.

1. Download and Installation

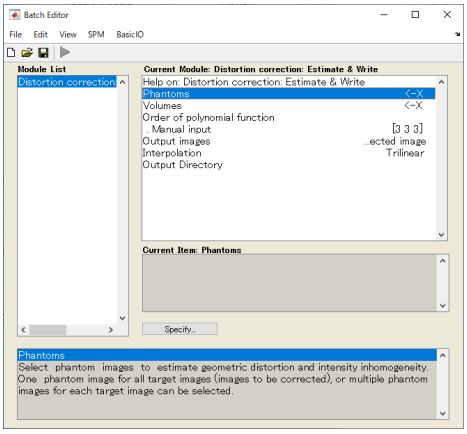
Download the latest version of DC toolbox from Download section of the following link:
http://amrc.iwate-med.ac.jp/modules/english_contents/
Unzip the DC.zip file and put the DC folder into the toolbox folder of SPM. If you want to use with SPM12, the path should be like spm12/toolbox/DC.

2. Estimate and write

Start DC toolbox from the toolbox of SPM and select "Estimate and write" from the menu.



After you select a module from the DC menu, a new window (the Batch Editor) will open. Here you will specify the phantom images, target images, order of polynomial function, type of output images, interpolation method and an output directory.



Phantoms: Choose phantom images.

Volumes: Choose target images to be corrected for geometric distortion and intensity inhomogeneity using the result of phantom image analysis.

Order of polynomial function: Select "Manual input" or "Automatic estimation using BIC". The default is "Manual input" and you can manually input the order of polynomial functions for distortion correction. You can choose automatic optimization method using Bayesian Information Criterion.

Output images: distortion corrected, bias (intensity inhomogeneity) corrected images and both can be selected for output.

Interpolation: Nearest neighbor, Trilinear and 2nd to 7th degree B-Spline interpolation method can be selected for image resampling.

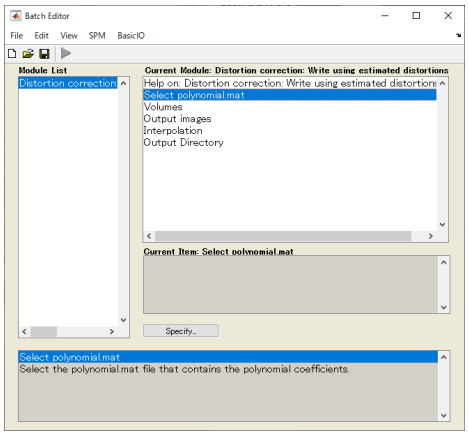
Output Directory: Specify the directory you want to save the output images.

Once everything is set up (and there are no “<-” symbols, which indicate that more information is needed), then you could click the Run button (the green triangle) and the database will be generated from the images specified.

3. Write using estimated distortion

Once deformation and bias correction parameters are estimated, you can apply them to other images anytime. Select “Write using estimated distortion” from the DC menu.

A batch editor will open. Here you will specify a correction parameter file and target images, type of output images, interpolation method and an output directory.



Select polynomial.mat: Select a polynomial.mat file containing the coefficients of a polynomial functions for distortion and bias corrections.

Volumes: Choose target images to be corrected for geometric distortion and intensity inhomogeneity using the result of phantom image analysis.

Output images: distortion corrected, bias (intensity inhomogeneity) corrected images and both can be selected for output.

Interpolation: Nearest neighbor, Trilinear and 2nd to 7th degree B-Spline interpolation method can be selected for image resampling.

Output Directory: Specify the directory you want to save the output images.