What is a Digital Reference Object (DRO)?

Digital reference images are synthetic images that have been created by computer simulations of a target in its environment; the images acquire no real data (e.g. the correlation structure in the image background). Phantoms and digital reference images may be used to establish a minimum performance requirement for QIB algorithms. (Ref: Obuchowski et al., SMIR 2014)

Future Work: Round 5 projects

Aggregated Measures of Agreement for QIB Validation: An Open Source Toolkit, Pi Daniel Barboriak

The purpose of this project is to develop open source software to calculate aggregated measures of agreement in order to facilitate image analysis algorithm development, comparative analysis of algorithm output, and demonstration of technical compliance and benchmarking. A number of DROs have been developed in order to provide a basis for developing performance evaluation tools for QIBA calibration. A set of performance evaluation tools are needed to compare the performance of multiple software packages. The project will develop open source software to calculate aggregated measures of agreement. The tool will be designed to work in conjunction with the DCE DROs and perform a detailed analysis of performance across all of the DROs. The tool will be designed to work in conjunction with the DCE DROs and perform a detailed analysis of performance across all of the DROs.

DCE-DRO Software Evaluation: Pi Hendrik Laue

The DCE DRO Evaluation Tool (DGET) was developed to assist in software evaluation. An open-source, Python-based software package, DGET is designed to test the performance of software packages on the DGET DROs. The DGET DROs consist of a grid of patches, each 10x10 pixels, with combinations of Kn and v. These patches signal intensities are temporally evolved over (10 minutes) using a set field strength values (field strength, flip angle, TR, time interval and temporal flip) and other image parameters. The DGET DROs were generated to be input for a given software analysis package, allowing evaluation of a given package’s performance in a known ground truth environment.

PET-CT SUV DRO: Pi Knahan

A PET-CT DRO was created, based on the NEMA image quality physical phantom, with SUVmax and (a) and (b) figures (Units and field strength) represent SUVmax and SUVpeak values, respectively. The PET-CT DROs use a variety of noise models to test the performance of software packages. The PET-CT DROs were generated to be input for a given software analysis package, allowing evaluation of a given package’s performance in a known ground truth environment.

DCE MRI DROs: Pi Daniel Barboriak

In DCE MRI, DROs are created in order to evaluate software analysis packages with respect to their ability to determine Kn using variable Kn and v, and to determine v using variable T1 and v. The initial DCE MRI DRO was created as part of the NIBIB-funded QIBA Round 1 project. There is now a set of DCE MRI DROs that explore a variety of conditions: in general, the DROs consist of a grid of patches, each 10x10 pixels, with combinations of Kn and v. These patches signal intensities are temporally evolved over (10 minutes) using a set field strength values (field strength, flip angle, TR, time interval and temporal flip) and other image parameters. The DCE MRI DROs were generated to be input for a given software analysis package, allowing evaluation of a given package’s performance in a known ground truth environment.

DWM-DRO development for ADC analysis, Pi Daryna Malynenko

Provide DWM DROs for relevant range of tissue diffusion values and Rician noise modeled diffusion of ADC images for DWI staining and acquisition optimization.

DWM-DRO Project Deliverables:
- Definition of parameter space suitable for DWM derivation
- Definition of DWM DRO generation using defined diffusion models and input parameters, including non-linear fitting procedures
- Fast procedures to evaluate DWM by reproducing input parameters and models
- DWI 3D DRO standard DCM set with analysis and performance evaluation instructions

DWM DRO Attributes: A SUL, ADC and b values are all correlated to the diffusion value, SUL is thus the only attribute that can be applied to derive results from practical aspects of the DWI phantom. SUL response phantom, and lesion simulation phantoms, extending the utility of the model across all QIBA efforts.

Publications and Presentations


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