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Combined 6 & 12-month interim reports for QIBA/NIBIB Round-1 Project #8a (13JUN2012)

Title: Digital Reference Object for DCE-MRI Analysis Software Verification

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The synthetic digital reference object project for the QIBA Perfusion Diffusion and Flow subcommittee continues to meet its milestones. Since February 2012, we have continued evaluating software using the T1 mapping DRO and tabulating results to document discrepancies in software outputs from identical images. As part of the QIBA metrology conference, we have begun exploring figures of merit for software evaluation. New digital reference objects have been added. For synthetic dynamic sequences, new DROs which probe the effect of varying the temporal resolution of the dynamic acquisition as well as temporal jitter within the acquisition has been posted in beta form (QIBA_v8_Tofts).

The status of project deliverables is as follows:

3 month deliverables (completed):

- Implementation of new analysis models. We have provided simulated image data using the extended Tofts model. DROs simulating simple Tofts model parameters across a range of Ktrans from 0 – 0.2/sec and ve from 0.1 – 0.5 have been produced.
- Verification of T1 mapping procedures. A separate DRO will be created to test T1 mapping procedures from simulated multi-flip SPGR (or FLASH) imaging.

6-month deliverables:

- Verification of dce-mri package. We have used our published DROs to begin the validation process of the open source dce-mri package.

12-month deliverables:

- Interim report

18-month deliverables (due by Sept 29, 2012):

- Extension of simulations to generate more realistic DROs. Advanced DROs have been produced taking into account less frequent imaging and temporal jitter. Use of these DROs will give more realistic predictions of the actual performance of software in clinical applications. A DRO which realistic levels of image noise is currently in pre-release evaluation.
- Development of verification protocols and integration into profiling activities. Developing verification protocols will be challenging because of disagreements on how exactly this should be accomplished and the complexity of the task. Progress is being made, however, on three fronts: first, we are collecting data from software packages in the field to document performance across a broad range of parameter space. This will provide the source data for the protocol verification process. Second, we are cooperating with the QIBA metrology initiative to help define figures of merit that can summarize performance in this multi-dimensional dataset. Third, we are cooperative with follow on projects which if funded will help automate the data acquisition.
- Creation of open source archives. We have created an open source archive on our own website (https://dblab.duhs.duke.edu/modules/QIBAcontent/index.php?id=1) and are working cooperatively with RSNA efforts to store data in a data warehouse.