Digital Reference Object for DCE-MRI Analysis Software Verification
Software report for T1-mapping
Update 9/3/2013

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Coming to consensus

• Clear that the evaluation of a large area of parameter space has limitations
  – If data is so noisy that one software has estimate of R1 that gives an overestimate by 300%, how is this “superior” to software that gives an overestimate by 1000%?

• Can we come to consensus about which areas of parameter space are relevant to our use cases?
Use cases

• We identified two use cases:
  – 1. Use of software to evaluate the phantom
  – 2. Use of software to calculate R1 as an intermediate value for Ktrans, IAUGC

• Importance:
  – Give manufacturers / software groups goals, insight on how to “tune” software
  – Acceptance criteria and certification

Results were mixed

• Disagreement on signal and noise metrics
• Disagreement on philosophy
  – Shouldn’t the areas of parameter space be the same for both applications?
  – Should we look only in clinically realistic areas? Why look in areas where data is “better” than we can really get?
Sample submissions – areas of parameter interest in blue

- Interm – use case as intermediate calculation
- QC – use case as QC from phantom

Example submission 1 - interm
## Example submission 2 - QC

<table>
<thead>
<tr>
<th>Method</th>
<th>QC is good to utilize (signal 1)</th>
<th>QC is good to utilize (signal 2)</th>
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<td>No. sm.</td>
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## Example submission 3 - interm

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Example submission 3 - QC

Directions forward

• What are clinically relevant areas of R1?
• $R_1 = R_{1,0} + r_1 \text{ [Gd]}$
• Peak [Gd] is likely 6mM
• Are we interested in $R_1 < 0.0005 \text{ ms}^{-1}$ (T1 > 2000 ms)?
• Would we anticipate peak $R_1 > 0.0035 \text{ ms}^{-1}$ (T1 < 285 ms)? (This is the $R_1$ we would expect to see if vertebral marrow or pancreas had superimposed peak [Gd] at 1.5T)
Directions forward

• What are clinically relevant areas of noise and signal max?
• Would we anticipate noise sigma > 10?
• Would we anticipate equilibrium magnetization < 1000?

Directions forward

• Do we anticipate phantom S0 < 5000?
• Do we want to test noise levels on phantom > 10?
Thank you!