AbstractID: 10204 Title: Automatic identification of water and fat images from a symmetrically-sampled dual-echo Dixon technique

Purpose:
Dixon techniques can produce useful separate water-only and fat-only images. Correct automatic identification of water and fat images after they are separated is a necessary requirement for proper image annotation and archival. Previously, the difference between the signal intensity histograms of water-only and fat-only images has been exploited for image identification. Here we demonstrate a more robust method that is based on the intrinsic asymmetry between the water and fat chemical shift spectra.

Method and Materials:
A total of 131 patient datasets (each containing approximately 100 separated water-only and fat-only image pairs) were randomly selected from different scanners. The proposed method is based on the observation that while water spectrum is a single peak, the fat spectrum is approximately bi-modal and contains a secondary peak near water resonance. Further, the method exploits the fact that most in vivo tissues are either water-dominant or fat-dominant. As a result, pixels with only fat will in general have non-zero signal intensity in the water-only image. In contrast, pixels with only water will have zero intensity in the fat-only image. A simple statistical parameter was calculated from the pair of the water-only and fat-only images and used to decide which of the two images is water and which is fat. Visual identification was used as the gold standard.

Results:
The spectrum based image identification method was correct in 98% of the 13496 total image pairs. In comparison, a pure histogram based algorithm had a success rate of only 41.5%. When applied to only the central 90% of the slices for all image datasets, the new method easily achieved a 100% success rate.

Conclusion:
In comparison to a pure histogram based method, the new method is shown to be much less susceptible to variations in scanning protocols, patients, and the injection of contrast agents.