AbstractID: 9197 Title: A technique for fully automated segmentation of breast tumors using dynamic contrast-enhanced MR images

Dynamic contrast enhanced (DCE) MRI is increasingly used to characterize abnormalities of the breast. Features of the contrast uptake and washout demonstrate high negative predictive value for identifying and characterizing breast lesions. Semi-automated segmentation based on contrast uptake and washout within a region of interest (ROI) has been shown to be more accurate than multi-spectral classification. The purpose of this work is to develop a fully automated three-dimensional (3D) segmentation algorithm for breast tumors that can also depict the relative timing of contrast uptake. The segmentation step can be used to detect abnormalities as well as extract valuable morphologic features. The method consists of three steps: (a) calculation of a 3D time of arrival map, (b) calculation of local roughness by convolution of the time-of-arrival map with a standard deviation kernel, and (c) adaptive thresholding using the histogram of standard deviation values calculated in (b). Voxels with low local roughness in the time-of-arrival image typically represent enhancing lesions while those with high local roughness typically represent background. Results in 5 patient exams (6 lesions, 2 benign and 4 malignant) demonstrated consistent segmentation of the tumors from background when the algorithm was performed on the subtracted DCE images. Parametric maps showing the timing of contrast uptake are overlaid on the T1-weighted image to highlight suspicious lesions. Accuracy of the automated method relative to segmentation by expert supervision is currently being assessed in a pilot study of 11 patients.