AbstractID: 7766 Title: PET tumor segmentation: Comparison of Gradient-based algorithm to Constant Threshold Algorithm

Purpose:
To compare the consistency and accuracy of a gradient-based algorithm (GRADIENT) with a constant threshold algorithm (THRESHOLD) for delineating positron emission tomography (PET) spheres of varying size and source-to-background ratio (SBR).

Method and Materials:
PET scans were acquired for cylindrical phantoms with fillable spheres on five different scanners including GE, Phillips and Siemens, emulating clinical conditions with different contrast levels to illustrate the influence of SBR. The phantoms were segmented from the scans using the GRADIENT and 37% constant threshold algorithm. The radii calculated from both methods were compared to the known actual radii of the phantoms in order to quantify the accuracy of each algorithm.

Results:
The gradient-based algorithm performed consistently across different scanners and with varying SBR and phantom size while the performance of the constant threshold algorithm deteriorated with decreases in both SBR and phantom size. For the gradient-based algorithm, the mean of the absolute radius percentage differences for the phantoms less than 10mm in size was 8.16% and the standard deviation was 0.1 whereas for the constant threshold algorithm the mean of the absolute percentage differences for the same phantoms was 55.98% and the standard deviation was 0.46. The statistics for the phantoms larger than 10mm in size were 3.84%, 0.03 and 8.45%, 0.05, respectively. Similar trends in percentage difference appeared for the same scanner and phantom set when the SBR decreased from 70:1 to 2:1. GRADIENT was robust to user initialization and resulted in less than 5% difference over several measurements for the same tumor.

Conclusion:
The gradient-based algorithm is more robust resulting in consistent results across different scanners and better accuracy than the constant threshold algorithm when evaluated in terms of varying SBR and phantom size for the in-vitro phantom studies.

Conflict of Interest:
Contributing authors employed by MIMvista Corporation.