AbstractID: 10757 Title: The influence of initial outlines on observers

Purpose:

When manually segmenting structures in medical images, an observer identifies the structure and then traces the structure's boundary. When an observer instead is presented with an initial segmentation boundary from a computerized method, the expectation is that the observer will alter that outline as necessary to fit their own perception of the boundary, which should not be substantially influenced by the initial, computer-defined segmentation. This expectation is implicit when observers modify computerized outlines to establish "truth," measure the area/volume of a structure, or use a computerized system as an initial reader. The goal of this study was to quantifying the extent to which initial outlines influence human observers.

Method and Materials:

A database of 30 thoracic CT scans from different mesothelioma patients was collected. For each scan, 5 sections were randomly selected for analysis, and three experienced observers independently outlined all mesothelioma tumor in each of these 150 sections to produce "truth outlines." After a three-month period, each observer was presented with all 450 truth outlines, which served as "initial outlines" in this second component of the study, and observers could alter these initial outlines to produce "modified outlines" that best captured their perception of tumor boundary. The area-of-overlap measure (AOM) between pairwise combinations of outlines was calculated.

Results:

The average AOM between the truth outlines of a given observer and the modified outlines derived from the initial outline of that same observer was 0.842 ± 0.009 across all observers. In comparison, the average AOM between the truth outlines of a given observer and the modified outlines derived from the initial outlines of the other two observers was 0.443 ± 0.006 across all observers.

Conclusion:

The substantial difference between the two mean AOM values implies that observers are strongly impacted by the presence of an initial outline.