AbstractID: 9633 Title: Automatic definition of radiation targets using textural characteristics of both Co-registered PET and CT images

Purpose: To automatically segment the radiation target for treatment of head and neck cancer (HNC) from FDG-PET/CT images using a textural classifier and to compare the automated results with contours defined by expert observers.

Method and Materials: 27 image features, including textural features from Spatial Gray-Level Dependence Matrices and Neighborhood Gray-Tone-Difference Matrices, as well as statistical and structural features were calculated for 476 head and neck regions of interest (ROIs) in PET/CT images of 20 patients with HNC and 20 patients with lung cancer. A voxel based automated segmentation method using a Decision Tree (DT) based K nearest neighbors (KNN) classifier was developed based on the features in these ROIs. PET/CT images of another 10 head and neck patients who had all primary tumors and positive nodes manually segmented by three radiation oncologists were used to evaluate the method. Features were calculated for each voxel from corresponding PET and CT images within a window centered on the voxel. All voxels of head and neck soft tissues from the below the eye to the apex of the lung were automatically segmented.

Results: The specificity was 95% ± 2% when all “true negative” voxels were considered to be all soft tissue voxels excluding the ROIs considered abnormal by one or more of three radiation oncologists. Sensitivity was 84% ± 19% when “true positive” was considered the intersection of at least two physicians’ abnormal ROIs and sensitivity was 90% ± 16% when all “true positive” was the intersection of the abnormal ROIs of all three physicians.

Conclusions: This work suggests that an automated segmentation method based on texture classification of FDG-PET/CT images has potential to provide accurate delineation of HNC. This could potentially lead to reduction in inter-observer variability in target delineation and improved accuracy of treatment delivery.