

AbstractID: 5644 Title: A Framework for Multimodal Thresholding, Target Delineation and Therapy Monitoring

Purpose: To develop a framework for the integration of multimodal and multidimensional treatment planning data and to evaluate the potential of the framework through application to several clinical problems in radiotherapy. There is a lack of tools to assist in the integration of multimodal imagery and applying this towards radiotherapy target identification. Fusion of multimodal imagery allows the characterization of points in space in terms of the individual signal intensities that define the co-registered voxels of the multimodal images. This parameterization permits alternative visualizations of the fused images, and can be exploited in order to develop novel treatment planning tools. An alternative visualization termed “feature space” forms the basis of a flexible framework for the integration of multimodal data, and the utility of this framework is illustrated.

Method and Materials: The framework was applied to the analysis of multimodal images of patients with Non-Hodgkin’s lymphoma and nasopharyngeal carcinoma. Images were registered and displayed as joint intensity distributions. Voxels within regions-of-interest in the component images were identified in the joint distributions. Conversely, voxels in the joint distributions can be selected and identified in the component images. Features of interest in the images that share similar parameters will cluster in the intensity distributions. Clusters of high density denote significant features. Image voxels are assigned membership to these features and are classified accordingly.

Results: The framework was applied to several clinical data sets, and shows potential as a multimodal thresholding technique, a tool to assist in target delineation and in the development of novel metrics for therapy monitoring.

Conclusions: A framework has been developed for the integration of multimodal data and has been applied to target delineation and therapy monitoring. The ability to accurately delineate the target and monitor treatment response is an essential component in the trend towards patient-specific image-guided adaptive interventions.