AbstractID: 6700 Title: The Image Tour as an aid to managing and reviewing multi-modality image data sets

Purpose: A key emerging problem in radiology and radiation oncology for treatment planning is to review data intensive multimodality image sets. This process becomes more challenging as the number of image sets increases beyond one or two. We investigated the potential of the Image Tour ('Image Grand Tour' in the statistics community) for quantitatively combining multiple image sets into a single more useful image set.

Methods: The Image Tour is a method for combining and visualizing multi-spectral images or multiple registered images. The idea underlying the Image Tour is to project a linear combination of the pixel vectors into one-dimensional space (for each pixel) and render these projected values as a gray-scale image. The Image Tour continuously moves through the set of all possible projections of the input images for a single plane of interest in the registered image sets. Features that are hidden in a set of images due to background noise or almost identical nearby pixel values may eventually be revealed by some linear re-combination of the input images. The user stops or flags tour projections which are judged particularly useful. We demonstrate the Image Tour applied to carotid MRI images where no single MRI modality is capable of simultaneously revealing the four main features of the diseased carotid (the area with plaque, the remaining blood flow, fatty mass, and a calcification).

Results: In this set of multiple pulse sequence MRI images, the Image Tour 'discovers' multiple projections that clearly allow the user to distinguish among the interesting carotid artery features. Finding these projections is facilitated by the 'video tour' process of the Image Tour.

Conclusions: The Image Tour has good potential both as a practical method of managing multi-modality image sets for radiology/radiation oncology applications as well as potentially improving the accuracy of identifying relevant radiographic features.