AbstractID: 1689 Title: Improved analysis of PET images for radiotherapy treatment planning: de-blurring and automated segmentation techniques

Positron emission tomography (PET) is increasingly being used for determining the extent of tumors in radiotherapy treatment planning. It has been demonstrated that FDG-PET can offer valuable information about both the anatomical extent and behavior of the tumor in the treatment planning process. In radiation therapy it is important to define accurately the volume that corresponds to the tumor or organ. However, the low resolution and the blurry nature of PET present a challenge to the growing use of this technology. In this work, we propose a two-step procedure to improve the PET resolution of the tumor edge. In the first step, we apply an iterative blind deconvolution algorithm (which doesn't require prior knowledge of the point spread function (PSF)) to reduce image blurring. In the second step, a deformable model-based segmentation approach using level sets is used to extract the boundaries of the tumor volume. The methods are tested on a collected set of PET/CT co-registered images with a pathological diagnosis of non small cell lung carcinoma. The PET images have a spatial resolution of 5.1 mm and a slice thickness of 3 mm. Preliminary results on deconvolution indicate that the best estimated PSF has a Gaussian shape with 15x15mm support. The deconvolved image is then fed into the deformable segmentation algorithm; the accuracy of this procedure is still under evaluation. These initial results show that blind deconvolution of PET image blurring is feasible, along with improved segmentation of target boundaries.