1056-92-432 **Dana Paquin*** (dpaquin@calpoly.edu), Department of Mathematics, California Polytechnic State University, San Luis Obispo, CA 93407, and **Doron Levy** and **Lei Xing**. *Multiscale Registration of Planning CT and Daily Cone Beam CT Images for Adaptive Radiation Therapy.*

Adaptive radiation therapy is the incorporation of daily images in the radiotherapy treatment process. Registration of planning images with daily images is an important component of ART. We report our research on multiscale registration of planning CT images with daily CBCT images. The multiscale algorithm is based on the hierarchical multiscale image decomposition of Tadmor et al., A multiscale image representation using hierarchical (BV, L^2) decompositions. Registration is achieved by decomposing the images to be registered into a series of scales using the (BV, L^2) decomposition and initially registering the coarsest scales of the image using a landmark-based registration algorithm. The resulting transformation is then used as a starting point to deformably register the next coarse scales with one another. This procedure is iterated, at each stage using the transformation computed by the previous scale registration as the starting point for the current registration. We present the results of studies of rectum, head-neck, and prostate CT-CBCT registration, and validate our registration method quantitatively and qualitatively. (Received September 07, 2009)