AbstractID: 13783 Title: GPU-Accelerated auto-segmentation for online adaptive radiotherapy

Purpose: Accurate and fast delineation of targets and normal structures based on daily CTs is critical for online adaptive radiotherapy (ART). Manual contouring generally takes too long to be practical. Auto-segmentation can run in a few minutes on modern computers, but it is desirable to reduce this time further. A simple, inexpensive option to accelerate auto-segmentation is to use a graphics processor unit (GPU). This work aims to evaluate the performance of a GPU-accelerated auto-segmentation.

Method and Materials: A GPU card (NVidia GTX 285) was added to a computer consisting of two 3GHz four core CPUs running auto-segmentation software, ABAS (Atlas Based Auto Segmentation, Elekta CMS Software). To evaluate performance, this setup was tested using daily CTs acquired during IGRT using a CT-on-Rails (CTVision, Siemens) for 14 breast (4 prone,10 supine) and 6 prostate cancer patients. Contours of targets and critical structures were populated from planning CTs to daily CTs using ABAS with and without the GPU. The accuracy of GPU-accelerated contouring was measured using Dice's Coefficient (DC).

Results: For prostate cases, there is no noticeable difference between contours generated with and without GPU (<2% difference in DC to physician contours). The average time to segment was reduced by 30%, to 1.4 minutes, with GPU, (as low as 0.97 minutes). For prone breast cases, except for lumpectomy cavity (DC: 77 – 93%), there is also no substantial difference between contours with or without GPU (DC>95%). The average time to segment images was reduced by 33% with GPU (to 2.8 minutes). For supine breast cases, contours generated with and without GPU agreed equally with contours drawn by physicians. The GPU average segmentation time was 2.3 minutes, reduced by 47%.

Conclusion: The use of GPU can substantially accelerate auto-segmentation without degrading the segmentation accuracy. This time saving is significant for online ART.