AbstractID: 6505 Title: Semi-automatic Segmentation of CT Image Using Watershed Algorithm and Graphical User Interface

Purpose: Radiotherapy planning requires image segmentation to define the planning target volume, neighboring organs at risk, and normal tissues. Manual segmentation has its limitations, depending on the operator's experience and changing for every trial by the same operator. To overcome this difficulty, we developed watershed image segmentation tool. **Method and Materials:** The watershed segmentation algorithm classifies pixels into regions using mathematical morphology. There are two different algorithms commonly used to implement watershed: top-down and bottom-up. A bottom-up algorithm first finds basins and next watersheds by taking a set of complements. A top-down algorithm first computes a complete partition of the image into basins and subsequently finds watersheds by boundary detection. We used both methods in this study. The drawback of watershed segmentation is that it produces a region for each local minimum, resulting in oversegmentation. To alleviate this problem, a graph merging algorithm is used with a threshold watershed depth. **Results:** We applied our algorithm to segment two- and three-dimensional head phantoms and several patients' abdomen CT datasets. The computing time for two-dimensional segmentation was approximately a few seconds using a desktop PC. The ASCII format output file including group numbers and pixel addresses provides visible information for calculating radiotherapy optimization matrix. Using the graphical user interface, we can add or remove groups of regions semi-automatically. **Conclusions:** We developed a medical image segmentation and registration tool for radiotherapy planning. We applied our algorithm to analyze head phantoms and several patients' abdomen CT datasets, and could find pixel addresses of the focused anatomical region for the use of treatment optimization simulation. We found that a semi-automatic method was useful to avoid errors incurred by both human and machine sources, and provided clear and visible information for optimization purpose. Further activity includes better rendering algorithms to select different organs. Supported by Com2Mac-KOSEF-MOST.