AbstractID: 13034 Title: Stereotactic body radiotherapy : Computer-assisted verification of a lung tumor region using EPID without implanted markers

Purpose: Our purpose of this study was to develop a computer-assisted verification method for lung tumor regions using a Gaussian image enhancement based on second derivatives of Gaussian functions in cine images on an EPID without implanted markers during SBRT.
Method and Materials: The localization for a lung tumor was based on a template matching technique between a "tumor template" image obtained from a first EPID cine image and the subsequent image. The irradiation field region was cropped from an original EPID cine image by analyzing the histogram of this image. The "tumor template" image was segmented from the first EPID cine image, i.e., reference portal image, by using a Gaussian image enhancement based on second derivatives of Gaussian functions and a region growing technique. The tumor region was determined within the irradiation field as the position where the tumor template image took the maximum cross-correlation value within each subsequent cine image. For performance evaluation of the proposed method, we applied the proposed method to EPID images acquired from twelve cases (age: 51-83 years old, mean: 72) with a non-small cell lung cancer, and calculated the following two values: (1) the location error, i.e., the Euclidean distance from "tumor" point to the candidate point and (2) the overlap measure between the target candidate regions obtained by the manual method and our automated segmentation method.
Results: The average location deviation between tumor center points obtained by the proposed method and the manual method was 1.80 ± 0.73 mm. The average overlap measure was 66.0 ± 10.0% for 12 cases.
Conclusion: The results of this study suggest that the proposed method based on the tumor template matching technique might be feasible for localization of a lung tumor without implanted markers in SBRT.