AbstractID: 10479 Title: A novel template technique for the analysis of alignment accuracy of a linac based SRS system

Introduction

The analysis of Winston-Lutz (WL) test for SRS QA is time consuming and subjects to human observation uncertainties. In this work, a novel template technique is described to analyze the low contrast portal images of WL test.

Methods/Materials

Linac based Steotactic Radiosurgery requires overall end-to-end accuracy of sub-millimeter (<1mm). In our department, a BrainLab® microMLC is utilized to perform SRS procedure. A WL test is performed by imaging a lead ball of size of 5mm in diameter via a Siemens Optivue EPID imager, 1 MU is delivered and a field size of 6mm×6mm is employed for 7 different gantry/table combinations.

The acquired EPID images are enhanced with a Mexican Hat Function which is a band limited filter. By using different dilation parameters, either the radiation field or the ball in the field can be enhanced.

A template binary image with known radiation isocenter, representing the ideal radiation field of size of 6mm×6mm, is generated. In addition the two dimensional projection of a lead ball is created for feature localization. The defined field and ball template images are then matched with the enhanced EPID images by using normalized cross-correlation method. The location of radiation center and mechanical isocenter can then be determined. The location difference between the beam and mechanical isocenter represents alignment accuracy for the particular field.

Results

This technique has been test on 151 images. The analysis of 145 images indicated alignment accuracy of better than 1mm. The review of 6 images failed the tolerance (>1mm) and needed to be realigned according to our protocol. The result is agreed with our visual observation.

Conclusions

By using modern image processing and analysis technique, we developed a template based algorithm to analyze WL test images for SRS quality assurance.