Interfractional trend analysis of dose discrepancies based on 2D portal dosimetry

By creating an interfractional trend overview of a treatment several dose delivery problems can be detected. Figure 1a shows an example lung cancer case with atelectasis. In the 3 different CT slices it is clearly visible that there are rather large anatomical changes from one CT to another. Furthermore, it can be seen in the systematic γ evaluations that there are large areas where γ exceeds unity while delivering the first plan. After adaptation it improves for the second plan but there is still a residual error which mostly disappears after a third adaptation. This also represented in figure 1b which shows the average percentage γ pixels exceeding unity for all the beams of a fraction and the standard deviation.

Figure 2a shows an example prostate cancer treatment with a consistent dose delivery error. This is caused by a gas-pocket in the planning CT. In this case when the γ statistics for different structures are compared the problem can be traced back to the rectum. Figure 2b shows the γ statistics for different projected contours.

Figure 1: An example patient lung cancer which had a treatment adaptation three times due to diminishing atelectasis. a) Systematic γ images for different treatment fractions and beams. b) The percentage γ exceeding unity for the separate plans and fractions.

Figure 2: An example patient prostate case with a variable gas-pocket. a) Systematic γ images for different treatment fractions and beams. b) The percentage γ exceeding unity for the rectum, bladder and the treatment field.