

Purpose: To describe a new method, called Differential Analysis (DA), of evaluating image processing algorithms in radiological imaging.

Methods: Thirty head CT images which showed abnormal findings were selected. Each abnormal image was paired with a normal head CT image at the same anatomical location. All images were processed using standard filtered back projection (FBP) and a new algorithm called iterative reconstruction in image space (IRIS). Three experienced neuroradiologists evaluated the image pairs and assigned a score from 1 to 10, based on how easy / difficult it was to differentiate between normal and abnormal findings. A score of 1 would indicate a barely visible lesion, implying that the processing allows poor differentiation between abnormal and normal pathology, whereas a score of 10 indicated a readily visible lesion, implying excellent differentiation. All evaluations were performed independently and in a random order. The results permitted a differential score “delta” (i.e., IRIS score minus FBP score) to be obtained, with positive values showing IRIS to be superior to FBP, and vice versa.

Results: Two observers had positive to negative delta ratios of 3 to 2, and one observer had a positive to negative delta ratio of 1. The ratio of positive to negative delta values for all observers was 2.5. Pooled delta scores showed 18 values less than -1, 38 values between -1 and +1, and 34 values greater than +1. Overall, twice as many images processed using IRIS showed improvements in the differential score as compared with filtered back projection.

Conclusions: We describe here a new method to evaluate image processing algorithms in radiological imaging which we propose to call Differential Analysis. Application of this method to a new Iterative Reconstruction algorithm (IRIS) showed improved visibility of brain lesions on CT.