AbstractID: 8378 Title: Hermitian curve interpolation for CT-data re-sampling

Purpose: Development of an interpolation algorithm for re-sampling spatially distributed CT-data with the following features: global and local integral conservation, avoidance of negative interpolation values for positively defined datasets and the ability to control re-sampling artifacts. **Method and Materials:** The interpolation can be separated into two steps: first, the discrete CT-data has to be continuously distributed by an analytic function considering the boundary conditions. Generally, this function is determined by piecewise interpolation. Instead of using linear or high order polynomial interpolations, which do not fulfill all the above mentioned features, a special form of Hermitian curve interpolation is used to solve the interpolation problem with respect to the required boundary conditions. A single parameter is determined, by which the behavior of the interpolation function is controlled. Second, the interpolated data have to be re-distributed with respect to the requested grid. **Results:** The new algorithm was compared with commonly used interpolation functions based on linear and second order polynomial. It is demonstrated that these interpolation functions may over- or underestimate the source data by about 10%-20% while the parameter of the new algorithm can be adjusted in order to significantly reduce these interpolation errors. Finally, the performance and accuracy of the algorithm was tested by re-gridding a series of X-ray CT-images. **Conclusion:** Inaccurate sampling values may occur due to the lack of integral conservation. Re-sampling algorithms using high order polynomial interpolation functions may result in significant artifacts of the re-sampled data. Such artifacts can be avoided by using the new algorithm based on Hermitian curve interpolation. **Conflict of Interest:** This work was supported in part by Varian Medical Systems.