

M. Schrapp, M. Goldammer, K. Schörner and J. Stephan, Improvement of image quality in computed tomography via data fusion, *Proceedings of the 5th International Conference on Industrial Computed Tomography (iCT)*, pp. 283-289, February **2014**, the University of Applied Sciences, Wels, Upper Austria. <http://www.ndt.net/article/ctc2014/papers/283.pdf>.

Abstract

For most real-world applications of computed tomography (CT) the quality of image reconstruction from measured projections is reduced by artifacts from a number of sources. Especially for large sized objects, such as turbine blades, it is often not possible to fully penetrate the object in specific directions. The corresponding measured projections are additionally affected by secondary radiation caused by scattering. This manifests itself as smearing and blurring artifacts in the reconstructed image and is specifically perceivable at concave edges in the case of turbine blades. By means of data fusion we are able to supplement and correct the missing data from the CT scan and improve the reconstructed image quality. As additional modalities a 3-D scanner as well as ultrasonic testing are available. A 3-D scanner can provide the complete surface information of the object simultaneously with the CT acquisition. A specific ultrasonic imaging technique called synthetic aperture focusing technique is used to obtain further data of the interior structure. In this contribution we present a general framework, how this additional data can be embedded in the CT reconstruction. This framework consists of a superiorized version of the simultaneous algebraic reconstruction technique (SART). The concept of superiorization is a new technique for constrained optimization and steers the algorithm to additionally fulfill the a priori given information from ultrasonic testing and 3-D scanning. Furthermore, our algorithm is able to handle additional data from the same modality but with different acquisition parameters. This means it is possible to incorporate another CT projection data set into our reconstruction as it is relevant in dual energy measurements for example. Applying this framework on a turbine blade model, the apparent smearing and blurring artifacts can be reduced significantly.