

A priori information based ROI correction in Computed tomography and laminography

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In computed tomography (CT) truncated projections occur if the inspected object cannot be completely projected onto the detector. Especially in the case of big objects with high absorption truncated data are unavoidable. Severe artefacts and low contrast in the reconstruction are the results of this problem.

Usually objects inspected by computed laminography (CL) are of planar shape, that means the ratio of base area to height is very high. If not the entire object but only a partial area with high resolution inside it is of interest, a so called region-of-interest (ROI) reconstruction has to be computed. This leads to strong edge artefacts inside the reconstruction volume, which cause decreasing gray values in the centre of the volume, thus significantly reducing contrast.

Given the assumption that the reconstruction volume represents only a section of a homogeneous object and that the whole object is also homogeneous outside the region-of-interest between two surface contours, a multiplicative correction factor for each ray may be computed to compensate for these region-of-interest-artefacts. This factor depends on the length l_v of the ray inside the volume itself and on the length l_o of the ray inside the entire object. If only a few voxels are hit by a ray, which also runs through an area of the object which is outside the region-of-interest, the corresponding correction factor for these voxels is small, reducing edge artefacts. Inside the region-of-interest, where the sum of the ray-lengths of the voxels hit by the ray is equal to the entire ray-length between the object's outer surfaces, the correction factor becomes one, thus changing nothing. This ensures that only areas of the volume are corrected in which the absorption is not completely modeled by the volume itself. The object's contours may be extracted from CAD or STL data and have to be registered with the measured data to guarantee a correct alignment.