

AbstractID: 10271 Title: Positional accuracy of a B-spline based method for image registration in the H&N area: effect of noise, contrast and registration parameters.

**Purpose:** Evaluation of the B-Spline based Registration Method (BSRM) and the effect of contrast, signal to noise ratio and registration parameter settings on the accuracy of the restored voxel displacements in deformed H&N images. **Method and Materials:** CT images of a 8x15x25 cm<sup>3</sup> phantom were constructed. The phantom contained spherical and elliptical structures simulating a tumor and several H&N organs. From this set, additional CT sets were constructed by: 1) affine transformation, 2) imposing shaped deformations up to 20 mm and 3) addition of noise of 10 HU up to 300 HU (1SD). The BSRM of the Insight Toolkit combined with Elastix was used to register the various distorted phantoms to the original phantom. The effect of different parameter settings of the registration has been investigated (number of iterations, spacing of the B-spline grid, number of resolution levels). Displacement vectors calculated in the deformable registration were compared with the imposed deformations. Average residual voxel displacement and other similarity measures were calculated. **Results:** Satisfactory convergence of the average residual displacement is reached after 64, 64 and 128 iterations for 3 levels of resolution. A grid spacing of 8-12 mm gives good results, although for sharp deformations a 6 mm grid is better in most cases. The increase in noise has a minor influence on the accuracy. An average tracking accuracy of better than 2 mm for parotid gland edges seems feasible. In some areas, however residual displacement errors up to 6-8 mm are observed. **Conclusions:** The BSRM seems to be suitable for intensity based deformable image registration of structures like the parotid and submandibular glands in the H&N region. Careful tuning of parameter values is important to obtain reliable results. References: ITK: [www.itk.org](http://www.itk.org), Elastix: [www.isi.uu.nl/Elastix](http://www.isi.uu.nl/Elastix).