AbstractID: 14140 Title: An adaptivie regularization for the Demons algorithm

Purpose: An examination of the regularization methods of the deformation vector field obtained with the "Demons" algorithm. The application of the adaptive smoothing for incremental variability of the similarity between the source and target image and its effect on the general characteristics of the transformation map.

Method and Materials: The synthetic images are used for the numerical experiments. An adaptive iterative smoothing of the deformation field computed with the "Demons" algorithm is examined. The transformation map is examined with respect to the degree of the dissimilarity between the matched images and adaptive filtering . The standard Gaussian filtering with varying standard deviations (σ) is used for the adaptive smoothing. The magnitudes if the deformation vectors and the smoothness characteristics of the deformation maps are examined.

Results:

The deformation map reflecting the degree of the dissimilarity between the source and the target image gains truthfulness after application of the adaptive regularization. The real magnitude of the deformation between registered objects affects the effectiveness of the filtering. Since this value is not known an arbitrary *a priori* selection of the Gaussian filter is never optimal. The larger the filter's σ the smaller the magnitude of the deformation vectors is obtained. An inverse trend is observed for the magnitude of the map's standard deviation. The convergence rate of the algorithm is affected by the selection of the given σ. The mean squared sum of intensity differences measures the images similarity.

Conclusion:

The application of the adaptive regularization of the deformation field reflects the varying scales of the real deformation and how the algorithm is parametrically allowed to accommodate these differences during the iteration. This idea might be extended to anisotropic adaptive filtering to accommodate inhomogeneity of the real deformation at a given resolution scale.