

MODEL-BASED ASSESSMENT OF NON-RIGID REGISTRATION

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Abstract

Non-rigid registration is the task associated with alignment of images. It is ubiquitously as a basis for medical image analysis and its applications include structural analysis, atlas matching and change analysis. The task is highly under-constrained, so a variety of different registration algorithms produce different results for any given set of images.

We compare two methods for assessing the performance of non-rigid registration algorithms. One approach utilizes a measure of overlap between data labels. Our new approach exploits the fact that, given a set of non-rigidly registered images, a generative statistical appearance model can be constructed. We observe that the quality of the model depends on the quality of the registration, and can be evaluated by comparing synthetic images sampled from the model with the original image set.

Indices of model specificity and generalisation are derived, which can be used to assess model/registration quality. We show that both approaches detect the loss of registration as a set of correctly registered MR images of the brain is progressively perturbed. We compare the sensitivities of the different methods and show that, as well as requiring no ground truth, our new specificity measure provides the most sensitive approach to detecting misregistration.