

## Publication

### Adaptive subdivision for hierarchical non-rigid registration of multi-modal images using mutual information

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In this paper we present an enhanced method for non-rigid registration of volumetric multi-modal images using Mutual Information (MI). Based on a hierarchical subdivision scheme, the non-rigid matching problem is decomposed into numerous rigid registrations of sub-images of decreasing size. A thorough investigation revealed limitations of this approach, caused by a peculiar behavior of MI when applied to regions covering only a limited number of image pixels. We examine and explain the loss of MI's statistical consistency along the hierarchical subdivision. We also propose to use information theoretical measures to identify the problematic regions in order to overcome the MI drawbacks. This does not only improve the accuracy and robustness of the registration, but also can be used as a very efficient stopping criterion for the further subdivision of nodes in the hierarchy, which drastically reduces the computational costs of the entire registration procedure.

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