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Two-level Method for 3D Non-rigid Registration: with an Application to Statistical Atlases Construction

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Abstract

We propose a two-level method for 3D non-rigid registration and apply the method to the problem of building statistical atlases of 3D anatomical structures. 3D registration is an important problem in computer vision and a challenge topic in medical image field due to the geometrical complexity of anatomical shapes and size of medical image data. In this work we adopt a two-level strategy to deal with these problems. Compared with a general multi-resolution framework, we use an interpolation to propagate the matching instead of repeating registration scheme in each resolution. Our algorithm is divided into two main parts: a low-resolution solution to the correspondences and mapping of surface models using Chui and Rangarajan's robust point matching algorithm, followed by an interpolation to achieve high-resolution correspondences. Experimental results demonstrate our approach for solving the non-rigid registration and correspondences within complicated 3D data sets. In this paper we present an example of this method in the construction of a statistical atlas of the femur.

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