

Abstract: A 3D Registration Algorithm for Abdominal PET-CT and MR images Using Intensity and Feature Information

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Abstract

The aim of this study is to develop a 3D registration algorithm for PET/CT and MR images acquired from independent PET/CT and MR imaging systems. Combined PET/CT images provide anatomical and functional information and MR images have high resolutions for soft tissues. With the registration technique, the strengths of each modality image can be combined so that we can achieve higher performance in diagnosis and radiotherapy planning. The proposed method consists of two stages: normalized mutual information (NMI) based global matching and independent component analysis (ICA) based refinement. In the global matching, the field of view of the CT and MR images are adjusted to the same size in the preprocessing step. Then, the target image is geometrically transformed, and the similarities between the two images are measured with NMI. The optimization step updates the transformation parameters to efficiently find the best matched parameter set. In the refinement stage, ICA planes from the windowed image slices were extracted and the similarity between the images was measured to determine the transformation parameters of the control points. B-spline based freeform deformation was performed for the geometrical transformation. The results showed good agreement between PET/CT and MR images.

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