

博士论坛

## 改进的粒子群算法多模态生物医学图像配准

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**摘要** 多模态生物医学图像配准在医疗诊断、治疗方案的制定,以及身体机能的研究等方面起到越来越大的作用。如何将这些多模态信息融合在一起是目前研究的重点,目前,该融合主要基于图像强度信息的配准方法。该方法通过最大化化图像间的相似性函数达到配准的目的,但配准过程中使用往往会出现参数变化非凸且不光滑的现象,因而,传统的局部最优方法通常不能得到较好的结果。粒子群算法是一种全局寻优算法,但传统的方法中受初始值的选取以及当前全局最优点的影响,易陷入局部最优。本文对其进行改进,使得即使在初始值离准确值较远时也能得到全局最优,并将该方法用于多模态医学图像配准中,得到了较好的结果。

**关键词** [全局最优](#) [图像配准](#) [局部最优](#) [粒子群算法](#)

分类号

## Multimodality Medical Image Registration Based on Improved Particle Swarm Optimization

### Abstract

biomedical image registration, or geometric alignment of two-dimensional and/or three-dimensional (3-D) image data, is becoming increasingly important in diagnosis, treatment planning, functional studies, computer-guided therapies, and in biomedical research. Registration based on intensity values usually requires optimization of some similarity function between the images. Local optimization techniques frequently fail because these functions with respect to transformation parameters are generally no convex and irregular and, therefore, global methods are often required. In this paper, a new evolutionary approach, particle swarm optimization, is adapted for biomedical image registration. Multimodal registrations with initial orientations far from the ground truth were performed on three volumes from different modalities. Results of optimizing the normalized mutual information similarity function were compared with various evolutionary strategies. The hybrid particle swarm technique produced more accurate registrations in many cases, with comparable convergence. These results demonstrate that particle swarm approaches, along with evolutionary techniques and local methods, are useful in image registration, and emphasize the need for hybrid approaches for difficult registration problems.

**Key words** [global optimization](#) [image registration](#) [local optimization](#) [particle swarm optimization](#).

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