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Achieve Incremental Nonrigid

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Introduction

Automatic multi-modal image registration is central to numerous tasks in medical imaging today and features a huge range of applications e.g., image guidance, atlas construction, etc. In this paper, we present a completely unique multi-modal 3D non-rigid registration algorithm where in 3D images to be registered are represented by their corresponding local frequency maps efficiently computed using the Riesz transform as against the popularly used Gabor filters. The non-rigid registration between these local frequency maps is formulated during a statistically robust framework involving the minimization of the integral squared error a.k.a. L2E (L2 error). This error is expressed because the squared difference between truth density of the residual (which is that the squared difference between the non-rigidly transformed reference and therefore the target local frequency representations) and a Gaussian or mixture of Gaussians density approximation of an equivalent. The non-rigid transformation is expressed during a B-spline basis to realize the specified smoothness within the transformation also as computational efficiency. The key contributions of this work are (i) the utilization of Riesz transforms to realize better efficiency in computing the local frequency representation as compared to Gabor filter-based approaches, (ii) new mathematical model for local-frequency based non-rigid registration, (iii) analytic computation of the gradient of the robust non-rigid registration cost function to realize efficient and accurate registration. The proposed non-rigid L2E-based registration may be a significant extension of research reported in literature so far. We present experimental results for registering several real data sets with synthetic and real non-rigid misalignments. Image moments are widely used for designing shape descriptors that are invariant to rigid transformations. This chapter focuses on the utilization of image moments to realize incremental nonrigid registration of images. Here, we address the matter of estimating non-rigid deformation fields supported image moment variations. We propose a non-rigid registration method that's ready to recover the deformation field between two images without solving the correspondence problem. This is achieved by representing deformation-induced variations in image moments as a system of quadratic functions. Our method uses polynomials to both parameterize the deformation field and to define image moments. The method was tested on MPEG-7 shapes and cardiac MRI sequences. In this paper, a strong and efficient coarse-to-fine non-rigid medical image registration algorithm is proposed. It contains three level deformation models, i.e., the worldwide holography model, the local mesh-level holography model, and therefore the local B-spline FFD (Free-Form Deformation) model. The coarse registration is achieved by the primary two level models. In the global holography model, a strong algorithm for simultaneous outliers (error matched feature points) removal and model estimation is applied. In the local mesh-level holography model, a replacement similarity measure is proposed to enhance the robustness and accuracy of local mesh based registration. In the fine registration, an area B-spline FFD model with normalized mutual information gradient is used.

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