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MI-based image registration using a new histogram estimation scheme. (English)
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Summary: A new histogram estimation scheme is proposed in the calculation of mutual information (MI) for image registration. We show that the mutual information function derived from the new estimation scheme is continuous and differentiable, and we derive analytic expressions of its derivatives that allow numerically exact evaluation of its gradient. Both Powell and conjugate gradient methods are applied to optimize the MI function. Experimental results show that, compared with the MI using partial volume interpolation (PVI), the MI registration function derived from the suggested scheme reduces the interpolation-induced artifacts, encounters less local maxima and the registration performance is improved significantly.

MSC:
94A15 Information theory (general)
94A08 Image processing (compression, reconstruction, etc.) in information and communication theory
90C90 Applications of mathematical programming

Keywords:
mutual information; joint histogram estimation; Powell’s method; conjugate gradient method