

Publication**Bilateral filter regularized accelerated Demons for improved discontinuity preserving registration****JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)****ID** 3287681**Author(s)** Demirović, D; Šerifović-Trbalić, A; Prljača, N; Cattin, Ph C**Author(s) at UniBasel** [Cattin, Philippe Claude](#) ;**Year** 2015**Title** Bilateral filter regularized accelerated Demons for improved discontinuity preserving registration**Journal** Computerized medical imaging and graphics : the official journal of the Computerized Medical Imaging Society**Volume** 40**Pages / Article-Number** 94-9

The classical accelerated Demons algorithm uses Gaussian smoothing to penalize oscillatory motion in the displacement fields during registration. This well known method uses the L2 norm for regularization. Whereas the L2 norm is known for producing well behaving smooth deformation fields it cannot properly deal with discontinuities often seen in the deformation field as the regularizer cannot differentiate between discontinuities and smooth part of motion field. In this paper we propose replacement the Gaussian filter of the accelerated Demons with a bilateral filter. In contrast the bilateral filter not only uses information from displacement field but also from the image intensities. In this way we can smooth the motion field depending on image content as opposed to the classical Gaussian filtering. By proper adjustment of two tunable parameters one can obtain more realistic deformations in a case of discontinuity. The proposed approach was tested on 2D and 3D datasets and showed significant improvements in the Target Registration Error (TRE) for the well known POPI dataset. Despite the increased computational complexity, the improved registration result is justified in particular abdominal data sets where discontinuities often appear due to sliding organ motion.

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