

# Tracking of 3D structures in MR Mammography

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## Abstract

This work presents a novel method to establish correspondence in MR images taken at different times which allows the tracking of regions of interest through a time-series of MR volumes.

This is developed as an hybrid correspondence, where a correlation measure (i.e. mutual information) and a point based method (i.e. Elastic Body Spline - EBS-) are used. The correlation measure recovers the global misalignment while the point based method tackles the local non-linear deformation. The latter involves the definition of robust and meaningful points of correspondence. To obtain such points, we extract salient ridges from the MR volume using a ridge operator. Our assumption is that the morphology of those structures is described by points of maximum local curvature. From those points, local features are computed and used by a matching process. Matching takes into account the non-rigid nature of the correspondence, ensures an homogeneous point distribution and is robust enough when dealing with noise and spurious structures.

After corresponding points have been obtained, areas are brought into spatial alignment and internal regions are tracked. Alignment is performed using EBS, which models the deformation as a three dimensional homogeneous elastic material.

Evaluation results are obtained using simulated deformation of the breast volume. It is shown that the proposed method is able to recover the induced deformation. In addition, registration and tracking results using real data are shown. Although not as satisfactory as with the simulated case, our approach is able to establish correspondence within MR volumes and it is undergoing pre-clinical evaluation.