AbstractID: 14111 Title: The analysis of the transformation map construction for optic flow based image registrations.

Purpose: A formal analysis and computational examples of the deformation field calculation for optic-flow-based image registration algorithms is presented. The addition and composition of the deformation field updates are compared for different types of medium deformation.

Method and Materials: A robust family of image registration algorithms is based on the optic flow method. They are iterative and use the conceptual temporal and spatial gradients of the registered images for the determination of the deformation between the objects. This transformation map is obtained iteratively from the current one by: i)the addition and ii)the composition with the update field. These methods are formally different and interplay with image gradients. This effect of the interplay is examined with respect to the type of the deformation. Synthetic and patient images are used in an experiment.

Results:

The inter-relation of the deformation field and the gradient forces of the algorithms provides the main gauge of the effectiveness of the iterative process of the determination of the deformation field. The disparity in the alignment of the gradient and the field decreases the efficiency of the iterative process for the additive update. The translational differences between the moving and static image do not affect either methods. The variable deformation is properly addressed by the composition in the iterative process.

Conclusion:

This analysis can be generalized for any image registration algorithms, which uses the multiple pass approach for the image update in an iterative scheme. The obvious temporal load of the field composition can be mitigated by the use of linear interpolations. For multigrid-based image registrations, the low resolution steps do can use B-spline interpolations without sacrificing performance. The improved effectiveness of the deformation field buildup is an important issue for the creation of physically veritable diffeomorphic transformations.