Volume Constraints in Image Registration

E. Haber, *Emory University, USA*

Abstract

Image registration is one of today's challenging image processing problems. Given a so-called reference R and a so-called template image T, the basic idea is to find a reasonable transformation such that a transformed version of the template image becomes similar to the reference image.

For non-parametric registration, we require an invertible transformation. This implies that the determinant of the transformation has to be larger than 0. However, in many cases an invertible transformation is not enough. Small values of the Jacobian implies highly distorted grids and should be avoided. Most registration algorithms monitor the size of the Jacobian and re-initialize or stop the registration process altogether if its value is small. This is usually done implicitly and is not a part of the objective function. In this work we examine constraints which are based on the determinant of the Jacobian. We discuss consistent discretization of the determinant and the application of this determinant as an equality or inequality constraints to image registration problems.