

Application of an image registration method based on maximization of mutual information

C. Spanakis^{a,b}, K. Marias^a, E. Mathioudakis^b and N. A. Kampanis^c

^aInstitute of Computer Science,

FORTH, Heraklion, Greece

^bApplied Mathematics and Computers Laboratory

Technical University of Crete, Chania, Greece

^cInstitute of Applied and Computational Mathematics,

FORTH, Heraklion, Greece

kspan@ics.forth.gr, manolis@amcl.tuc.gr,
kmarias@ics.forth.gr, kampanis@iacm.forth.gr

Abstract

Image Registration is the process of transforming sets of data acquired at different time-points, sensors and viewpoints into a single coordinate system. It is widely used in computer vision, medical imaging and satellite image analysis. Although it has been a central research topic in computer vision and medical image analysis for a long time, there are still unresolved issues and success rates seem to be data-dependent. There are many categories of methods that are able to align images, but usually they are either specialized and accurate for specific types of data or more generic and error-prone frequently stumbling upon pitfalls. In this work, we describe our implementation and results on Maes' method. By using three different variants of mutual information (used as the similarity measure), we present indicative results from different imaging domains and discuss the drawbacks/pitfalls of the method especially with regard to initial transformation selection and the initial direction vectors. The results are quite accurate with translation and rotation when dealing with images of good quality. However, the choice of a starting point and the initial direction vectors proved to be two critical factors for the success of the method, since different starting point or/and different initial direction vectors may lead to different "optimal" alignment registration results between the images. In order to solve this problem, we propose an extension of this method by enhancing its global optimization scheme by means of stochastic optimization.

Key words: Image Registration, Mutual Information, Genetic Algorithms.