

GPU Based Affine Linear Image Registration

GPU basierte affin-lineare Bildregistrierung

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Abstract

In this thesis, a GPU implementation of an affine linear registration algorithm using the Sum of Squared Differences (SSD) or Normalized Gradient Fields (NGF) distance measure is presented. The mathematical framework of the algorithm was carefully analyzed and restructured to be computed in parallel. Through the extensive use of different memory types, well handled thread management, optimized kernel layout and efficient hardware interpolation extremely fast executing code was gained. The GPU implementation achieved a speedup of up to 18.4 compared to parallelized CPU code and 300 compared to research code. Matching two 512×512 pixel images is performed in 18 ms using SSD and in 28 ms using NGF.

Speedup for different implementations of a multilevel registration using NGF compared to MatLab Code

