

Elastic registration is a task of finding the matching of two images, using geometric and elastic transformations, so that objects in images have the same size, position and orientation. We apply elastic registration in the framework of volume reconstruction, where an object acquired from parallel physical sections is composed and mutual positions of the sections including deformations caused by their cutting have to be found. Our aim was to find a parallelizable algorithm that can be implemented on a graphics card using NVidia CUDA programming environment. The method lies in optimizing a functional consisting of two parts: first, discrete total variation as a measure of roughness and, second, L1 norm as a measure of dissimilarity of images. As a parallelizable optimization strategy we apply a potential-based equivalent transformation of a (max,+)-labelling problem. CUDA-based implementation of the described elastic registration algorithm is reasonably fast, requires seconds to minutes of calculations, provides good results and, thus, can be used for practical tasks dealing with alignment of biomedical images.