

Processing and visualization of medical images from CT scans

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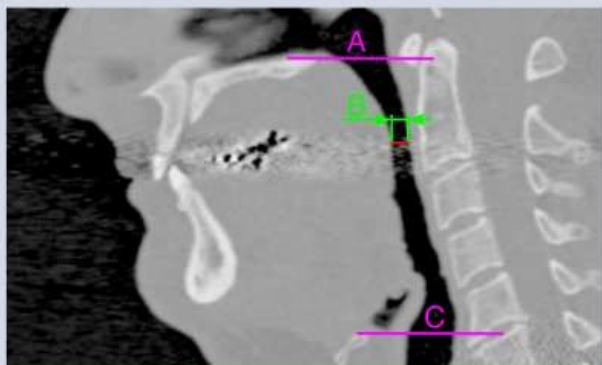
Motivation

- Improvement of current methods and methodologies for retrieving information from medical images
- Extraction of additional information from CT and MRI images which can not be obtained by current approaches

Objectives

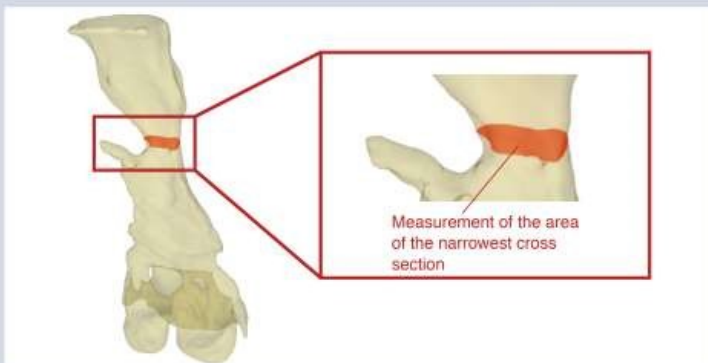
- HPC as a service for medical image processing
- Development of semi-automatic tool for image segmentation
- Reduction of time required for medical image post processing
- Development of tool for surgery planning

CT image of upper respiratory tract



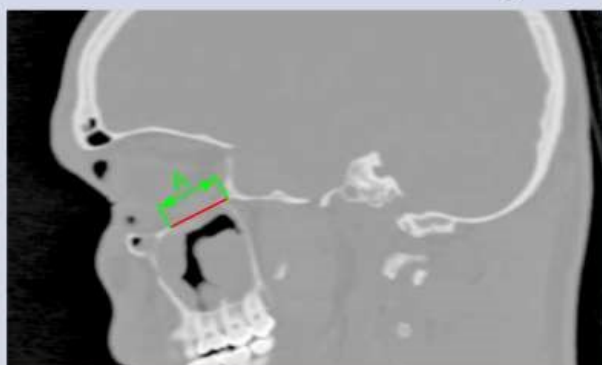
A – upper boundary, B – measurement of the narrowest cross section, C – lower boundary

3D model of upper respiratory tract



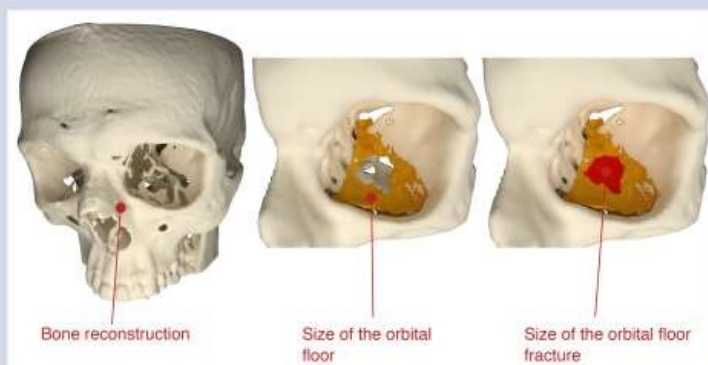
Model reconstruction by image processing methods applied on CT images

Measurement of orbital fracture on CT image



A – length of orbital fracture (the only information which could be retrieved from 2D image)

Measurement of orbital fracture on 3D model



Bone reconstruction

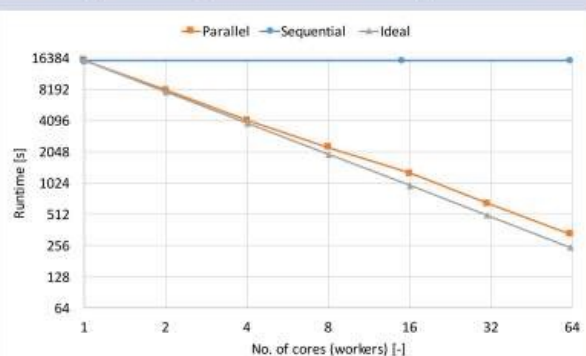
Size of the orbital floor

Size of the orbital floor fracture

Methods

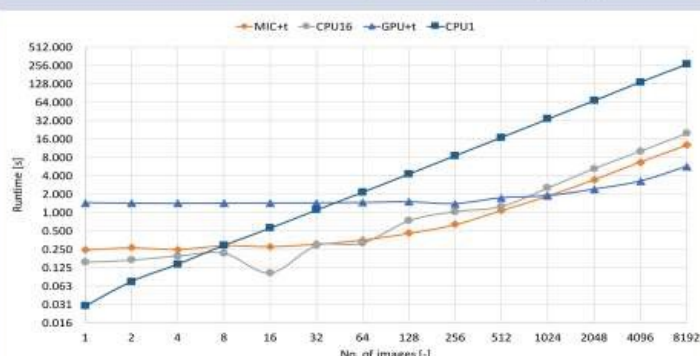
- Parallelization of image processing algorithms and methods
- Exploitation of accelerators for most demanding tasks
- Creation of virtual 3D models of human organs and tissues

Strong scalability of the BM3D filter implementation



Comparison of parallel and sequential implementation of CPU version of BM3D filter

Parallelization of K-means clustering method for image segmentation



Comparison of parallel implementations for different architectures (CPU, GPU, MIC). Tested on 64 clusters