HPC biomedical simulations based on CT data

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Computed Tomography is a modern imaging technique with various applications in medicine, biology, engineering, etc. [1,2]. Particular features of the reconstructed CT volume can be extracted by applying different filtering and segmentation techniques [3]. Resulting geometry can be used as a computational domain for realistic numerical simulations. High Performance Computing is crucial for such kind of applications due to the complicated geometry and high resolution of the CT data.Typical biomedical applications are related to simulations of blood flow through the blood vessels [4], and bone tissue simulations [5].

References

[1] https://en.wikipedia.org/wiki/CT_scan

[2] https://en.wikipedia.org/wiki/Industrial_computed_tomography

[3] I. Georgiev, S. Harizanov, Y. Vutov, Supervised 2-phase Segmentation of Porous Media with Known Porosity, Lecture Notes in Computer Sciences, 9374 (2015), 343-351.

[4] W. Fenz, J. Dirnberger, I. Georgiev; Blood Flow Simulations with Application to Cerebral Aneurysms; SCS SpringSim 2016, Pasadena, USA, 2016.

[5] N. Kosturski, S. Margenov, Numerical Homogenization of Bone Microstructure, Lecture Notes in Computer Science, vol. 5910, 140-147, 2009