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Parallel implementations of image reconstruction algorithms for X-ray microtomography

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Significant improvement of detector resolution and, consequently, rapid growth of acquired data amounts, typical for evolving modern tomographic systems, demands development of more efficient image reconstruction software. A Medipix semiconductor detector with 55 μm spatial resolution and a cone-beam scanning scheme are used for taking projections in a microCT scanner MARS, being run at the Dzheleпов Laboratory of Nuclear Problems of JINR. The FDK algorithm realization developed at JINR, which is currently used for image reconstruction, requires a significant time to process the data. Its reducing is a priority task. For this purpose, parallel implementations of the reconstruction algorithm using OpenMP, MPI, and CUDA technologies have been developed and deployed for calculations on heterogeneous computing systems. A comparative analysis of the developed parallel implementations has been done, the results on calculation speedup and efficiency are presented. The computations were performed on the heterogeneous cluster HybriLIT at the JINR Laboratory of Information Technologies.

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