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Investigation of many-core scalability of the track reconstruction in the CBM experiment

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Search for particle trajectories is a basis of the on-line event reconstruction in the heavy-ion CBM experiment (FAIR/GSI, Darmstadt, Germany). The experimental requirements are very high, namely: up to 10ˆ7 collisions per second, up to 1000 charged particles produced in a central collision, a non-homogeneous magnetic field, about 85% of the additional background combinatorial measurements in the detector, full on-line event reconstruction and selection. This requires use of the full potential of modern many-core CPU/GPU architectures.

The Cellular Automaton (CA) method is one of the most efficient methods of searching for charged particles trajectories. The implementation of the CA algorithm in the CBM experiment is well optimized with respect to time consumptions, the calculations are carried out in parallel with use of parallelism at the level of data, as well as at the level of cores. We present a detailed description of the algorithm realization and results of the many-core scalability tests on a server at the Laboratory of Information Technologies (JINR, Dubna, Russia) with 2 Intel Xeon E5640 CPUs (in total 8 physical or 16 logical cores). The track reconstruction efficiency, the speed of the algorithm and its scalability with respect to number of cores are presented in detail. Using the Nvidia GPU card as an accelerator is also discussed.

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