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Comparison of Python 3 Single-GPU Parallelization Technologies on Example of Charged Particles Dynamics Simulation Problem

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Low energy ion and electron beams, produced by ion sources and electron guns, find their use in surface modifications, nuclear medicine and injection into high-energy accelerators. Simulation of particle dynamics is a necessary step for optimization of beam parameters. Since such simulations require significant computational resources, parallelization is highly desirable to be able to accomplish them in a reasonable amount of time. From the implementation standpoint, dynamically typed interpreted languages, such as Python 3, allow high development speed that comes at cost of performance. It is tempting to transfer all computationally heavy parts on GPU to alleviate this drawback. Using the example of charged particles dynamics simulation problem, various GPU-parallelization technologies, available in Python 3, are compared in terms of ease of use and computational speed. Computations were held on the basis of the heterogeneous computing cluster HybriLIT (LIT, JINR).
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