

Название публикации:

Comparison of python 3 single-GPU parallelization technologies on the example of a charged particles dynamics simulation problem

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Аннотация:

Low energy ion and electron beams, produced by ion sources and electron guns, find their use in surface modification, 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 tasks on a GPU to alleviate this drawback. Using the example of a charged particles dynamics simulation problem, various GPU-parallelization technologies available in Python 3 are compared in terms of ease of use and computational speed. The reported study was funded by RFBR according to the research project No 18-32-00239/18. Computations were in part held on the basis of the heterogeneous computing cluster HybriLIT (LIT, JINR). © 2018 Alexey Boytsov, Ivan Kadochnikov, Maxim Zuev, Andrey Bulychev, Yaroslav Zolotuhin, Igor Getmanov.

Ключевые слова:

Charged particles, Cluster computing, Dynamics, Electron guns, Graphics processing unit, High level languages, Ion sources, Nuclear medicine, Surface treatment