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Accelerating fast calorimeter simulation with CUDA in ATLAS

ATLAS is one of the largest experiments at the Large Hadron Collider. Its broad physics program relies on very large samples of simulated events, but producing these samples is very CPU intensive when using the full GEANT4 detector simulation. A parameterization-based Fast Calorimeter Simulation, i.e. AtlFast3, is developed to replace the Geant4 simulation to meet the computing challenges. Parameterizations of electromagnetic and hadronic calorimeter showers are used to deposit particle energies in the detailed calorimeter structure. To accelerate the fast simulation further, ATLAS plans to employ GPUs to parallelize the parameterization at the particle level. The simulation time per particle in the calorimeter is reduced by a factor of 3 with porting the parameterization to CUDA on GPU with respect to C++ on CPU. Significant improvement is expected for processing large samples for the high-luminosity LHC where an extremely large number of particles per event will result from the many simultaneous proton-proton collisions. This talk will present the GPU processing of AtlFast3 and the performance study.

Significance

We have accelerated the fast calorimeter simulation by parallelizing the hit simulations on the GPU in ATLAS for the first time, and will present the novel result on the simulation performance with GPU in this talk.”

References

Z. Dong, et. al. arXiv:2103.14737

Speaker time zone

Compatible with Asia

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