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Track reconstruction as a service for collider physics

Tracking algorithms play a vital role in both online and offline event reconstruction in Large Hadron Collider (LHC) experiments; however, they are the most time-consuming component in the particle reconstruction chain. To reduce processing time, existing tracking algorithms have been adapted for use on massively parallel coprocessors such as GPUs. Nevertheless, fully utilizing the computational capacities of these coprocessors remains challenging. This talk proposes a novel coprocessor-as-a-service approach for tracking algorithms in LHC experiments, which allows multiple CPU cores to offload computations to shared GPU resources efficiently. To evaluate the efficacy of this approach, we employ two distinct benchmark tracking algorithms: Patatrack, a non-machine learning (non-ML) algorithm, and Exa.TrkX, an ML-based algorithm. These implementations enhance GPU utilization and enable concurrent processing of requests from multiple CPU cores without degrading individual performance. We observed that data transfer latency is minimal and negligible compared to the processing time on local coprocessors. The Tracking as a Service approach significantly improves the computational efficiency of charged particle tracking, offering a scalable solution to the computing challenges anticipated in the High-Luminosity LHC era.

Focus areas

HEP

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