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Adaptive track scheduling to optimize concurrency and vectorization in GeantV ^[1]

Date published:

Friday, 22 May, 2015

Document type:

Journal paper

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The GeantV project is focused on the R&D of new particle transport techniques to maximize parallelism on multiple levels, profiting from the use of both SIMD instructions and co-processors for the CPU-intensive calculations specific to this type of applications. In our approach, vectors of tracks belonging to multiple events and matching different locality criteria must be gathered and dispatched to algorithms having vector signatures. While the transport propagates tracks and changes their individual states, data locality becomes harder to maintain. The scheduling policy has to be changed to maintain efficient vectors while keeping an optimal level of concurrency. The model has complex dynamics requiring tuning the thresholds to switch between the normal regime and special modes, i.e. prioritizing events to allow flushing memory, adding new events in the transport pipeline to boost locality,

dynamically adjusting the particle vector size or switching between vector to single track mode when vectorization causes only overhead. This work requires a comprehensive study for optimizing these parameters to make the behaviour of the scheduler self-adapting, presenting here its initial results.

Event published at:

IOPScience.iop.org - 16th International workshop on Advanced Computing and Analysis Techniques in physics research (ACAT, Prague, Czech Republic)

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