
Portable Monte Carlo Transport Performance Evaluation in the PATMOS Prototype

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A heterogeneous offload version of Monte Carlo neutron transport has been developed in the framework of PATMOS prototype via several programming models (OpenMP thread, OpenMP offload, OpenACC and CUDA). Two algorithms are implemented, including both history-based method and pseudo event-based method. A performance evaluation has been carried out with a representative benchmark, slabAllNuclides. Numerical results illustrate the promising gain in performance for our heterogeneous offload MC code. These results demonstrate that pseudo event-based approach outperforms history-based approach significantly. Furthermore, by using pseudo event-based method, the OpenACC version is competitive enough, obtaining at least 71% performance comparing to the CUDA version, wherein the OpenMP offload version renders low performance for both approaches.

Keywords: Monte Carlo transport, history-based method, pseudo event-based method, OpenMP thread, OpenMP offload, OpenACC, CUDA.