

Evaluation of likelihood functions on CPU and GPU devices

Thursday, 8 September 2011 16:10 (25 minutes)

In this work we present the parallel implementations of an algorithm used to evaluate the likelihood function of the data analysis. The implementations run on CPU and GPU, respectively, and both devices cooperatively (hybrid). Therefore the execution of the algorithm can take full advantage from users commodity systems, like desktops and laptops, using entirely the hardware at disposal. CPU and GPU implementations are based on OpenMP and OpenCL, respectively. For the hybrid case, we implemented a scheduler of the tasks so that the workload can be split and balanced in the two devices. Initially the scheduler determines the workloads for each device, so that the corresponding execution times are balanced. From this phase a ratio of the workloads is obtained. Then it starts the likelihood function evaluations, keeping fixed the previously determined ratio of the workloads. We show the results of the scalability when running on CPU. Then we show the comparison of the performance of the GPU implementation on different hardware systems from different vendors, and the performance when running in the hybrid case. The tests are based on likelihood functions from real data analysis carried out in the high energy physics community.

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Session Classification: Thursday 08th - Computing Technology for Physics Research

Track Classification: Track 1: Computing Technology for Physics Research