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TIME: Wednesday, 2:30 PM, Apr. 03, 2013   LOCATION: A601 NAOC

GPU Accelerated Gravitational Wave Discovery

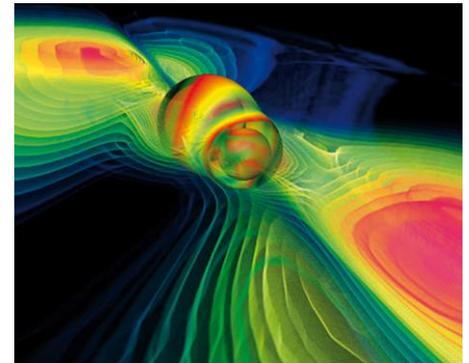### Dr. Zhihui Du (Tsinghua University)

Dr. Zhihui Du is an associate professor in the Department of Computer Science and Technology at Tsinghua University. His principal research interests lie in the High Performance Computing, such as parallelizing and optimizing computational science and engineering applications on (GPU) cluster systems, developing energy efficient scheduling algorithms and energy efficient data migration and layout algorithms for multicore or cluster systems, optimizing the performance of some basic algorithms on GPU, developing resource management algorithms for cloud and grid systems.

Abstract

Gravitational waves (GWs), predicted by Einstein as a part of his General Theory of Relativity (1916) , can provide an entirely new way to study the cosmos because they can carry totally different information about sources than electromagnetic waves (light, radio, etc). Accurate modeling the waveforms and quickly identifying GW signals from noises are critical to detect GWs. Fortunately, Graphics Processing Unit (GPU), a powerful accelerator or co-processor, can help us to address the time-consuming waveform modeling problem and real time data processing problem. In this talk, I will first show that even on a desktop computer equipped with one GPU, we can achieve real time GW data processing (only one second delay) and 50X speedup compared with the CPU implementation. We apply an efficient batched parallel computing model that significantly reduces the number of synchronizations in SPIIR (Summed Parallel Infinite Impulse Response) and optimizes the usage of the GPU memory and hardware resource.   Then I will give a brief introduction on our ongoing project of improving the performance of an intermediate mass ratio binary black hole systems simulation MPI program on Tianhe-1A supercomputer to model GW sources (5X speedup is achieved currently). All of the methods can be employed into the direct GWs detection scientific collaboration around the world.

All are welcome! Tea, coffee, biscuits will be served at 2:15 P.M.

You are welcome to nominate speakers to Weimin Yuan (wmy@nao.cas.cn), Mei Zhang (zhangmei@bao.ac.cn), Licai Deng (licai@bao.ac.cn), Xuelei Chen (xuelei@cosmology.bao.ac.cn), Shude Mao (smao@nao.cas.cn)