

Division of Computer Engineering

Distributed Pararell Processing Laboratory



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Refereed academic journal

[nakasato-204-005-01:2017] Yushi; Nomoto Ken'ichi; Maeda Keiichi; Nakasato Naohito; Hachisu Izumi Tanikawa, Ataru; Sato. Does Explosive Nuclear Burning Occur in Tidal Disruption Events of White Dwarfs by Intermediate-mass Black Holes? *Astrophysical Journal*, 839(81), 2017.

We investigate nucleosynthesis in tidal disruption events (TDEs) of white dwarfs (WDs) by intermediate-mass black holes. We consider various types of WDs with different masses and compositions by means of three-dimensional (3D) smoothed particle hydrodynamics (SPH) simulations.

[nakasato-204-005-02:2017] Nakasato; Kensaku Hayashi; Alexander Vazhenin; Stanislav Sedukhin Fumiya, Kono; Naohito. Evaluations of OpenCL-written tsunami simulation on FPGA and comparison with GPU implementation. *Journal of Supercomputing*, 74(6):2727–2775, 2018.

When a tsunami occurred on a sea area, prediction of its arrival time is critical for evacuating people from the coastal area. There are many problems related to tsunami to be solved for reducing negative effects of this serious disaster. Numerical modeling of tsunami wave propagation is a computationally intensive problem which needs to accelerate its calculations by parallel processing. The method of splitting tsunami (MOST) is one of the well-known numerical solvers for tsunami modeling. We have developed a tsunami propagation code based on MOST algorithm and implemented different parallel optimizations for GPU and FPGA. In the latest study, we have the best performance of OpenCL kernel which is implemented tsunami simulation on AMD Radeon 280X GPU. This paper targets on design and evaluation on FPGA using OpenCL. The performance on FPGA design generated automatically by Altera offline compiler follows the results of GPU by several kernel modifications.

Refereed proceedings of an academic conference

[kazuya-m-204-005-01:2017] Idomura Y., Ina T., Mayumi A., Yamada S., Matsumoto K., and Asahi Y. Application of a communication-avoiding generalized minimal residual method to a gyrokinetic five dimensional Eulerian code on many core platforms. In *Proceedings of the 8th Workshop on Latest Advances in Scalable Algorithms for Large-Scale Systems (ScalA '17)*, number 7, page 8 pages. ACM, 11 2017.

Summary of Achievement

None

[nakasato-204-005-03:2017] Nakasato; Kensaku Hayashi; Alexander Vazhenin; Stanislav Sedukhin Fumiya, Kono; Naohito. Performance Evaluation of Tsunami Simulation Using OpenCL on GPU and FPGA. In *2017 IEEE 11th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSoc)*, pages 106–113, 2017.

Simulation of tsunami, a series of waves caused by submarine earthquake, is strongly demanded to forecast its damages for an emergency evacuation order. To carry out fast but accurate simulation with unstable power supplied after a major earthquake, we need high-speed but low-power computing machines. Although GPUs are capable of high-performance computing, their power consumption is also high.

Advisor for undergraduate research and graduate research

[nakasato-204-005-04:2017] Masaya Kobayashi. Master Thesis: Approximation of Riemann Problem Using Neural Networks, University of Aizu, 2018.

Thesis Advisor: N. Nakasato

[nakasato-204-005-05:2017] Nao Yamauchi. Graduation Thesis: Parallel Computing of Monte-Carlo, University of Aizu, 2018.

Thesis Advisor: N. Nakasato

[nakasato-204-005-06:2017] Ryosuke Kobayashi. Graduation Thesis: Studies on Acceleration of N-body Problem, University of Aizu, 2018.

Thesis Advisor: N. Nakasato