An accelerating method of genetic algorithms by the use of GPU computation

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1. **Introduction** Genetic Algorithms (GAs) are well-known to be an effective but computationally-expensive approach to optimization problems which are difficult to find good solutions, due to the high dimensional search space or the complex shape of fitness landscape. In order to accelerate the GA computation, GPU (Graphics Processing Units), a device specialized for graphics applications, has attracted much research interest in recent years. In this paper, we propose a new implementation method of GAs by the use of GPU with data parallelization.
2. **Experiments** The proposed implementation method of GAs is illustrated as in Fig.1. An individual is allocated to a Streaming Multiprocessor (SM) (which is called task parallelization) and its genetic data are allocated to Streaming Processors (SPs) (which is called data parallelization), while some of related work[1,2] adopt the strategy of allocating a subpopulation to a SM.
3. **Experimental Results** Tab.1 shows the processing times for Hypersphere and Griewank functions. The proposed implementation method generated 7.6～18.4 times faster results than those of a CPU implementation.

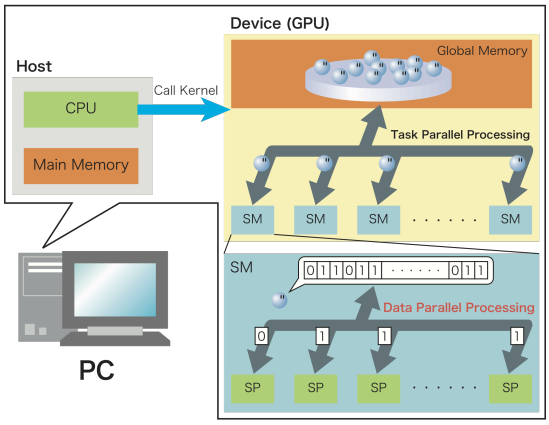

Fig.1 An overview of the implementation method with data parallelization

References

1. Tsutsui, S. and Fujimoto, N. (2010) "An Analytical Study of GPU Computation for Solving QAPs by Parallel Evolutionary Computation with Independent Run", Proceedings of IEEE World Congress on Computational Intelligence (WCCI 2010), pp.889–896.
2. Pospichal, P. and Jaros, J. (2009) "GPU-based Acceleration of the Genetic Algorithm", Proceedings of the GECCO 2009 Workshop on Computational Intelligence on Consumer Games and Graphic Hardware (CIGPU-2009).

Table.1 The experimental results.

Dimensions	Function	Processing Time (sec)		Speedup Ratio
		CPU	GPU	
32	Hypersphere	8.49	1.11	7.64
	Griewank	10.32	1.13	9.10
128	Hypersphere	66.15	4.29	15.43
	Griewank	88.74	4.38	18.43