Title: Parallel Self-Adaptive Evolutionary Optimization Framework on GPU

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Keywords: optimization, evolutionary computation, self-adaptive, parallel computing, graphics processing unit, GPU

Context
Evolutionary optimization algorithms, inspired by the natural evolution process, have demonstrated strong efficacy for solving complex real-world optimization problems. However, in practice, users have to select one algorithm out of numerous candidates and carefully set its corresponding operators and parameters, which is quite time-consuming. Furthermore, even the chosen algorithm with the specified operators and parameters can not guarantee consistent competence at different searching stages. On the other hand, computation time of evolutionary optimization algorithms mainly depends on computational cost of solution evaluation. Recent years have seen many self-adaptive evolutionary optimization algorithms, which can continuously adjust the applied operators and parameters during the course of search using the accumulated searching experience. Meanwhile, the emerging parallel evolutionary algorithms can dramatically reduce computation time by evaluating candidate solutions in parallel. Nowadays, common personal computers can already support high-performance parallel computing via the general-purpose computing graphics processing unit (GPU). Therefore, a parallel self-adaptive evolutionary optimization framework on GPU is highly desirable.

Objectives
The goals of this internship are:
- To survey and analyze existing self-adaptive evolutionary optimization algorithms and parallel evolutionary optimization algorithms.
- To develop a parallel self-adaptive evolutionary optimization framework on GPU.
- To instantiate the developed framework in the context of specific evolutionary optimization algorithms, and make the performance comparison with the state-of-the-arts.

Skills
The candidate is expected to have good background in computer engineering. The required knowledge includes parallel computing and hardware related programming. Knowledge or experience about evolutionary optimization algorithms is preferred but not necessary. The applicant should have good English-language reading, writing and oral communication skills. As regards to software development, C/C++ and Matlab languages are preferred.

References:
