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Comparison of Parallel CUDA and OpenMP Implementations of Memetic Algorithms for Solving Optimization Problems

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Abstract : Memetic algorithms (MAs) are useful for solving optimization problems. It is quite difficult to search the search space of the optimization problem with large dimensions. There is a challenge to use all the cores of the system. In this study, a sequential implementation of the memetic algorithm is converted into a concurrent version, which is executed on the cores of both CPU and GPU. For this reason, CUDA and OpenMP libraries are operated on the parallel algorithm to make a concurrent execution on CPU and GPU, respectively. The aim of this study is to compare CPU and GPU implementation of the memetic algorithm. For this purpose, fourteen benchmark functions are selected as test problems. The obtained results indicate that our approach leads to speedups up to five thousand times higher compared to one CPU thread while maintaining a reasonable results quality. This clearly shows that GPUs have the potential to acceleration of MAs and allow them to solve much more complex tasks.

Keywords : memetic algorithm, CUDA, GPU-based memetic algorithm, open multi processing, multimodal functions, unimodal functions, non-linear optimization problems
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