

GPU based Local Search for the DCVRP

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The capacitated vehicle routing problem is a well-known and studied problem. Due to its complexity, metaheuristics are nowadays the most successful tools in solving VRP instances in practice. Local Search is an essential part of most metaheuristics and it is embarrassingly parallel. Exploiting this parallelism will thus naturally lead to improved performance. There exists a variety of papers on parallelization on the CPU. In recent years the graphic unit processor, or GPU, became more general and thus interesting for non-graphic use. The GPU is a very powerful, intrinsic parallel machine which employs the idea of data parallelism. This means it performs the same task on a lot of data. Local search offers such kind of data parallelism. We have a large neighborhood with a high number of moves, which all have to be evaluated with respect to the same criteria and objectives. Earlier studies of using the GPU for local search have shown the potential of this approach. However, a thorough investigation of how well the local search process can be adapted to the specific requirements of the GPU was lacking so far. It recently has become widely accepted that the GPU is fast and powerful. The real problem of using the GPU is therefore the question of how well one can change the algorithm at hand to fit the GPU as best as possible. In this talk we will present our adaptation of local search to the GPU. In particular we show how we managed to incrementally improve the implementation to achieve high performance.