Speedup Breadth-First Search by Graph Ordering

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Abstract : Breadth-First Search(BFS) is a core graph algorithm that is widely used for graph analysis. As it is frequently used in many graph applications, improve the BFS performance is essential. In this paper, we present a graph ordering method that could reorder the graph nodes to achieve better data locality, thus, improving the BFS performance. Our method is based on an observation that the sibling relationships will dominate the cache access pattern during the BFS traversal. Therefore, we propose a frequency-based model to construct the graph order. First, we optimize the graph order according to the nodes' visit frequency. Nodes with high visit frequency will be processed in priority. Second, we try to maximize the child nodes overlap layer by layer. As it is proved to be NP-hard, we propose a heuristic method that could greatly reduce the preprocessing overheads. We conduct extensive experiments on 16 real-world datasets. The result shows that our method could achieve comparable performance with the state-of-the-art methods while the graph ordering overheads are only about 1/15.

Keywords : breadth-first search, BFS, graph ordering, graph algorithm

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