

Space-Economical Depth-First Search

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Joint work with Amr Elmasry and Frank Kammer

As part of a wider investigation of space-bounded RAM computations, we consider the special problem of depth-first search (DFS) on a RAM with a read-only input, a small working memory and a write-only output. The usual recursive DFS algorithm needs $\Theta(n \log n)$ bits of stack memory and $O(n + m)$ time to process an input graph with n vertices and m edges. It will be shown how to reduce the number of bits of working memory needed to $O(n \log \log n)$ while preserving a linear running time. Alternatively, $O(n)$ bits suffice if one accepts a running time of $O((n + m) \log \log n)$, and a tradeoff between these two extremes is possible. The latter result depends on a dynamic dictionary that will also be sketched.