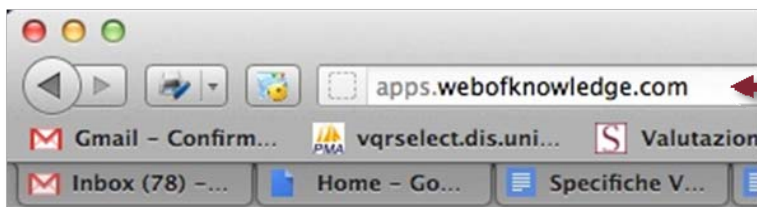




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Source: JOURNAL OF THE ACM Volume: 51 Issue: 6 Pages: 968-992 DOI: 10.1145/1039488.1039492 Published: NOV 2004
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A new approach to dynamic all pairs shortest paths

Author(s): Demetrescu, C (Demetrescu, C); Italiano, GF (Italiano, GF)

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Abstract: We study novel combinatorial properties of graphs that allow us to devise a completely new approach to dynamic all pairs shortest paths problems. Our approach yields a fully dynamic algorithm for general directed graphs with non-negative real-valued edge weights that supports any sequence of operations in $O(n^2 \log(3) n)$ amortized time per update and unit worst-case time per distance query, where n is the number of vertices. We can also report shortest paths in optimal worst-case time. These bounds improve substantially over previous results and solve a long-standing open problem. Our algorithm is deterministic, uses simple data structures, and appears to be very fast in practice.

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