TU Clausthal

Bachelor-, Master- und Doktorandenseminar
des Instituts für Informatik

Using graph databases for computing pareto-optimal paths in time-dependent graphs: A performance comparison

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We are using technology to accomplish different tasks in all aspects of our lives and almost every section of our economy depends on it. Graph databases have recently emerged as a novel technology that offer new opportunities for processing highly intra-connected data. In this thesis, we want to investigate the potential of graph databases to make graph algorithms more scalable in the face of big or complex data sets. Graphs and graph algorithms play a fundamental role in many parts of computer science, and have many applications in areas such as transportation, social science, or medicine. Various algorithms have been proposed to find optimal paths in a graph. Some of them consider time-dependent graphs to account for dynamic environments. The basis of our investigation is a recently published algorithm for "Finding optimal paths in time-dependent graph with time constraint". Firstly, we adapt this algorithm to be used with a graph database backend. Secondly, we extend the algorithm to compute Pareto-optimal paths. While most algorithms aim to find the shortest path or a path with minimal cost, many applications require us to consider time and cost simultaneously, and to compute paths that are optimal in time and cost. The goal of our work is to develop a prototype for comparing the performance of the algorithm with and without a graph database. Therefore we implement exactly the same algorithm with pure Java objects. For an experimental evaluation, we develop a random graph generator and analyze the running time of the both implementations. Eventually, we conduct a thorough performance comparison of both implementations through tests with different datasets.

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