

Hub Labels in Databases: Shortest Paths for the Masses

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We introduce HLDB, the first practical system that can answer exact spatial queries on continental road networks entirely within a database. HLDB is based on hub labels (HL), the fastest point-to-point algorithm for road networks, and its queries are implemented (quite naturally) in standard SQL. Within the database, HLDB can answer exact distance queries and retrieve full shortest-path descriptions in real time, even on networks with tens of millions of vertices. Moreover, the basic algorithm can be extended in a natural way (still in pure SQL) to answer much more sophisticated queries, such as finding the ten closest fast-food restaurants or minimizing the detour for stopping at a gas station on the way home. By taking advantage of special properties of HLDB (instead of using a distance oracle as a black box), even these sophisticated queries can be answered in real time. As databases are external memory by design, so is HLDB.

Joint work with Ittai Abraham, Daniel Delling, and Renato Werneck.