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Master's Independent Study Module Datenbanktechnologie Topic: Extending D-tree for connectivity queries on graphs with large diameters.

Answering connectivity queries is fundamental for fully dynamic graphs where edges are inserted and deleted. D-tree [1] scales up to billion-edge graphs with small diameters and answers connectivity queries efficiently. However, the maintenance and query performances of D-trees degenerate on graphs with large diameters, e.g. road networks.

The goal of this independent study is to improve the maintenance and query performances for D-trees on graphs with large diameters.

Tasks

- Task 1: Literature Review
 - Study the research paper [1].
- Task 2: Run experiments on Open Street Map (OSM) data
 - Download and process OSM data https://planet.osm.ch/.
 - Run D-tree [1] and HK algorithm [2] on processed OSM data.
 - Report the performance of updates and queries.
- Task 3: Extend D-tree
 - Improve the maintenance and query performances of D-trees on OSM data with the given technique.
- Task 4: Summarize technical results in a report

References



- Q. Chen, O. Lachish, S. Helmer, and M. H. Böhlen. Dynamic spanning trees for connectivity queries on fully-dynamic undirected graphs (extended version). *CoRR*, abs/2207.06887, 2022.
- [2] M. R. Henzinger and V. King. Randomized fully /dynamic graph algorithms with polylogarithmic time per operation. *J. ACM*, 46(4):502–516, 1999.

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