Exercise Sheet 9: Property Graph and Cypher

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Exercise 9.1. A Hamiltonian cycle in a directed graph is a directed cycle that visits each vertex exactly once. Show that for every $k \geq 1$, there is a SPARQL query that finds a Hamiltonian cycle in the `eg:edge` predicate of an RDF graph containing exactly k vertices.

Is there also a fixed query deciding the existence of Hamiltonian cycles in an RDF graph?

Exercise 9.2. Download and install Neo4j[1], or use the Neo4j Sandbox[2].

Use the `:play movies` command to load the movie example data set. Write Cypher queries that find

1. all actors who have co-starred in two movies,
2. for every actor, the length of the shortest path (along any relationship type) connecting this actor to Kevin Bacon,
3. pairs of persons and movies where the person has at least two relationships of distinct relationship types to the movie, and
4. the number of undirected triangles along any relationship type. How often is each triangle counted?

Exercise 9.3. Add five nodes a, b, c, d, e to your database. Connect them into a 5-clique using `:EDGE` relationships.

Write a Cypher query that finds the number of distinct paths of length at most $5, 6, \ldots$ from a to b. What is the maximal length for which the query does not time out?

Hint: Use CREATE[3] clauses to add data to your database.

[1] https://neo4j.com/download/

[2] https://neo4j.com/sandbox-v2/

[3] https://neo4j.com/docs/cypher-manual/current/clauses/create/