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Cypher query optimisation - Utilising known properties of nodes



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Setup:



Neo4j and Cypher version 2.2.0. I'm querying Neo4j as an in-memory instance in Eclipse created TestGraphDatabaseFactory().newImpermanentDatabase();. I'm using this approach as it seems faster than the embedded version and I assume it has the same functionality. My graph database is randomly generated programmatically with varying numbers of nodes.



I generate cypher queries automatically. These queries are used to try and identify a single 'target' node. I can limit the possible matches of the queries by using known 'node' properties. I only use a 'name' property in this case. If there is a known name for a node, I can use it to find the node id and use this in the start clause. As well as known names, I also know (for some nodes) if there are names known not to belong to a node. I specify this in the where clause.

The sorts of queries that I am running look like this...

START nvari = node(5)MATCH (target:C5)-[:IN_LOCATION]->(nvara:LOCATION) (nvara:LOCATION)-[:CONNECTED]->(nvarb:LOCATION), (nvara:LOCATION)-[:CONNECTED]->(nvarc:LOCATION), (nvard:LOCATION)-[:CONNECTED]->(nvarc:LOCATION), (nvard:LOCATION)-[:CONNECTED]->(nvare:LOCATION), (nvare:LOCATION)-[:CONNECTED]->(nvarf:LOCATION), (nvarg:LOCATION)-[:CONNECTED]->(nvarf:LOCATION), (nvarg:LOCATION)-[:CONNECTED]->(nvarh:LOCATION), (nvari:C4)-[:IN_LOCATION]->(nvarg:LOCATION), (nvarj:C2)-[:IN_LOCATION]->(nvarg:LOCATION), (nvare:LOCATION)-[:CONNECTED]->(nvark:LOCATION), (nvarm:C3)-[:IN_LOCATION]->(nvarg:LOCATION), WHERE NOT(nvarj.Name IN ['nf']) AND NOT(nvarm.Name IN ['nb','nj']) RETURN DISTINCT target

Another way to think about this (if it helps), is that this is an isomorphism testing problem where we have some information about how nodes in a query and target graph correspond to each other based on restrictions on labels.

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Question:

With regards to optimisation:

- 1. Would it help to include relation variables in the match clause? I took them out because the node variables are sufficient to distinguish between relationships but this might slow it down?
- Should I restructure the match clause to have match/where couples including the where clauses from my previous example first? My expectation is that they can limit possible bindings early on. For example...

START

nvari = node(5)

MATCH

(nvarj:C2)-[:IN_LOCATION]->(nvarg:LOCATION)

WHERE NOT(nvarj.Name IN ['nf'])

MATCH

(nvarm:C3)-[:IN_LOCATION]->(nvarg:LOCATION)

WHERE NOT(nvarm.Name IN ['nb','nj'])

MATCH

(target:C5)-[:IN_LOCATION]->(nvara:LOCATION), (nvara:LOCATION)-[:CONNECTED]-> (nvarb:LOCATION), (nvara:LOCATION), (nvara:LOCATION),

(nvard:LOCATION)-[:CONNECTED]->(nvarc:LOCATION), (nvard:LOCATION)-[:CONNECTED]->(nvare:LOCATION), (nvare:LOCATION)-[:CONNECTED]->(nvarg:LOCATION), (nvarg:LOCATION)-[:CONNECTED]->(nvarf:LOCATION), (nvarg:LOCATION), (nvarg:LOCATION)-[:CONNECTED]->(nvark:LOCATION)

RETURN DISTINCT target

On the side:

3. (Less important but still an interest) If I make each relationship in a match clause an optional match except for relationships containing the target node, would cypher essentially be finding a maximum common sub-graph between the query and the graph data base with the constraint that the MCS contains the target node?

Thanks a lot in advance! I hope I have made my requirements clear but I appreciate that this is not a typical use-case for Neo4j.





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I think querying with node properties is almost always preferable to using relationship
properties (if you had a choice), as that opens up the possibility that indexing can help speed
up the query.



As an aside, I would avoid using the IN operator if the collection of possible values only has a single element. For example, this snippet: NOT(nvarj.Name IN ['nf']), should be (nvarj.Name <> 'nf'). The current versions of Cypher might not use an index for the IN operator.

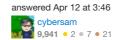
- 2. Restructuring a query to eliminate undesirable bindings earlier is exactly what you*should* be doing.
- First of all, you would need to keep using MATCH for at least the first relationship in your query (which binds target), or else your result would contain a lot of null rows -- not very useful.

But, thinking clearly about this, if all the other relationships were placed in separate <code>OPTIONAl</code> MATCH clauses, you'd be essentially saying that you want a match even if none of the optional matches succeeded. Therefore, the logical equivalent would be:

MATCH (target:C5)-[:IN_LOCATION]->(nvara:LOCATION)
RETURN DISTINCT target

I don't think this is a useful result.

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1. In that case, would chaining multiple inequalities with <> bet better than using NOT with IN? E.g. (nvarj.Name <> 'nf') AND (nvarj.Name <> 'ng') 2. Great, good to know it matches my intuition. I assume this is done in order from the first match declared to the last? 3. Good point. I suppose what I really want is possible valuations for target ordered by how many of the optional match clauses were bound. I suppose I would have to use variables for relationships, return these relationships and create this order manually? – Michael Anslow | Apr 22 at 12:09

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