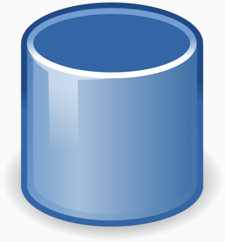
DIG Seminar December 2020

Short overview of my research

Louis Jachiet

Context: Query evaluation

The evaluation problem for databases



Database

$\mathcal{Q}$

Query

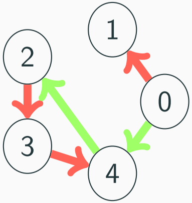
x	y
x_1	y_1
x_2	y_2
x_3	y_3
x_4	y_4
x_5	y_5

Solutions

More expressive queries and more diverse models

Graph databases and/or recursive queries

How to efficiently evaluate queries on graph?



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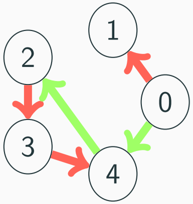


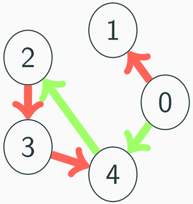
$$\begin{tikzcd}
 & & 1 & \\
2 \arrow[d] & & & \\
 & & & 0 \arrow[uul] \arrow[dl] \\
3 \arrow[r] & & 4 \arrow[uull] &
\end{tikzcd}$$

?x Red/Green$^+$?y

How to efficiently evaluate Regular Path Queries?

Graph databases and/or recursive queries

How to efficiently evaluate queries on graph?



?x Red/Green$^+$?y

How to efficiently evaluate Regular Path Queries?

How to efficiently evaluate relational queries with recursion?

Enumeration algorithms for query evaluation

Idea of enumeration algorithms

Problem

Outputting all solutions to a query might take a very long time.

Idea of enumeration algorithms

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Outputting all solutions to a query might take a very long time.

Solution

Consider solutions that read the input and then output solutions one by one.

A very simple model

Input

A string or a sequence of events or a stream of events:

$$E_1 E_2 \ldots E_k$$

Query

A “string pattern” (typically a regular expression).

Our results

Recent

We can enumerate with linear preprocessing and constant delay when the pattern is regular.

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We can improve the above bound to constant delay.

Our results

New

With a regular expression that “scores” each solution, we can enumerate in score order with linear preprocessing and logarithmic delay.

Future 1

We can improve the above bound to constant delay.

Future 2

We can enumerate with linear preprocessing and constant delay when the pattern is deterministic context-free.

Miscellaneous

Side project on the transdichotomous RAM model

What really takes constant time? Is division allowed? etc.

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Side project on ontologies and reasoning

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Side project on updating strings

We have a string S and updates "change letter to c at position k" what properties we can check efficiently on S after updates.

Future

Develop the reasoning and ontology part.