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Incremental Reasoning on RDFS

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Context

The Semantic Web enables to:
- describe knowledge from data
- leverage implicit knowledge through reasoning algorithms

The main limitations of current reasoning methods are:
- lack of scalability for large datasets
- inability to reason over knowledge from evolving data

We contribute to solving these problems by introducing Slider, an efficient incremental reasoner.

Main Features

- **Parallel and Scalable Execution**: Each inference rule is mapped to an independent module, receiving intended triples and later distributing them to other modules for further processing.
- **Duplicates Limitation**: Vertical partitioning [1] and multiple indexing limit the production of duplicates and avoid unnecessary computation.
- **Data Stream Support**: Slider can handle both dynamic triple streams and static triples sets by employing parallel architecture.
- **Fragment’s Customization**: Slider natively support both RDFS [4] and ρdf [5] fragments, and can be extended to any other fragments.

Architectural Overview

Input Manager Buffers Thread Pool Distributors

General Distributor

Explicit Triples
Implicit Triples

Concurrent Access

Evolving Data

Parallel and Scalable Execution

DEVELOPMENT

Inference time (in ms.)

Slider
OWLIM

10.68% improvement for ρdf

36.08% improvement for RDFS

71.47% improvement in average

Experiments

- Comparison with OWLIM-SE [2]
- Inference on both RDFS and ρdf
- 13 different ontologies
  - 5 generated with BSBM [3]
  - 2 from real-word datasets
  - 6 subClassOf ontologies
- 106.86% improvement for ρdf
- 36.08% improvement for RDFS
- 71.47% improvement in average

Future Work

- Implementation of more complex inference rules, to provide reasoning over more complex fragments.
- Just-in-time optimisations of the rules execution’s scheduling.
- Use of previous runs informations to adapt and be more reactive.

Source Code and Demo

The source code is available here: https://github.com/juleschevalier/slider
A demo can be found here: http://demo-satin.telecom-st-etienne.fr/slider/

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References