Experimental Comparison of SPARQL+ASP Reasoning

Setup and Experiments

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Systems

We compared 4 different systems. The files for each experiment are stored in the corresponding folder.

- bbox: loosely coupled system in which a SPARQL query is executed by a SPARQL reasoner, and then an ASP solver is used to process the output of the SPARQL query
- clingo-python: clingo with Python support, allows one to embed SPARQL queries in the ASP code
- dlvhex2: tightly coupled system. SPARQL queries are embedded in ASP code
- hexlite: tightly coupled system. SPARQL queries are embedded in ASP code

The 4 systems were compared over a single SPARQL+ASP query. The query was run over 4 ontologies of growing size.

Ontologies and Experiments

The ontologies for all experiments are stored in folder ONTOLOGY-SET.

Experiment 1: part1.owl

Experiment 2: part1.owl + part2.owl

Experiment 3: part1.owl + part2.owl + part3.owl

Experiment 4: part1.owl + part2.owl + part3.owl + part4.owl

For hexlite, we created 3 different encodings aimed at leveraging more effectively the computation performed by the solver.

Running bbox

Bbox is a self-contained system that is expected to run on most Windows, Unix, and MacOS systems.

1. Start the system by double-clicking runUI.bat. The batch file is for Windows. Unix and MacOS versions can be easily obtained by inspecting the file
2. Select the ontologies to be used for a given experiment by storing them in folder bbox\system\asklab\ui\ONTOLOGY. Bbox will use **all** ontologies stored in this folder, so make sure to remove any ontologies that should not be used
3. The SPARQL query is stored in file bbox\system\asklab\ui\dump.sparql. There is no need to modify this file for these experiments
4. Paste the content of file bbox\ADHOC.lp in the “ASP Query” box

5. Select clingo as the solver using the drop-down list
6. Run the experiment by clicking “Run Query”
7. The output will be displayed in the “Result” box

Note: it is possible to run another experiment on a different set of ontologies by replacing the files in folder bbox\system\asklab\ui\ONTOLOGY. The system reloads the ontologies every time “Run Query” is clicked.

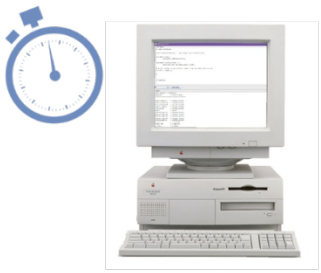
Running clingo-python, dlvhex2, hexlite

1. Copy the selected OWL files in the experiment’s folder
2. Execute the logic program via its solver
3. The output will be displayed to the console

Note: we have used the latest versions of clingo, dlvhex2 and hexlite as of April 2019. The version of Python used for clingo-python was 3.7. Clingo was installed using coda.

Results

The results of our experiments are summarized below. They were obtained on an entry-level laptop running a virtual machine.



	Black-Box (Clingo)	Python-Enabled Clingo	DLVHEX2	HEXLite
Elapsed Time (1 Ontol.)	2.36s	6.917s	2.227s	2.579s
Elapsed Time (2 Ontol.)	2.37s	13.435s	2.875s	3.151s
Elapsed Time (3 Ontol.)	2.89s	19.783s	3.146s	3.209s
Elapsed Time (4 Ontol.)	39.16s	Ontology size not supported	Out of memory at 40m36.94s	Out of memory at 23m6.37s