

ORE 2014 Competition

In addition to workshop paper submissions, ORE 2014 also included a competition in which OWL reasoners were faced with different reasoning tasks. The competition included six disciplines in which reasoners could compete: ontology classification, consistency checking, and realisation each for OWL EL and OWL DL reasoners. The tasks were performed on several large corpora of real-life OWL ontologies obtained from the web, as well as user-submitted ontologies which were found to be challenging for reasoners.

The competition framework is available from GitHub <https://github.com/andreas-steigmiller/ore-2014-competition-framework/>.

Participating Systems

TrOWL: <http://trowl.eu/>
Konclude: <http://www.derivo.de/en/produkte/konclude/>
ELepHant: <https://code.google.com/p/elephant-reasoner/>
TReasoner: <https://code.google.com/p/treasoner/>
Hermit: <http://www.hermit-reasoner.com/>
MORE: <http://code.google.com/p/more-reasoner/>
ELK: <http://code.google.com/p/elk-reasoner/>
jcel: <http://jcel.sourceforge.net/>
FaCT++: <http://code.google.com/p/factplusplus/>
Jfact: <http://sourceforge.net/projects/jfact/>
Chainsaw: <http://sourceforge.net/projects/chainsaw/>

A package containing all the ORE 2014 reasoners is available from <https://zenodo.org/record/11145/> (note that we included a license that only allows usage for reproducing the competition results).

Datasets

The ORE 2014 data set contains overall 16,555 unique ontologies. The set comprises:

- the MOWLCorp (Manchester OWL Corpus), which was obtained through a Web Crawl, Google Custom Search API and user submissions (<http://mowlrepo.cs.manchester.ac.uk/datasets/mowlcorp/>),
- the Oxford Ontology Library (<http://www.cs.ox.ac.uk/isg/ontologies/>),
- a BioPortal (<https://bioportal.bioontology.org/>) Snapshot (June 2014),
- and user submitted ontologies such as BioKB, DMOP, FHKB, USDA, DPC, genomic-CDS, City-Bench.

The ontologies in the data set are binned by profiles. For the competition, the EL profile bin (8,805 ontologies) and the pure DL bin (7,704 DL ontologies)

that do not fall into one of the profiles) were used. Two further bins are obtained from these two bins by considering only the ontologies with an ABox (DL 2,439, EL 1,941 ontologies). The latter two are used for the realisation discipline, whereas the former ones are used for the classification and consistency checking disciplines.

Within these bins, the ontologies are further categorised by size (very small, small, medium, large, very large). A file list is then created by iterating over these categories (skipping categories that are already fully covered). From these file lists, the first X are used for the competition, where X is chosen such that most reasoners are able to finish within a time limit (7 hours for classification and realisation, 3 hours for consistency checking). For classification X is 250 (OWL DL) and 300 (OWL EL), for consistency checking and realisation X is 200 (OWL DL) and 250 (OWL EL).

The whole data set is available for download at <http://zenodo.org/record/10791> and more details about the corpus can be found at <http://mowlrepo.cs.manchester.ac.uk/datasets/ore-2014/>.

Execution

The competition was executed live on July 18th with a PC cluster at the University of Manchester provided by Konstantin Korovin. The machines of the cluster were equipped with an Intel Xeon QuadCore CPU running at 2.33GHz and 12GB RAM, where 10GB could be used by the reasoners. The reasoners were executed on the machines (one reasoner per machine) by running them natively on the used Fedora 12 operating system (64bit) or within a Java Runtime Environment (Java version 1.6). A three minute time limit was given every reasoner for each ontology, where 2.5 min was allowed for reasoning, i.e., 0.5 min could additionally/separately be used for parsing of the ontology and serialization of the result. Expected results were determined by a majority vote between the hash codes of the normalised results of those reasoners that terminated within the time limits. In case of a draw, one hash code was randomly chosen and declared as the expected hash code.

Results

The results of the ORE 2014 live competition are available from <https://zenodo.org/record/11142/>. The competition queries are available from <https://zenodo.org/record/11133/>

The first three reasoners (ranked by number of expected results within the time limit of 3 min per ontology) were given prizes:

OWL EL Consistency Checking:

1. Prize: ELK
2. Prize: Konclude
3. Prize: MORE

OWL DL Consistency Checking:

1. Prize: Konclude
2. Prize: Chainsaw
3. Prize: HermiT

Discipline: OWL EL Consistency (finished)					
Rank	Reasoner	Progress	Score	I	Time
1	ELK		250 / 250	0	566.5 s
2	Konclude		249 / 250	1	412.5 s
3	MORe		244 / 250	6	1,470.7 s
4	Chainsaw		237 / 250	13	441.4 s
5	HermiT		236 / 250	14	607.1 s
6	FaCT++		234 / 250	16	502.2 s
7	jcel		228 / 250	22	2,170.9 s
8	TReasoner		223 / 250	27	2,371.7 s
9	ELepHant		212 / 250	38	142.7 s
10	JFact		168 / 250	50	1,844.6 s

Discipline: OWL DL Consistency (finished)					
Rank	Reasoner	Progress	Score	I	Time
1	Konclude		194 / 200	6	541.0 s
2	Chainsaw		186 / 200	14	521.7 s
3	HermiT		184 / 200	16	1,055.3 s
4	FaCT++		176 / 200	24	1,679.0 s
5	TReasoner		145 / 200	55	1,398.1 s
6	MORe		143 / 200	56	1,286.6 s
7	JFact		88 / 200	82	1,248.8 s

Fig. 1. Results of the consistency checking disciplines (OWL EL & DL)

OWL EL Classification:
 1. Prize: Konclude
 2. Prize: MORe
 3. Prize: ELK

OWL DL Classification:
 1. Prize: Konclude
 2. Prize: HermiT
 3. Prize: MORe

Discipline: OWL EL Classification (finished)					
Rank	Reasoner	Progress	Score	I	Time
1	Konclude		297 / 300	3	659.7 s
2	MORe		292 / 300	8	2,112.8 s
3	ELK		284 / 300	16	1,146.6 s
4	TrOWL		283 / 300	17	2,477.9 s
5	HermiT		271 / 300	29	3,743.2 s
6	FaCT++		241 / 300	59	1,962.7 s
7	JFact		192 / 300	108	3,564.2 s
8	Chainsaw		147 / 300	131	1,559.0 s
9	jcel		114 / 300	134	85.6 s
10	ELepHant		62 / 300	238	164.8 s
11	TReasoner		22 / 300	254	89.4 s

Discipline: OWL DL Classification (finished)					
Rank	Reasoner	Progress	Score	I	Time
1	Konclude		224 / 250	26	1,098.2 s
2	HermiT		181 / 250	69	3,863.3 s
3	MORe		178 / 250	72	1,659.8 s
4	TrOWL		172 / 250	78	2,318.2 s
5	FaCT++		147 / 250	103	943.7 s
6	JFact		102 / 250	148	640.3 s
7	Chainsaw		91 / 250	144	1,020.7 s
8	TReasoner		8 / 250	242	34.1 s

Fig. 2. Results of the classification disciplines (OWL EL & DL)

OWL EL Realisation:
 1. Prize: Konclude
 2. Prize: TrOWL
 3. Prize: FaCT++

OWL DL Realisation:
 1. Prize: Konclude
 2. Prize: FaCT++
 3. Prize: TrOWL

Discipline: OWL EL Realisation (finished)					
Rank	Reasoner	Progress	Score	I	Time
1	Konclude		243 / 250	7	474.5 s
2	TrOWL		226 / 250	24	1,339.2 s
3	FaCT++		221 / 250	29	522.4 s
4	JFact		178 / 250	72	4,836.9 s
5	ELK		157 / 250	93	645.5 s
6	HermiT		121 / 250	129	1,044.9 s
7	Chainsaw		107 / 250	134	1,018.3 s
8	ELepHant		105 / 250	145	21.2 s

Discipline: OWL DL Realisation (finished)					
Rank	Reasoner	Progress	Score	I	Time
1	Konclude		178 / 200	22	866.3 s
2	FaCT++		112 / 200	88	458.5 s
3	TrOWL		106 / 200	94	1,126.7 s
4	HermiT		98 / 200	102	1,421.2 s
5	JFact		63 / 200	137	576.3 s
6	Chainsaw		49 / 200	151	707.4 s

Fig. 3. Results of the realisation disciplines (OWL EL & DL)

The competition was also part of the 1st FLoC Olympic Games 2014 (<http://vs12014.at/olympics/>) together with 13 other competitions. For the Olympic Games each competition could award three Kurt Gödel Medals. For ORE 2014 the reasoners were ranked according to the number of expected results over the number of attempted tasks over all disciplines in which a reasoner participated. The medal winners were:

1. Prize: Konclude (95.5%)
2. Prize: ELK (86.4%)
3. Prize: MORE (85.7%)