

# Inference in Description Logic $\mathcal{ALC}$

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## 1 Inference Procedures

**Ex. 1** — Why inconsistency of an OWL-DL ontology is a problem? What is its consequence?

**Ex. 2** — Show that disjointness of two concepts can be reduced to unsatisfiability of a single concept.

**Ex. 3** — A concept  $C$  is satisfiable w.r.t.  $\mathcal{K}$  iff it is interpreted as a non-empty set in at least one model of  $\mathcal{K}$ . Is it possible to find out that  $C$  is interpreted as a non-empty set in all models of  $\mathcal{K}$ ?

## 2 Tableaux Algorithm for $\mathcal{ALC}$

**Ex. 4** — Decide, whether the  $\mathcal{ALC}$  concept  $\exists hasChild.(Student \sqcap Employee) \sqcap \neg(\exists hasChild.Student \sqcap \exists hasChild.Employee)$  is satisfiable (w.r.t. an empty TBox). Show the run of the tableau algorithm in detail.

**Ex. 5** — Decide, whether the theory/ontology  $\mathcal{K} = (\mathcal{T}, \mathcal{A})$  is consistent. Show the run of the tableau algorithm in detail.

- $\mathcal{T} = \{\exists hasChild \cdot \top \equiv Parent\}$
- $\mathcal{A} = \{hasChild(JOHN, MARY), Woman(MARY)\}$

**Ex. 6** — Decide and show, whether the ontology

$$\mathcal{K}_1 = (\mathcal{T} \cup \{Parent \sqsubseteq \forall hasChild \cdot \neg Woman\}, \mathcal{A})$$

is consistent.

**Ex. 7** — Decide and show, whether the ontology

$$\mathcal{K}_2 = (\mathcal{T} \cup \{Parent \sqsubseteq \exists hasChild \cdot Parent\}, \mathcal{A})$$

is consistent.

### 3 Practically in Protégé

**Ex. 8** — Model the previous ontology in Protégé and check (using the Pellet/HermiT reasoner) whether your solutions in the previous tasks were correct.

**Ex. 9** — Adjust the Pizza ontology introduced in the previous seminar, so that the class *IceCream* and *CheesyVegetableTopping* become satisfiable.

**Ex. 10** — Explain, why the Pizza ontology is consistent, although it contains unsatisfiable classes.