

Constraintsystem Feature Terms (FT)

Exercise 1. Implementation of a feature term solver

- Implement the FT solver from the lecture slides.
- Extend your solver with negation, according to the slides.
- Test your solver with three meaningful examples (of your choice) and document the result.
- The solver from the slides relies on the built-in equality constraint =. Write a solver that does without the built-in equality and uses the feature term equality constraint instead, i.e. that implements the axioms of “eq”. (Make sure to model the interaction between “eq” and the other constraints!) Test your implementation with your examples from above and document the results.

Constraintsystem Description Logic (DL)

Download the constraint solver `dl-ex6.pl` and make yourself familiar with the implementation:

- Concept/Role definitions are implemented as built-in constraints.
- `::` is used both for concept and role membership (by abuse of notation).

Exercise 2 (Warmup – Hybrid¹ Family).

Add the following T-Box to the constraint solver.

```
hybrid isa man and woman.
```

```
parentStandard isa some child is man and some child is woman.
```

```
parentHybrid isa some child is hybrid.
```

Test with the following goals and explain the answers:

```
X::parentStandard and nota parentHybrid.
```

```
X::parentStandard and nota parentHybrid, labeling.
```

Exercise 3 (Moving furniture). Consider the following scenario.

- Furniture are goods.
 - Vehicles can use traffic routes.
 - Transporters are vehicles that can transport goods.
 - Automobiles are vehicles that are driven by a motor and that use roads (only).
 - Trucks are automobiles that can transport goods.
 - Trains are vehicles that use rails (only).
 - Freight trains are trains that can transport goods.
 - Furniture trucks are trucks to transport furniture (only).
 - Bulli is a furniture truck.
 - Bulli transports G112 and G235.
 - G112 and G235 are goods.
 - Z521 is a train.
 - Z521 transports bananas and coals.
- (a) Identify the primitive and the compound concepts. Indentify the roles. Separate T-Box from A-Box knowledge.
 - (b) Add the T-Box as Prolog facts to the constraint solver. Test the T-Box with queries like `X::transporter`.
 - (c) Add the A-Box as CHR-constraints. Explain the answer to the goal `z521::train` (use labeling.). Adapt (if necessary) your T-Box, s.t., `z521` does not use the road!

¹The correct biological term is hermaphrodite.

- (d) Explain the answers when unfolding the following concept terms. Use labeling.
- (1) Train and not a transporter.
 - (2) Freight train and not a vehicle. (Hint: Is the solver complete?)