

assignment #11 (winter term 2005)  
solutions will be presented Tuesday, 31-Jan-2006, 2 PM, o27/2203  
<http://www.informatik.uni-ulm.de/pm/index.php?id=112>

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### Constraintsystem Description Logic

Download the constraint solver `u11-d1.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 1 (Warmup – Hybrid<sup>1</sup> 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 2 (Solver Extension). Extend the solver with

- concept inclusion,  

```
operator(1200,xfx,sub).  
I::C ==> (C sub T) | I::T.  
I::nota C ==> (T sub C) | I::nota T.
```
- features (`operator(100,fx,feature)`), and
- distinct concepts (`operator(100,fx,distinct)`).

Give a sample query and answer for each extension.

#### 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. Identify 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!
- (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?)

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<sup>1</sup>The correct biological term is hermaphrodite.