Logics, Categories, and Colimits for Artificial Intelligence

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Exercise Sheet 11

Due: January 23, 2009

Exercise 11.1 (Normal forms of structured specifications)

(a) Complete the proof that in a semi-exact institution, building normal forms preserves the model class (the cases of translation and hiding are missing).

(b) Does the result hold for weakly semi-exact institutions as well?

Exercise 11.2 (Subsorts)

Consider the following specification:

```
spec sp1 =
  sorts Man, Woman < Person
  sort Hybrid < Man
  sort Hybrid < Woman
end

spec sp2 =
  sorts Man, Woman < Person
  sorts Female     < Person
  forall p: Person
  . p in Woman =>     p in Female
  . p in Man   => not p in Female
end

spec sp = {sp1 hide Hybrid} and {sp2 hide Female} end
```

(a) Use the semantics of structured specifications to argue that the model class of `sp` is empty (i.e., `sp` is inconsistent). Use the proof calculus for structured specifications to derive `sp` $\vdash \bot$.

(b) Compute the normal form and prove that `sp` is inconsistent.

(c) Try out HETS. Extend the above specification by:

```
spec spimplies = sp
then %implies
  . false
end
```

and then use "`Edit -> Proofs -> TheoremHideShift`" to compute the normal form.

The exercise sheets may and should be worked on in groups of two (2) students. Please write both names on your solution.