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Fachrichtung 6.2 – Informatik
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8th Theoretical Assignment in Artificial Intelligence (WS 2006/2007)

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Exercise 8.1
Give one analogue and one symbolic (e.g. Fregean) representation for a maze. How are these representations related to the different algorithms for finding a path through the maze?

Exercise 8.2
Let *Man, Woman, Male, Female, Human* be concept names, and let *has-child, is-brother-of, is-sister-of, is-married-to* be role names.
 1. Construct a TBox in which the concepts *Mother, Father, Grandmother, Grandfather, Aunt, Uncle, Niece, Nephew, Mother of at least three sons, Father of at most two daughters* are defined.
 2. Expand the definition of *Grandmother*!
 3. Expand the definition of *Niece*!
 4. Draw the subsumption hierarchy!

Exercise 8.3
Let $\mathcal{A}$ be the ABox that contains the following assertions:

- likes(Marc, Lydia)
- is-flatmate-of(Lydia, Phoebe)
- single(Lydia)
- likes(Marc, Phoebe)
- $\neg$ single(Phoebe)
- is-flatmate-of(Phoebe, Kate)
- $\neg$ single(Kate)

1. Indicate $(\exists\text{is-flatmate-of}.\neg\text{single})^{\mathcal{I}}$ where $\mathcal{I}$ is the interpretation function over the domain {Marc, Lydia, Phoebe, Kate}!
2. Indicate $(\forall\text{likes}.\exists\text{is-flatmate-of}.\neg\text{single})^{\mathcal{I}}$ where $\mathcal{I}$ is the interpretation function over the domain {Marc, Lydia, Phoebe, Kate}!
3. Indicate $(\forall\text{is-flatmate-of}.\neg\text{single})^{\mathcal{I}}$ where $\mathcal{I}$ is the interpretation function over the domain {Marc, Lydia, Phoebe, Kate}!
4. Is Marc an instance of the concept $\exists\text{likes}.(\text{single} \sqcap \exists\text{is-flatmate-of}.\neg\text{single})$ with respect to $\mathcal{A}$?
5. Is Marc an instance of the concept $\exists\text{likes}.(\exists\text{is-flatmate-of}.(\forall\text{is-flatmate-of}.\neg\text{single}))$ with respect to $\mathcal{A}$?

Exercise 8.4

Consider the following (politically incorrect) TBox $\mathcal{T}$ with concepts *Human, Man, Woman* and *Male*, and the role name *married-to*:

- Man $\equiv$ Human $\sqcap$ Male
- Woman $\equiv$ $\forall$ married-to . Man

Also consider the ABox $\mathcal{A}$:

- Human(Claus)
- Male(Claus)
- Woman(Grete)
- Woman(Susan)
- married-to(Grete,Claus)

Is the ABox $\mathcal{A}$ consistent w.r.t. $\mathcal{T}$? In any case, justify your findings!

The whole team of the AI Lecture wishes you an enjoyable Christmas time!