Formale Semantik
05. Prädikatenlogik

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stets aktuelle Fassungen: `https://github.com/rsling/VL-Deutsche-Syntax`

Inhalt

Why predicate calculus?

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- compositionality resticted to level of connected propositional atoms

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- plus the connectives of SL

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- syntax for connectives from SL
- for any wff ϕ and any variable x, $(\exists x)\phi$ and $(\forall x)\phi$ are wff's

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- s.t. $[\![P(m)]\!]^{\mathcal{M}_1} = [\![P]\!]^{\mathcal{M}_1}([\![m)]\!]^{\mathcal{M}_1}) = 1$ iff $[\![m]\!]^{\mathcal{M}_1} \in [\![P]\!]^{\mathcal{M}_1}$

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- check outside-in (unambiguous scoping)

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  - if $\exists\forall$ is true, $\forall\exists$ follows

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- $\neg$ negates the wff, not the q:
  $^{*}(\neg\forall x)Px$ but $\neg(\forall x)Px$

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- $\Leftrightarrow (\exists x)\neg Px$

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- why?

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- i.e.: Watch your variables!

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- *Heiko Laux owns Kanzleramt records and does not like any Gigolo artist.*
- *Some humans are neither talkmasters nor do they own Kanzleramt records.*

Natural deduction in PC

Universal instantiation ($-\forall$) and generalization ($+\forall$)

- $(\forall x)Px \rightarrow Pa$

Universal instantiation ($-\forall$) and generalization ($+\forall$)

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- hence: When you apply EI, always use fresh constants!

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- (1) Herr Keydana drives a Golf. (2) Anything that drives a golf is human or a complex program simulating an artificial neural net. (3) There are no programs s.a.a.n.n. which are complex enough to drive a Golf.

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- $(\exists x)Hx$

The proof

(1)	Dk	
(2)	$(\forall x)(Dx \rightarrow Hx \vee Px)$	
(3)	$\neg(\exists x)(Px \wedge Dx)$	
(4)	$(\forall x)\neg(Px \wedge Dx)$	3,QN
(5)	$(\forall x)(\neg Px \vee \neg Dx)$	4,DeM
(6)	$(\forall x)(Dx \rightarrow \neg Px)$	5,Comm,Impl
(7)	$Dk \rightarrow \neg Pk$	6,$-\forall$(1)
(8)	$\neg Pk$	1,7,MP
(9)	$Dk \rightarrow Hk \vee Pk$	2,$-\forall$(1)
(10)	$Hk \vee Pk$	1,9,MP
(11)	Hk	8,10,DS
$\therefore$	$(\exists x)Hx$	10,$+\exists$

Literatur I

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