

## Curry-Howardov izomorfizem

Konjunkcija: 
$$\frac{\Gamma \mid A \quad \Gamma \mid B}{\Gamma \mid A \wedge B}$$

$$\frac{\Gamma \mid A \wedge B}{\Gamma \mid A}$$

$$\frac{\Gamma \mid A \wedge B}{\Gamma \mid B}$$

Kartezijski produkt:

$$\frac{\Gamma \mid a:A \quad \Gamma \mid b:B}{\Gamma \mid (a, b): A \times B}$$

$$\frac{\Gamma \mid p:A \times B}{\Gamma \mid \pi_1(p): A}$$

$$\frac{\Gamma \mid p:A \times B}{\Gamma \mid \pi_2(p): B}$$

Implikacija: 
$$\frac{\Gamma, A \mid B}{\Gamma \mid A \Rightarrow B}$$

$$\frac{\Gamma \mid A \Rightarrow B \quad \Gamma \mid A}{\Gamma \mid B}$$

Funkcijski tip: 
$$\frac{\Gamma, x:A \mid e:B}{\Gamma \mid (\lambda x:A. e): A \rightarrow B}$$

$$\frac{\Gamma \mid f:A \rightarrow B \quad \Gamma \mid a:A}{\Gamma \mid f a : B}$$

Logika izjava A dokaz izjave A	Teorija tipov tip A izraz $e : A$
$A \wedge B$	$A \times B$
$A \Rightarrow B$	$A \rightarrow B$
$A \vee B$	$A + B$
T	1 unit
⊥	0 Empty-set
$\forall$ in $\exists$	??? ... ...

## Odvisni tip

Izjava  $A$

tip  $A$

Množica  $X$

tip  $X$

Predikat  $P: X \rightarrow \{\perp, \top\}$

Odvisni tip:  
" " "

$P: X \rightarrow \text{Prop}$

$P: X \rightarrow \text{Type}$

" Naj bo  $x \in [a, b]$  in .... "

Družina tipov

$\{t \in \mathbb{R} \mid a \leq t \leq b\}$

množica/tip odvisna od  
vrednosti  $a$  in  $b$

$[, ]: \mathbb{R} \times \mathbb{R} \rightarrow \text{Set}$

$\{A_i\}_{i \in I}$

$A: I \rightarrow \text{Set}$

" Naj bo  $l$  seznam dolžine  $n$  "

$\text{list}: \mathbb{N} \rightarrow \text{Type}$

$\text{list}(7)$

**Produkt**

Množice:  $I$  množica

$A : I \rightarrow \text{Set}$   
 $i \mapsto A_i$

Produkt  $\prod_{i \in I} A_i$

Element  $f \in \prod_{i \in I} A_i$

funkcija: za svak  $i \in I$ ,  $f(i) \in A_i$   
izbire

Tipi:  $\frac{\Gamma, x:A \mid B \text{ tip}}{\Gamma \mid \prod_{x:A} B \text{ tip}}$

Ovisna funkcija

$\Gamma \mid \prod_{x:A} B \text{ tip}$

$B$  je kakvo ovisen od  $x$ .  
 ( $x$  se pojavljuje u  $B$ ).

$\Gamma, x:A \mid e : B$

$\Gamma \mid f : \prod_{x:A} B \quad \Gamma \mid a : A$

$\Gamma \mid (\lambda x:A. e) : \prod_{x:A} B$

$\Gamma \mid fa : B\{a/x\}$   
 $\uparrow$  zamenjuje  $x$  za  $a$ -jem.

**Produkt in univerzalni kvantifikator**

$$\frac{\Gamma, x:A \mid \Delta \vdash P}{\Gamma \mid \Delta \vdash \forall x \in A. P}$$



$\frac{\Gamma, x:A \mid B \text{ tip}}{\Gamma \mid \prod_{x:A} B \text{ tip}}$	$\frac{\Gamma, x:A \mid P \text{ prop}}{\Gamma \mid \forall x:A. P \text{ prop}}$
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$$\frac{\Gamma, x:A \mid e : B}{\Gamma \mid (\lambda x:A. e) : \prod_{x:A} B}$$

$$\frac{\Gamma \mid \Delta \vdash \forall x:A. P \quad \Gamma \mid \Delta \vdash a:A}{\Gamma \mid \Delta \vdash P\{a/x\}}$$

$$\frac{\Gamma \mid f : \prod_{x:A} B \quad \Gamma \mid a:A}{\Gamma \mid fa : B\{a/x\}}$$

## Vsota in eksistenčni kvantifikator

Družina  $A : I \rightarrow \text{Set}$   
 $\{A_i\}_{i \in I}$

Koprodukt :  $\coprod_{i \in I} A_i = \{(i, x) \mid i \in I, x \in A_i\}$   
 $\uparrow$   
 odvisni par

$$\frac{\Gamma, x:A \mid B \text{ tip}}{\Gamma \mid \sum_{x:A} B \text{ tip}}$$

Coq:  $\text{sig}^T B$   
 $\{x:A \ \& \ B\}$

$\{x \in A \mid \varphi\}$

$$\frac{\Gamma \mid a:A \quad \Gamma \mid b:B\{a/x\}}{\Gamma \mid (a,b) : \sum_{x:A} B}$$

$$\frac{\Gamma \mid \Delta \vdash a:A \quad \Gamma \mid \Delta \vdash P\{a/x\}}{\Gamma \mid \Delta \vdash \exists x:A. P}$$

$$\Gamma \mid P : \sum_{x:A} B$$

$$\Gamma \mid \pi_1(P) : A$$

$$\Gamma \mid P : \sum_{x:A} B$$

$$\Gamma \mid \pi_2(P) : B\{\pi_1(P)/x\}$$

?? ?

" "

$$\frac{\Gamma \mid \Delta \vdash \exists x:A. P \quad \Gamma, x:A \mid \Delta, P \vdash Q}{\Gamma \mid \Delta \vdash Q}$$

## Vsota

$$\frac{\Gamma \mid \Delta \vdash \exists x:A. P \quad \Gamma, x:A \mid \Delta, P \vdash Q}{\Gamma \mid \Delta \vdash Q}$$

$$\frac{\Gamma \mid p: \sum_{x:A} B \quad \Gamma, x:A, y:\overset{\text{chosen of } x}{\downarrow} B \mid e:C}{\Gamma \mid ( \text{match } p \text{ with } \begin{array}{l} | (x,y) \Rightarrow e \\ \text{end} \end{array} ) : C}$$

$$\Gamma \mid ( \text{match } p \text{ with } \begin{array}{l} | (x,y) \Rightarrow e \\ \text{end} \end{array} ) : C$$

$$\text{Cwg: } (a,b) \dots \text{existT } P \ a \ b$$

$$\uparrow \\ \sum_{x:A} P$$

$$\pi_1(p) \dots \text{projT1 } p$$

$$\pi_2(p) \dots \text{projT2 } p$$

# Fork

