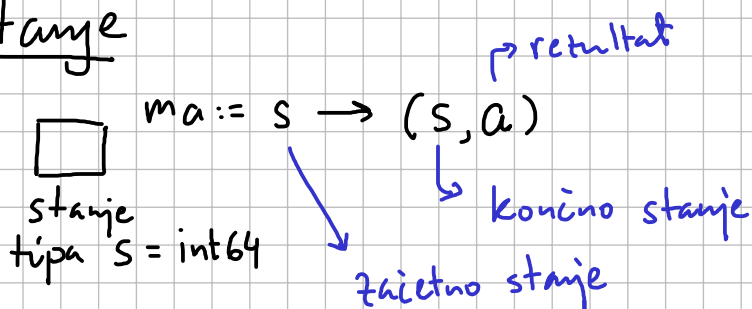


Monade

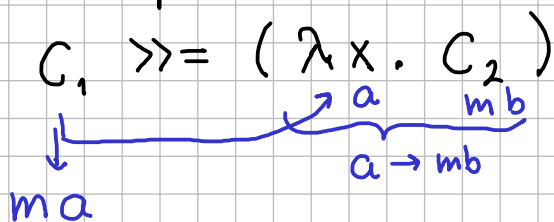
Vhod (input)

$ma = \text{String} \rightarrow a$

Stanje



Kako deluje $\gg=$



$\gg=$ ima tip $ma \rightarrow (a \rightarrow mb) \rightarrow mb$

Nedeterminizem:

$ma = [a]$

seznam a-jev predstavljá možne rezultate izračuna

return $v = [v]$

$C \gg= f = \text{concat}(\text{map } f C)$

"
 $[v_1, \dots, v_n]$

$f v_1 = [w_{11}, \dots, w_{1n_1}]$

$f v_2 = [w_{21}, \dots, w_{2n_2}]$

⋮

$f v_n = [\quad \quad]$

Leva: $\text{return } x \gg= f$
 $[x] \gg= f$
 $\text{Concat } (\text{map } f [x])$
 $\text{Concat } ([f x])$
 $f x$

Desna $C \gg= \text{return}$ $C = [v_1, \dots, v_n]$
 $\text{Concat } (\text{map } \text{return } C)$
 $\text{Concat } ([\text{return } v_1, \dots, \text{return } v_n])$
 $\text{Concat } ([[v_1], \dots, [v_n]])$
 $[v_1, \dots, v_n]$
 C

Kaj je m v "ma" ?
 \downarrow tip rezultatov
 $\underbrace{\hspace{10em}}$ tip izračunov

$m : \text{Type} \rightarrow \text{Type}$ konstruktor tip (type constructor)

Verjetnostno računanje

X množica

Verjetnostni porazdelitev na X

$$\mu : X \rightarrow [0, 1]$$

$\mu(x)$ verjetnost, da
 izračunamo x

$$\sum_{x \in X} \mu(x) = 1$$

pod-porazdelitev

Monada:

~~$$D(X) := X \rightarrow [0, 1]$$~~

izračuni = porazdelitve

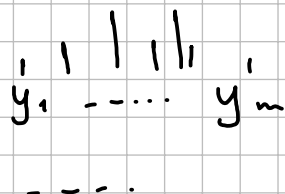
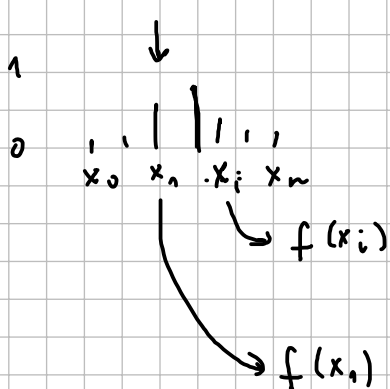
\hookrightarrow omejimo se na končne porazdelitve

$$D(X) := \left\{ \mu: X \rightarrow [0,1] \mid \sum_{x \in X} \mu(x) \leq 1, \right. \\ \left. \{x \in X \mid \mu(x) > 0\} \text{ je konina} \right\}$$

$$\text{return } x := \lambda y: X. \text{ if } x=y \text{ then } 1 \text{ else } 0 \\ = \delta_x \text{ Kroneckerova funkcija}$$

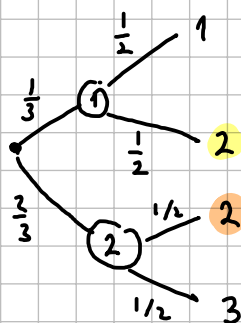
$$\delta_x(y) = \begin{cases} 1 & \text{če } x=y \\ 0 & \text{sicer} \end{cases}$$

$$d \gg= f$$



$$[(1, \frac{1}{3}), (2, \frac{2}{3})] \gg= \lambda x.$$

$$[(x, \frac{1}{2}), (x+1, \frac{1}{2})]$$



$$\Rightarrow [(1, \frac{1}{6}), (2, \frac{1}{6} + \frac{1}{3}), (3, \frac{1}{3})]$$

$$\Downarrow \\ [(1, \frac{1}{6}), (2, \frac{1}{6}), (2, \frac{1}{3}), (3, \frac{1}{3})]$$