

F - Functor

\oplus : Addition

\otimes : (\cdot)

(\cdot) : (\rightarrow)

(Bool, A)

$(\text{Fin } 3, A, A)$

$$F(X) = 1 + X \Rightarrow \text{IN} = \mu(F)$$

$$F_2(A, X) = 1 + A \times X$$

$$\text{Fix}(F)$$

$$\begin{aligned} \text{List } A &= 1 + A \times \text{List } A = \dots \longrightarrow 0 + A^1 \times \text{List } A \\ &= 1 + A \times (1 + A \times \text{List } A) = \dots = \\ &= 1 + A + A \times A + A \times A \times A + \dots = \\ &= 1 + A^1 + A^2 + A^3 + A^4 + \dots \\ &\hookrightarrow 0 + 1 + 2A + 3A^2 + \dots \end{aligned}$$

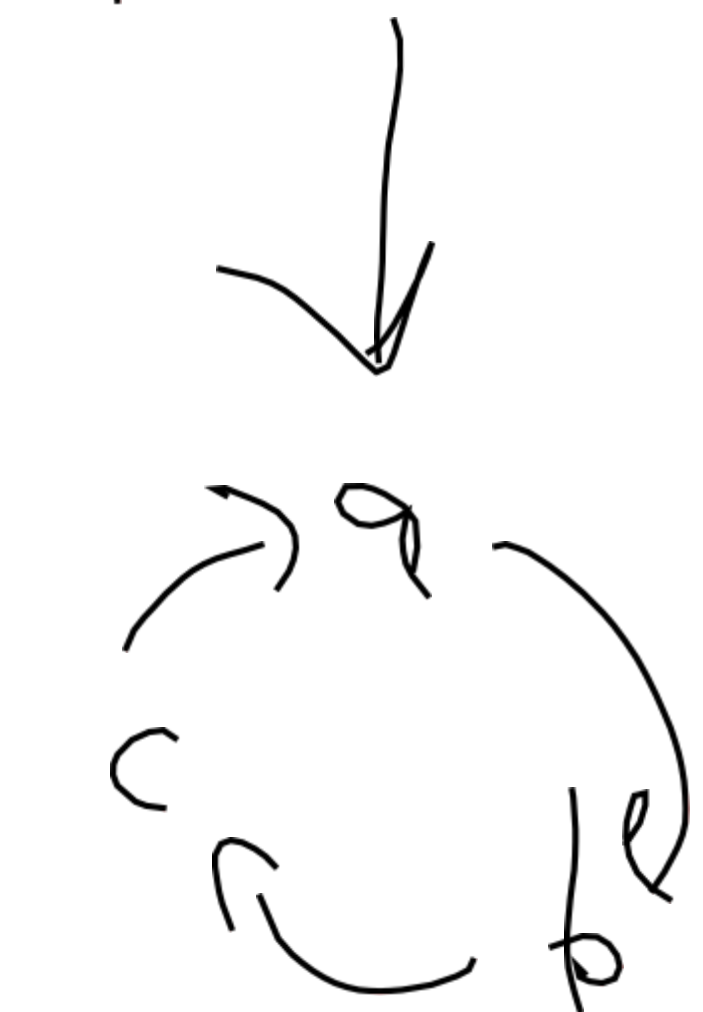
$$\begin{aligned} &+ \text{List } A \times A^1 \times A \\ &\downarrow \\ &\underbrace{\text{List } A}_A + \underbrace{A \times \text{List } A}_{A} \end{aligned}$$

$$\begin{aligned} &[] \quad [- a] \\ &\quad \quad [a -] \quad [a, -] \\ &\quad \quad \quad \underbrace{\quad}_n \quad [a, b, \dots, d] \end{aligned}$$

$$[a/b, c]$$

$$\uparrow \text{den}$$

$$[a, b, c]$$



$$e^x = 1 - x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

$$\frac{X^n}{n!} = \overbrace{X \times X \times \dots \times X}^n$$

$$\begin{aligned} f : \text{Fin } n &\rightarrow \text{Fin } n \\ \wedge g : \text{Fin } n &\rightarrow \text{Fin } n \\ f \circ g &= \text{id} \wedge g \circ f = \text{id} \end{aligned}$$

$$1 + 1 + A^2 + A^3 + \dots$$

$$A + \frac{A^2}{2} + \frac{A^3}{3} + \frac{A^4}{4} + \dots + \frac{A^n}{n}$$

$$\begin{aligned} &\begin{pmatrix} a & b & c \\ c & a & b \\ b & c & a \end{pmatrix} \\ &\begin{pmatrix} b & a & r \\ c & b & a \\ a & c & b \end{pmatrix} \end{aligned}$$

data $\text{CL } A$
 $2 : A \rightarrow \text{CL } A$
 $+$: $\text{CL } A \rightarrow \text{CL } A$
 $0 : \text{CL } A$
 $\text{as } p+q+r = x+(p+r)$
 $\text{id} : 0+x=x$
 $\text{id} : x+p=x$
 $\text{acc } 2q+x=x+2q$

$$2q+x+y = x+yq+y$$

data $\text{CL } A : \text{Set}$
 $\eta : \text{List } A \rightarrow \text{CL } A$
 $\text{all } \eta(x :: xs) = \eta(xs) + (\bar{x})$
 $\eta(xs + yp) = \eta(yp) + xs$

$$\begin{aligned} \eta[a, b, c] &= \eta[b, c, a] \\ \parallel \\ \eta[b, c, a] &= \eta[c, a, b] \end{aligned}$$

data $\text{MS } A : \text{Set}$ where
 $[\cdot] : \text{MS } A$
 $_{-} : A \rightarrow \text{MS } A \rightarrow \text{MS } A$

$$\text{eg: } \begin{aligned} x :: y :: xs &= \\ y :: x :: xs \end{aligned}$$

SET:
 $\text{eq}' : x :: x' :: xs = x' :: xs$

Derivates of containers

Container $(S \triangleleft P)X = \sum (s, s) \cdot (P_s \rightarrow X)$
 $S : \text{Set}$
 $P : S \rightarrow \text{Set}$
 $2(S \triangleleft P) = (s, s) \triangleleft (P_s \times (P_s - 1))$
 $= R(p, p) \cdot \sum (p, p) \cdot p \neq p'$
 $\text{List } A = ((n : \mathbb{N}) \triangleleft \text{Fin } n)A =$
 $\sum (n : \mathbb{N}) \cdot (\text{Fin } n \rightarrow A)$
 $\stackrel{A}{=} 0 + 1 + A + A^2 + \dots$