

Definition and Symbol Index

- $A^{\mathbb{N}}$, infinite sequences of elements of A , 7
- A^{\S} , space of polynomials on a vector space A , 66
- A^{∞} , both finite and infinite sequences of elements of A , 7
- A^* , finite sequences of elements of A , 7, 31
- $\mathcal{L}(A)$, set $\mathcal{P}(A^*)$ of languages over A , 144
- $\mathcal{R}(A)$, set of regular languages over A , 144

- DA**, category of deterministic automata, 101
- DB**, category of deterministic behaviours, 101
- Dcpo**, category of directed complete partial orders, 26, 301
- Grp**, category of groups, 26
- Hilb**, category of Hilbert spaces, 195
- JSL**, the category of join semilattices, 301
- MSL**, the category of meet semilattices, 188, 311, 383
- Mon**, category of monoids, 26
- PreOrd**, category of preorders, 26
- Pred**, category of predicates, 338
- Rel**, category of binary relations, 124
- Sets**, category of sets and functions, 26
- SetsRel**, category of sets and relations, 27
- Sp**, category of topological spaces, 26
- Vect**, category of vector spaces, 66

- Alg**(F), category of F -algebras, 78
- Alg**(F, \mathcal{A}), category of algebras of a functor F that satisfy axioms \mathcal{A} , 406
- CoAlg**(F), category of F -coalgebras, 30
- CoAlg**(F, \mathcal{A}), category of coalgebras of a functor F that satisfy axioms \mathcal{A} , 423
- $\mathcal{EM}(S)$, category of coalgebras for the comonad S , 297
- $\mathcal{EM}(S, \mathcal{A})$, category of Eilenberg–Moore coalgebras of a comonad S that satisfy axioms \mathcal{A} , 423
- $\mathcal{EM}(T)$, category of algebras for the monad T , 296
- $\mathcal{EM}(T, \mathcal{A})$, category of Eilenberg–Moore algebras of a monad T that satisfy axioms \mathcal{A} , 406
- $\mathcal{K}(S)$, Kleisli category of comonad S , 266
- $\mathcal{K}(T)$, Kleisli category of monad T , 263
- $\mathcal{K}_{\mathbb{N}}(T)$, finitary Kleisli category of a monad T on **Sets**, with $n \in \mathbb{N}$ as objects, 393
- Mnd**(\mathbb{C}), category of monads on \mathbb{C} , 257
- Model**(T), category of functorial models of a monad T , 394
- Model**(T, \mathcal{A}), category of functorial models of a monad T that satisfy axioms \mathcal{A} , 406
- \mathbb{C}/I , slice category over I , 31
- $\mathbb{C} \times \mathbb{D}$, product category of \mathbb{C} and \mathbb{D} , 28
- \mathbb{C}^{op} , opposite category of \mathbb{C} , 28
- $\text{Pred}(\mathbb{C})$, category of predicates from \mathfrak{M} in \mathbb{C} , 186
- $\text{Rel}(\mathbb{C})$, category of relations in \mathbb{C} , 186

- $F \dashv G$, F is left adjoint of G , 95
- F^* , free monad on a functor F , 257
- F^{∞} , cofree comonad on a functor F , 263
- $F_{\#}$, functor associated with arity $\#$, 51
- T/\mathcal{A} , quotient monad obtained from T via axioms \mathcal{A} , 412
- \mathcal{D} , discrete probability distribution functor, 163
- $\mathcal{EM}(G)$, lifting of a functor G to an Eilenberg–Moore category, 306
- $\mathcal{K}(F)$, lifting of a functor F to a Kleisli category, 267, 306

- M_M , multiset functor, counting in monoid M , 161
- $\alpha: H \Rightarrow K$, α is a natural transformation from H to K , 99
- Q , quotient functor, 410
- $\text{Pred}(F)$, predicate lifting
 - for a polynomial functor, 336
 - with respect to a factorisation system, 342
- $\overleftarrow{\text{Pred}}(F)$, left adjoint to predicate lifting, 340
- $\text{Rel}(F)$, relation lifting
 - with respect to a factorisation system, 202
 - for a polynomial functor, 116
- $\mathcal{D}_{\leq 1}$, discrete sub-probability distribution functor, 164
- $\{S \mid \mathcal{A}\}$, subset comonad obtained from S via axioms \mathcal{A} , 428
- θ , universal map $F \Rightarrow F^*$ from an endofunctor F to the free monad F^* on F , 257
- $\{-\}$, comprehension functor, 188
- $\text{Th}(Ax)$, set of equations derivable from Ax , 403
- \square , before operator, 373
- \diamondleftarrow , earlier operator, 373
- \diamond , eventually operator
 - on sequences, 20
- \square , henceforth operator, 354
 - for a factorisation system, 361
 - on sequences, 19
- \bigcirc , lasttime operator, 373
- $\neg U$, negation (or complement) of U , 43
- \bigcirc , nexttime operator, 364
 - on sequences, 19
- S , since operator, 373
- $Ax \vdash t_1 = t_2, t_1 = t_2$ is derivable from Ax ., 403
- \mathcal{U} , until operator
 - on sequences, 24
- \mathcal{U} , until operator, 365
- $!$, unique map
 - to a final object, 35
 - from an initial object, 38
- $X' \twoheadrightarrow X$, epimorphism, 108
- $X' \hookrightarrow X$, monomorphism, 108
- $\Lambda(f)$, abstraction morphism, 42
- beh_c , behaviour function for coalgebra c , 8, 68
- \cong , isomorphism, 27
- $[f, g]$, cotuple of morphisms f and g , 37
- dst , double strength for a commutative monad, 273
- ev , evaluation morphism, 42
- id_X , identity morphism on an object X in a category, 25
- int_b , interpretation map for coalgebra b , 79
- κ_1 , first coprojection morphism, 37
- κ_2 , second coprojection morphism, 37
- π_1 , first projection morphism, 35
- π_2 , second projection morphism, 35
- st , strength natural transformation, 107, 272
- $\langle f, g \rangle$, tuple of morphisms f and g , 35
- $d \odot c$, composition of coalgebras: c followed by d , 249
- $f[U]$, direct image, 44
- f^\S , Kleisli extension of f , 266
- $g \odot f$, composition of Kleisli maps: f followed by g , 263
- $g \circ f$, composition g after f in a category, 25
- BT, Böhm tree function, 367
- FV, free variables in a Böhm tree, 369
- hnf, head normal form function, 367
- comp, on sequences, 17
- evens, on sequences, 12
- merge, on sequences, 15
- nextdec, 10
- next, final coalgebra for sequences, 7
- odds, on sequences, 14
- tail, on sequences, 14
- L_a , a -derivative of language L , 72
- $[-]_R$, quotient map, 135
- $\| - \|_\rho$ interpretation in an algebra, for valuation ρ , 393
- δ^* , iteration of transition function δ , 57
- μ , least fixed point operator, 365
- ν , greatest fixed point operator, 365
- 0 , null process, 152
- supp, support, 161
- $b \cdot z$, prefix of action b to process z , 152
- c/R , coalgebra on quotient by R , 135, 222
- c_P , subcoalgebra on greatest invariant in subset P , 355
- $t[\vec{s}/\vec{v}]$, term t with terms \vec{s} substituted for variables \vec{v} , 395
- $z + w$, sum of two processes, 152
- \vee , join, 24
- \wedge , meet, 24
- \perp , bottom element, 46
- \top , top element, 46

- $(\cdot \neq x)$, predicate of elements unequal to x , 370
 $(\cdot = x)$, predicate of elements equal to x , 370
 R^\dagger , reverse relation, 43
 $S \circ R$, relation composition, 27
 $U(x)$, predicate U holds for x , 43
 $\text{Graph}(f)$, the graph of a function f , 29
 $c \xleftrightarrow{d} d$, bisimilarity with respect to coalgebras c and d , 121
 $\xleftrightarrow{\quad}$, bisimilarity, 120
 $\prod_f(U)$, direct image, 44
 $\text{Eq}(X)$, equality relation on a set X , 27
 $\prod_f(U)$, product predicate, 47
 $(x \downarrow b) \xrightarrow{a} (x' \downarrow b')$, a -transition with observations b, b' , 56, 59
 $x \rightarrow$, state x halts, 11
 $x \downarrow b$, b can be observed about x , 56, 59
 $a \in x$, a occurs in the behaviour sequence of x , 21
 $x \xrightarrow{a}$, there is no a -step from x , 59
 $x \xrightarrow{\sigma^*}$ y , multiple σ -steps from x to y , 57
 $x \xrightarrow{a} x'$, a -step from x to x' , 11, 56, 59
 L^Δ , initial algebra (of parsed words) for the functor $(- + L)^*$, 284
 \mathcal{B} , final coalgebra of Böhm trees, 367
 $\text{BinTree}(A)$, initial algebra of binary trees, 83
 X^n , n -fold product (power), 35
 $n \cdot X$, n -fold coproduct (copower) of X , 38
 0 , empty set, 38
 0 , initial object, 38
 1 , final object, 35
 1 , singleton set, 36
 2 , two-element set $\{0, 1\}$, 72
 $X + Y$, coproduct of objects X, Y , 37
 $X \times Y$, product of objects X, Y , 35
 Y^X , exponent of objects X, Y , 42
 $\mathcal{P}_{\text{fin}}(X)$, set of finite subsets/predicates on X , 44
 $\text{Ker}(f)$, kernel of function f , 125
 $\mathcal{P}(X)$, set of subsets/predicates on X , 43
 $\prod_{i \in I} X_i$, set-indexed product, 36
 $\text{Eq}(f, g)$, pullback of f, g , 126, 171