FP trivia Language Reference

2021-06-11

Naming Conventions

name	the name itself
name	the type / the class
(?)	Uncertainties
*	Footnote / Note

Data Types

Data type	Syntax	Type identifier
data		// General
null	( )	_null
*int**	[_123]	_integer
real	_31.415e_123	_real
string	"abc"	_string
ident	abc <u>or</u> +-*/	_ident
prefix	@...	_prefix
index	[abc]	_index
array	{a b c}	_array
error	(*index* _error ... ...)	_error
*table**/*dict**	(a x b y c z)	// In pairs
list	(a ; b ; c ;)	;
object	(*ident* :: a x b y c z)	::
turtle	(turtle :: ... ...)	// Object
combi	(*term* _combine .. *arg*)	_combine
monad	(*int* _act ... ...)	_act
bool	true <u>or</u> false	// Idents
etc...		

*note that *int*- and *dict*-literals require the constant combinator!

Comments

codetext **//** *comment*

Definition of Identifiers

ident **==** *term*
ident **≡** *term*

Script Structure

term definition1 definition2 definition3 ...

Ddot

prop = *head infix* **..** *tail*

Include Files

coreimport == "*Script1.txt*" ; "*Script2.txt*" ; "*Script3.txt*" ; ... ;

userimport == "*Script1.txt*" ; "*Script2.txt*" ; "*Script3.txt*" ; ... ;

corepath?

userpath?

List/Dict Functions and Operators

dict = (first$_1$ infix$_1$ first$_2$ infix$_2$ ... ... first$_m$ infix$_m$)
list = (element$_0$; element$_1$; element$_2$; ... ;)

[*i* **]** ° *list* -- *element*$_i$

head ° *dict* -- first
head ° *list* -- *first*
First element of the list.

head ° *object* --

tail ° *dict* -- rest
tail ° *list* -- *rest*
List without the first element and first infix.
tail ° *object* --

infix ° *dict* -- infix value
infix ° *object* --

prop ° *first,infix,rest,* -- dict

top ° *dict* -- first
top ° *list* -- first

pop ° *dict* -- rest
pop ° *list* -- rest

tag ° *data* -- typus // als typeof
tag ° *dict* -- infix value

term ° *combi* -- term value

arg ° *combi* -- arg value

termoarg -- term o arg

first **,** *rest* -- list
Appendleft

length ° *dict* -- *real*
length ° *list* -- *real*
length ° object --
Number of list items.

reverse ° *dict* -- *dict*
reverse ° *list* -- *list*
reverse ° *object* --
Reverses the list items.

data **distl** *list* -- matrix

list **distr** *data* -- matrix

dict **++** *dict* -- *dict*
list **++** *list* -- *list*

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Concatenate the lists.

dict **take** *num*	--	*dict*
list **take** *num*	--	*list*

Takes the first *num* elements from the list.

dict **drop** *num*	--	*dict*
list **drop** *num*	--	*list*

Drops the first *num* elements in the list.

trans ° *matrix*	--	matrix
transpose ° *matrix*	--	matrix

num **pick** *list*	--	element
num **sel** *list*	--	element

last ° *list*	--

(*num* **r**) ° *list*	--

tailr ° *list*	--	list
tailr ° *dict*	--	dict

rotl ° *list*	--	list

rotr ° *list*	--	list

list **count** *data*	--	real

data **make** *num*	--	list

list **find** *data*	--	real

iota ° *num*	--	*list*
ɩ ° *num*	--	*list*

Generates a list of numbers from 1 to *num*.

iota0 ° *num*	--	*list*

Generates a list of numbers from 0 to *num*-1.

int **to** *int*	--	list
real **to** *real*	--	list

int **upto** *int*	--	list
real **upto** *real*	--	list

int **downto** *int*	--	list

real **downto** *real*   --   list

swap ° *x,y,list*   --   *y,x,*list

Math Functions and Operators

int **+** *int*   --   *int*
real **+** *real*   --   *real*
Addition of numbers.

int **-** *int*   --   *int*
real **-** *real*   --   *real*
Subtraction of numbers.

int ***** *int*   --   *int*
real ***** *real*   --   *real*
int **×** *int*   --   *int*
real **×** *real*   --   *real*
Multiplication of numbers.

num **/** *num*   --   *real*
num **÷** *num*   --   *real*
Division of numbers.

int **^** *int*   --   *int*
real **^** *real*   --   *real*
Power of numbers.

int **idiv** *int*   --   *int*
Integer division

int **imod** *int*   --   *int*
Integer modulo

pred ° *int*   --   *int*
pred ° *real*   --   *real*
Predecessor function

succ ° *int*   --   *int*
succ ° *real*   --   *real*
Successor function

sign ° *int*   --   *int*

sign ° *real*   --   *real*
Sign function

abs ° *int*   --   *int*
abs ° *real*   --   *real*
Absolute value function

neg ° *int*   --   *int*
neg ° *real*   --   *real*
_ ° *int*   --   *int*
_ ° *real*   --   *real*
Negation of a number.

round ° *num*   --   *int*
Rounding to an integer.

trunc ° *num*   --   *int*
Truncate to an integer.

int ° *num*   --   *real*
Integer part of the number as a real number.

frac ° *num*   --   *real*
Fraction part of a real number.

float ° *num*   --   *real*
Conversion to the real number.

num **roundto** *num*   --   real

exp ° *real*   --   *real*
Exponential function

ln ° *real*   --   *real*
Natural logarithm.

lg ° *real*   --   *real*
Decadic logarithm.

ld ° *real*   --   *real*
Binary logarithm.

sq ° *int*   --   *int*
sq ° *real*   --   *real*
Square of a number.

sqrt ° *num*   --   *real*
Square root of a number.

pi   --   3.141592653589793
Ludolph's number: π = 3.14159265358979323846264338327950288...

2pi   --   6.283185307179586
Scope of the unit circle.

sin ° *real*   --   *real*
Sine function

cos ° *real*   --   *real*
Cosine function

tan ° *real*   --   *real*
Tangent function

arcsin ° *real*   --   *real*
Arcsine function

arccos ° *real*   --   *real*
Arccosine function

arctan ° *real*   --   *real*
Arctangent function

num **arctan2** *num*   --   real

sinh ° *real*   --   *real*
Hyperbolic sine function

cosh ° *real*   --   *real*
Hyperbolic cosine function

tanh ° *real*   --   *real*
Hyperbolic tangent function

arsinh ° *real*   --   real

arcosh ° *real*   --   real

artanh ° *real*   --   real

deg ° *num*   --   *real*
Radiant-to-Degree function

rad ° *num*   --   *real*
Degree-to-Radiant function

real **mod** *real* --   *real*
Modulo of real numbers.

sum ° *list*   --   *num*
Sum of the list items.

prod ° *list*   --   *num*
Product of the list items.

avg ° *list*   --   *real*
Average value of the list items.

integral

dd

zero ° *data*   --

one ° *data*   --

Dictionary Operators and Combinators

dict is a table for pattern matching treatment

dict = (value0 key0 value1 key1 value2 key2 ... ...)

_super
Key for the super dictionary.

dict **get** *key*   --   *value*
Get the *value* for the *key* from a *dict*.

dict **put** *key,value,*   --   *dict*
Replaces the *value* to a *key* in the *dict*.

dict **iget** *ident*   --   *value*
dict **iget** *index*   --   *value*
API-Get for identical keys.

dict **iput** *ident,value,* --   *dict*
dict **iput** *index,value,* --   *dict*

API-Put for identical keys.

#_ident ° dict_   --   _value_
(_ident_ **_v**) ° _dict_   --   _value_
Instance variable value.

(_ident_ **:=** _value_) ° _dict_ --   _dict_
Substitution of an instance variable with a _value_.

func **<-** _key1_ ; _key2_ ; ... ;
func **←** _key1_ ; _key2_ ; ... ;
Assign combinator, general.

func **<-** _key1 isfunc1 key2 isfunc2 ... ..._
func **←** _key1 isfunc1 key2 isfunc2 ... ..._
Assign combinator, typed.

Boolean Functions and Operators

bool   =   **true**   <u>or</u>   **false**

'true   --   _bool_
Value for true.

'false   --   _bool_
Value for false.

data **=** _data_   --   _bool_
Check for equality.

data **<>** _data_   --   _bool_
data **!=** _data_   --   _bool_
data **≠** _data_   --   _bool_
Check for inequality.

data **<** _data_   --   _bool_
Checks whether smaller.

data **>** _data_   --   _bool_
Checks whether larger.

data **<=** _data_   --   _bool_
Checks whether less than or equal.

data **>=** *data*   --   *bool*

Checks whether greater than or equal to.

¬   ° *bool*   --   *bool*

not ° *bool*   --   *bool*

not ° *int*   --   *int*

NOT function

bool **and** *bool* --   *bool*

int **and** *int* --   *int*

AND operator

bool **or** *bool*   --   *bool*

int   **or** *int*   --   *int*

OR operator

bool **xor** *bool* --   *bool*

int   **xor** *int*   --   *int*

Exclusive-OR operator

isatom ° *data* --   bool

Checks whether the *data* is a basic data type. (?)

isprop ° *data* --   *bool*

Checks whether the *data* is a triple value. (?)

islist ° *data*   --   *bool*

Checks whether the *data* is a list.

isbool ° *data* --   *bool*

Checks whether the *data* is a Boolean identifier.

isnum ° *data* --   *bool*

Checks whether the *data* is a number. Generic function.

iszero ° *data*   --   bool

Checks whether the data is zero. Generic function.

ispos ° *data*   --   *bool*

Checks whether the *data* is greater than zero. Generic function.

isneg ° *data*   --   *bool*

Checks whether the *data* is less than zero. Generic function.

isnil (?)

ispreg (?)

isnull ° *data*	--	*bool*	
isint ° *data*	--	*bool*	
isreal ° *data*	--	*bool*	
isstring ° *data*	--	*bool*	
isident ° *data*	--	*bool*	
isprefix ° *data*	--	*bool*	
isindex ° *data*	--	*bool*	
isarray ° *data*	--	*bool*	
iscons ° *data*	--	*bool*	
iscombi ° *data*	--	*bool*	
isalt ° *data*	--	*bool*	
isobj ° *data*	--	*bool*	
isquote ° *data*	--	*bool*	
isivar ° *data*	--	*bool*	
isact ° *data*	--	*bool*	

Predicates to check the appropriate data type.

isbound ° *ident*	--	*bool*
isbound ° *prefix*	--	*bool*

Checks whether an identifier is bound.

isundef ° *data*	--	*bool*

Testing for _undef

iscomplex ° *complex*	--	*bool*

Checks whether it is a complex number. (?)

object **is** *ident*	--	*bool*

Checks whether the *ident* is the same as the class identifier of the *object*. (?)

(*ident* **hastag**) ° *data* --   bool   (?name)

Combinators for Program Execution (?)

combi = (*term* **_combine** .. *arg*)

func **_s**
Single function evaluation

' *literal*

literal **k**

literal **_q**

Constant combinator

ƒ **:** *x*

Application   // to be used for closed and lift

func1 **°** *func2*

func1 **o** *func2*

func1 ° *func2*

Composition of functions.

functional **app** *argument*

Apply operator

func1 **,** *func2* **,** *func3* **,** ... **,**

Construction of lists.

test **->** *then* **|** *else*

test **→** *then* **|** *else*

test **->** *then* **;** *else*

Condition with Alternal/Cons

test **->*** *func*

test **→*** *func*

while Loop

func **loopif** *test*

do-while Loop

(*func* **do**)°*num,num,num,*

functional **for** *num,num,num,*

list **map** *functional*

Map operator

(*func* **aa**) ° *list*

(*func* **α**) ° *list*

Apply-to-all combinator

list **insl** *functional*

Insertl operator

list **insr** *functional*
Insertr operator

(*func* ****) ° *list*
Insertr combinator

list **filter** *functional*
Filter operator

(*list,arg1,arg2,...,*) **map0** *functional*

(*func* **aa0**) ° *list,arg1,arg2,...,*
Combination of **aa** and **distr**, extended.

func1 **ee** *func2*
ee ° *data,data,*
Eval-Eval combinator for infix notation.

func1 **swee** *func2*
swee ° *data,data,*
Swap-Eval-Eval combinator

(*func1* **eea** *func2*) ° *argum*   --   (x ; y ; argum ;)

(*func* **dip**) ° *list*
(*func* **dip**) ° *object*
Dip combinator (stolen from Joy)

(*test* **try** *then* **|** *else*) ° *argument*
in then/else with (*testresult* ; *argument* ;)

ifnull

ifprop

data1 **??** *data2*   --   data

(func Y)
Y-Combinator...

quote ° *data*   --   func
Quote functional

func1 **comp** *func2*   --   func
Compose functional

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(*func* **any**) ° *list*	--	bool
(*func* **all**) ° *list*	--	bool

Misc Functions and Operators

undef	--	*error*	

Function is defined as undefined.

id ° *argument*	--	*argument*

Identity function.

out ° *argument*	--	*argument*	// *Side effect

Output for debugging.

data **min** *data*	--	*data*
min ° *data,data,*	--	*data*

Minimum of two values.

data **max** *data*	--	*data*
max ° *data,data,*	--	*data*

Maximum of two values.

name ° *ident*	--	*string*

Print name of an identifier.

body ° *ident*	--	*value*

The assigned *value* of an identifier.

address ° *data*	--	*real*

Address value of the triple cell.

identlist	--	*list*

List of all used identifiers. (?)

indexdict	--	*dict*

Dict of all index types with integers.

maxcell	--	int

_reserve

Value for an unbound identifier.

_undef

Value for undefined.

gc ° *argument*   --   *argument*
Turns on the garbage collector.

String Functions and Operators

substring ° *string,num,num,*   --   string

string **concat** *string*   --   *string*
string **&** *string*   --   *string*
Concatenates the strings.

string **indexof** *substr*   --   real

list **join** *sepstr*   --   string

string **split** *sepstr*   --   list

string **repeat** *num*   --   string

string **delete** *num,num,*   --   string

string **insert** *num,string,*   --   string

length ° *string*   --   *real*
Length of the string.

string **mid** *num,num,*   --   string

string **left** *num*   --   string

string **right** *num*   --   string

char ° *num*   --   string

unicode ° *string*   --   real

trim ° *string*   --   *string*
Trims the *string* on the left and right side.

triml ° *string*   --   *string*
Trims the *string* on the left.

trimr ° *string*   --   *string*

Trims the *string* on the right.

upper ° *string* -- *string*
AnsiUpperCase of the string.

lower ° *string* -- *string*
AnsiLowerCase of the string.

capitalize ° *string* -- string

parse ° *string* -- *list*
Precompiles the *string* into a *list*.

value ° *string* -- *data*
Converts the *string* to a *data* type.

string ° *data* -- *string*
Converts the *data* to its text representation.

unpack ° *string* -- *list*
Splits the *string* into a list of individual string characters.

pack ° *list* -- *string*
Concatenates the strings in the *list*.

timetostring ° *real* -- string

datetostring ° *num* -- string

weekday ° *num* -- real (?)

OOP

object = (*cap* **::** *inst*)   // Object classes

pair = *object* , *parameter* ,

self ° *pair*

para ° *pair*

index **op** *func*

index **swop** *func*

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index **fn** *func*

(*object* (*index* **cb** *func*) *parameter*) ° argum   --   *method* ° [0],[1],argum,

cap ° *list*   --   ( )
cap ° *object*   --   (*cap* **::**)

ident **obj** *list*   --   (*ident* **::** *list*)
ident **obj** *dict* --   (*ident* **::** *dict*)

ident **new** *parameter*

object **as** ident (?)   --   object

box ° *primdata*   --   object

unbox ° *object*   --   primdata

object == .. { ( ) ... ... }
Object class

list == .. { object ... ... }
List class

dict == .. { object ... ... }
Dict class

matrix == .. { ... ... }
Matrix class

Monads and Effects

monad = (*int* **_act ..** *dict*)   // absolute
monad = (*index* **_act ..** *dict*)   // relative

it ° *dict*   --   #_it ° dict
Result of a monad action.   // monad ... name (?)

#_it

#_self

#_para

_bind

Continuation

_eff
Effects

monad **>>** *term*	--	monad	// _bind := *term*

int **act** *dict*	--	monad	
index **act** *dict*	--	monad	
monad **act** *dict*	--	monad	

nun auch die Möglichkeit gegeben eine actbox zu bauen   //bitte in engl!
(verschachteltes Act)

monad **eff** *array*	--	monad
monad **eff** *ident*	--	monad

monad **var** *data*	--	monad
monad **var** *dict*	--	monad

(*ident* **define** *data*) ° *dict*   --   monad
//(prefix define data) ° dict

(*ident* **redefine** *data*) ° *dict*   --   monad
//(prefix redefine data) ° dict

(*data* **showgraph**) ° *dict*   --   monad   // *+ (*x* eff 'io)

(*data* **showinfo**) ° *dict*   --   monad   // *+ (*x* eff 'io)

(*data* **print**) ° *dict*   --   monad   // *+ (*x* eff 'io)

(*string* **input**) ° *dict*   --   monad   // *+ (*x* eff 'io)
(*string* **input** *string*) ° *dict*

(*fname* **loadtext**) ° *dict*   --   monad   // *+ (*x* eff 'io)

(*fname* **savetext** *string*) ° *dict*   --   monad   // *+ (*x* eff 'io)

(*string* **run**) ° *dict*   --   monad   // *+ (*x* eff 'io)

quit   --   monad

time ° *dict*   --   monad   // *+ (*x* eff 'io)

date ° *dict*   --   monad   // *+ (*x* eff 'io)

io == .. { ... ... }

System effects class

Runtime Errors(?)

error = (*index* **_error** *string* ; ... ...)

index **error** *string*,   --   error

fail ° *argument*   --   error
Use for selector signatures(?)

stop ° *argument*   --   error
Generally, e.g. Program termination, etc

raise ° *string*   --   exception
An exception is thrown.

_error == .. { ... ... }
Class for redirects...

// try

Complex Numbers

complex = (**complex ::** *real* **re** *real* **im**)

i   --   (complex :: 0 re 1 im)
Square root of _1

real **cval** *real*   --   *complex*
To form a complex number from real numbers.

re ° *complex*   --   *real*
Real part of the complex number.

im ° *complex*   --   *real*
Imaginary part of the complex number.

complex **+** *complex*   --   *complex*
Addition of complex numbers.

complex **-** *complex*   --   *complex*

Subtraction of complex numbers.

complex ***** *complex*   --   *complex*
complex **×** *complex*   --   *complex*
Multiplication of complex numbers.

complex **/** *complex*   --   *complex*
complex **÷** *complex*   --   *complex*
Division of complex numbers.

zero, **one**, **iszero**, etc

complex == .. { dict ... ... }
Complex-class with the complex methods.

Matrix Functions and Operators

matrix = (*list* ; *list* ; ... ;)   <u>oder</u>
matrix = (**matrix** :: *list* ; *list* ; ... ;)

IP ° *list,list,*   // Backus Turing Lecture
list **IP** *list*

MM ° *matrix,matrix,*   // Backus Turing Lecture
matrix **MM** *matrix*

det ° *matrix*   --   real

inv ° *matrix*   --   matrix

trans ° *matrix*   --   matrix   // transpose

ismatrix ° *data*   --   bool

tomatrix ° *list*   --   matrix

matrix == .. { list ... ... }
Matrix-class for MM (*), det, inv, trans, add, sub

Turtle Graphics

turtle = (**turtle ::** *list* **stack** *real* **x** *real* **y** *real* **angle**

bool **pen** *num* **color** *num* **size** *num* **brush**)

pair = (*x* , *y* ,)

// 2pi

initturtle
'*turtle* **new**   // recommended

pair **moveto** *turtle*

pair **moverel** *turtle*

real **move** *turtle*

real **turnto** *turtle*

real **turn** *turtle*

penup ° *turtle*

pendown ° *turtle*

num **pencolor** *turtle*

num **pensize** *turtle*

num **brushcolor** *turtle*

real **circle** *turtle*

rectangle ° *turtle*   // rect

(*turtle* (**draw** eff 'io)) ° *dict*   --   monad
For drawing the turtle trail.

#x ° *turtle*   --   real
#y ° *turtle*   --   real
#angle ° *turtle*   --   real
etc
Attributes of the turtle object.

colors == '(... ...)
#red ° colors   for the color value red.

turtle == .. { dict ... ... }
Turtle class,

own turtle classes can also be created through inheritance.

(xlist (**plot0** eff 'io) 0-y) ° *dict*   --   monad