Package ‘frab’

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Type Package

Title An Alternative Interpretation of Named Vectors

Version 0.0-1

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Description An alternative interpretation of named vectors as generalized tables, so that c(a=1,b=2,c=3) + c(b=3,a=-1) will return c(b=5,c=3). Uses 'disordR' discipline (Hankin, 2022, <doi:10.48550/ARXIV.2210.03856>). Extraction and replacement methods are provided. The underlying mathematical structure is the Free Abelian group, hence the name.

License GPL (>= 2)

Depends R (>= 3.5.0)

Suggests knitr, markdown, rmarkdown, testthat

VignetteBuilder knitr

Imports Rcpp (>= 1.0-7), mathjaxr, disordR (>= 0.9-8-1), methods

LinkingTo Rcpp

URL https://github.com/RobinHankin/frab

BugReports https://github.com/RobinHankin/frab

RdMacros mathjaxr

R topics documented:

`frab-package` *An Alternative Interpretation of Named Vectors*

Description

An alternative interpretation of named vectors as generalized tables, so that c(a=1,b=2,c=3) + c(b=3,a=-1) will return c(b=5,c=3). Uses 'disordR' discipline (Hankin, 2022, <doi:10.48550/ARXIV.2210.03856>). Extraction and replacement methods are provided. The underlying mathematical structure is the Free Abelian group, hence the name.

Details

The DESCRIPTION file:

Package:	frab
Type:	Package
Title:	An Alternative Interpretation of Named Vectors
Version:	0.0-1
Authors@R:	person(given=c("Robin", "K. S."), family="Hankin", role = c("aut","cre"), email="hankin.robin@gmai
Maintainer:	Robin K. S. Hankin <hankin.robin@gmail.com>
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RdMacros:	mathjaxr
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```

Author(s)

NA

Maintainer: Robin K. S. Hankin <hankin.robin@gmail.com>

Examples

```
x <- frab(c(a=1, b=2, c=5))
y <- frab(c(b=-2, c=1, d=8))

x+y
```

`Arith` *Extraction and replacement methods for class* `"frab"`

Description

The `frab` class provides basic arithmetic methods for frab objects. Low-level helper functions `c_frab_eq()` amd `c_frab_pmax()` are documented here for consistency; but technically `c_frab_eq()` is a Comparison operator, and `c_frab_pmax()` is an “Extremes” function. They are documented at `Compare.Rd` and `pmax.Rd` respectively.

Usage

```
frab_negative(x)
frab_reciprocal(x)
frab_plus_frab(F1,F2)
frab_multiply_numeric(e1,e2)
frab_power_numeric(e1,e2)
numeric_multiply_frab(e1,e2)
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frab_unary(e1,e2)
frab_arith_frab(e1,e2)
frab_arith_numeric(e1,e2)
numeric_arith_frab(e1,e2)
```

Arguments

`e1,e2,x,F1,F2`	Objects of class `frab`, coerced if needed

Value

Return `frab` objects

Methods

Arith `signature(e1="frab" , e2="missing")`: blah blah blah

Arith `signature(e1="frab" , e2="frab" )`: ...

Arith `signature(e1="frab" , e2="numeric")`: ...

Arith `signature(e1="numeric", e2="frab" )`: ...

Arith `signature(e1="ANY" , e2="frab" )`: ...

Arith `signature(e1="frab" , e2="ANY" )`: ...

Author(s)

Robin K. S. Hankin

See Also

`Compare`

Examples

```
x <- frab(c(a=1,b=2,c=3))
y <- frab(c(b=-2,d=8))

x+y
```

`Compare-methods` *Comparision methods*

Description

Methods for comparison (greater than, etc) in the **frab** package.

Functions `frab_gt_num()` etc follow a consistent naming convention; the mnemonic is the old Fortran `.GT.` scheme [for “greater than”].

Function `frab_eq()` is an odd-ball, formally documented at `Arith.Rd`. It is slightly different from the other comparisons: it calls low-level helper function `c_frab_eq()`, which calls its C namesake which is written for speed (specifically, returning `FALSE` as soon as it spots a difference between its two arguments).

Usage

```
frab_eq(e1,e2)
frab_compare_frab(e1,e2)
frab_eq_num(e1,e2)
frab_gt_num(e1,e2)
frab_ge_num(e1,e2)
frab_lt_num(e1,e2)
frab_le_num(e1,e2)
frab_compare_numeric(e1,e2)
num_eq_frab(e1,e2)
num_gt_frab(e1,e2)
num_ge_frab(e1,e2)
num_lt_frab(e1,e2)
num_le_frab(e1,e2)
numeric_compare_frab(e1,e2)
```

Arguments

`e1,e2`	Objects of class `frab`

Value

Generally, return a `frab` or a logical

Author(s)

Robin K. S. Hankin

See Also

`Arith`

Examples

```
rfrab()
a <- rfrab(26,sym=letters)
a[a<4] <- 100
```

`Extract` *Extraction and replacement methods for class* `"frab"`

Description

The `frab` class provides basic arithmetic and extract/replace methods for frab objects.

Class *index* is taken from the excellent **Matrix** package and is a `setClassUnion()` of classes `numeric`, `logical`, and `character`.

Value

Generally, return a `frab` object.

Methods

[`signature(x = "frab", i = "character", j = "missing")`: `x["a"] <- 33`

[`signature(x = "frab", i = "disord", j = "missing")`: `x[x>3]`

[`signature(x = "frab", i = "missing", j = "missing")`: `x[]`

[<- `signature(x = "frab", i = "character",j = "missing", value = "ANY")`: `x["a"] <- 3`

[<- `signature(x = "frab", i = "disord", j = "missing",value="frab")`: `x[x<0] <- -x[x<0]`; not implemented

[<- `signature(x = "frab", i = "ANY",j = "ANY", value = "ANY")`: not implemented

[<- `signature(x = "frab", i = "disindex",j = "missing",value = "numeric")`: `x[x>0] <- 3`

Double square extraction, as in `x[[i]]` and `x[[i]] <- value`, is not currently defined.

Author(s)

Robin K. S. Hankin

Examples

```
frab(setNames(seq_len(0),letters[seq_len(0)]))

a <- rfrab(26,sym=letters)
a<4
a[a<4]
a[a<4] <- 100
a

x <- rfrab()
values(x) <- values(x) + 66

x <- rfrabb()
v <-  values(x)
v[v<0] <- abs(v[v<0]) + 50
values(x) <- v
```

`frab` *Creating* `frab` *objects*

Description

Package idiom for creating `frab` objects

Usage

```
frab(x)
as.frab(x)
is.frab(x)
list_to_frab(L)
```

Arguments

`x`	object coerced to, or tested for, `frab`
`L`	List of two elements, a numeric vector named `values` and a character vector named `names`

Details

Function `frab()` is the creation method, taking a named numeric vector as its argument; it is the only function in the package that actually calls `new("frab", ...)`.

Function `as.frab()` tries a bit harder to be useful and can coerce different types of object to a `frab`. If given a list it dispatches to `list_to_frab()`. If given a table it dispatches to `table_to_frab()`, documented at `table.Rd`.

Value

Returns a `frab`, or a boolean

Author(s)

Robin K. S. Hankin

See Also

`frab-class`

Examples

```
as.frab(c(a=2,b=1,c=77))

as.frab(list(names=letters[5:2],values=1:4))
```

`frab-class` *Class "frab"*

Description

The formal S4 class for frab objects

Usage

```
## S4 method for signature 'frab'
names(x)
## S4 method for signature 'frab'
namedvector(x)
```

Arguments

x	Object of class `frab`

Objects from the Class

Formal class *frab* has a single slot `x` which is a named numeric vector.

The class has three accessor methods: `names()`, `values()`, and `namedvector()`.

Author(s)

Robin K. S. Hankin

Examples

```
new("frab",x=c(a=6,b=4,c=1))   # formal creation method (discouraged)


frab(c(a=4,b=1,c=5))   # use frab() in day-to-day work

frab(c(a=4,b=0,c=5))   # zero entries are discarded

frab(c(a=4,b=3,b=5))   # repeted entries are summed

frab(c(apple=4,orange=3,cherry=5))   # any names are OK

x <- frab(c(d=1,y=3,a=2,b=5,rug=7,c=2))
(y <- rfrab())
```

```
x+y          # addition works as expected
x + 2*y      # arithmetic
x>2          # extraction
x[x>3] <- 99 # replacement


# sum(x)       # some summary methods implemented
# max(x)
```

---

misc *Miscellaneous functions*

Description

This page documents various functions that work for frabs, and I will add to these from time to time as I add new functions that make sense for frab objects. To use functions like `sin()` and `abs()` on `frab` object `x`, work with `values(x)` (which is a `disord` object). However, there are a few functions that are a little more involved:

- length() returns the length of the data component of the object.
- `which()` returns a `disind` object when given a Boolean `frab`
- `is.na()` returns a logical `disord` object

Usage

```
## S4 method for signature 'frab'
length(x)
```

Arguments

`x`	Object of class `frab`

Value

Generally return frabs

Note

note here

Author(s)

Robin K. S. Hankin

See Also

`extract`

Examples

```
(a <- frab(c(a=1,b=NA,c=44,x=NA,h=4)))
is.na(a)

(x <- frab(c(x=5,y=2,z=3,a=7,b=6)))
which(x>3)
x[which(x>3)]
x[which(x>3)] <- 4
x

is.na(x) <- x<3
x
x[is.na(x)] <- 100
x
```

`namedvector` *Named vectors and the frab package*

Description

Named vectors are closely related to `frab` objects, but are not the same. However, there is a natural coercion from one to the other.

Usage

```
is.namedvector(v)
is.namedlogical(v)
is.unnamedlogical(v)
is.unnamedvector(v)
```

Arguments

`v`	Argument to be tested or coerced

Details

Coercion and testing for named vectors. Function `nv_to_frab()`, documented at `frab.Rd`, coerces a named vector to a `frab`.

Value

Function `is.namedvector()` returns a boolean, function `as.namedvector()` returns a named vector.

Author(s)

Robin K. S. Hankin

Examples

```
x <- c(a=5, b=3, c=-2,b=-3, x=33)
is.namedvector(x)
as.namedvector(frab(x))



x <- c(a=5, b=3, c=-2)
y <- c(p=1, c=2, d= 6)

x
y
x+y

frab(x) + frab(y)
```

pmax *Parallel maxima and minima for frabs*

Description

Parallel (pairwise) maxima and minima for frabs.

Usage

```
pmax_pair(F1,F2)
pmin_pair(F1,F2)
pmax_dots(x, ...)
pmin_dots(x, ...)
## S4 method for signature 'frab'
pmax(...)
## S4 method for signature 'frab'
pmin(...)
```

Arguments

`F1, F2, x, ...`	Frab objects

Details

Pairwise minima and maxima for frabs, using names as the primary key.

Functions `pmax_pair()` calls `c_frab_pmax()` and `pmin_pair()` use

Functions `pmax()` and `pmin()` use the same mechanism as `cbrob()` of the **Brobdingnag** package, originally due to John Chambers (pers. comm.)

Value

Returns a frab object

Author(s)

Robin K. S. Hankin

Examples

```
x <- rfrab()
y <- rfrab()
```

`print` *Methods for printing frabs*

Description

Methods for printing frabs nicely

Usage

```
## S4 method for signature 'frab'
show(object)
frab_print(object)
```

Arguments

`object`	An object of class `frab`

Details

The method is sensitive to option `frab_print_hash`. If `TRUE`, the hash code is printed; otherwise it is not.

Function `frab_print()` returns its argument, invisibly.

There is special dispensation for the empty `frab` object.

Value

Returns its argument, invisibly

Author(s)

Robin K. S. Hankin

Examples

```
print(rfrab())  # default

options(frab_print_hash = TRUE)
print(rfrab())  # prints hash code

options(frab_print_hash = NULL)  # restore default
```

rfrab *Random frabs*

Description

Random `frab` objects, intended as quick “get you going” examples

Usage

```
rfrab(n = 9, v = seq_len(5), symb = letters[seq_len(9)])
rfrabb(n = 100, v = -5:5, symb = letters)
rfrabbb(n = 5000, v = -10:10, symb = letters,i=3)
```

Arguments

`n`	Length of object to return
`v`	Values to assign to symbols (see details)
`symb`	Symbols to use
`i`	Exponentiating index for `rfrabbb()`

Details

What you see is what you get, basically. If a symbol is chosen more than once, as in, `c(a=1,b=2,a=3)`, then the value for `a` will be summed.

Use function `rfrab()` for a small, easily-managed object; `rfrabb()` and `rfrabbb()` give successively larger objects.

Value

Returns a frab object

Author(s)

Robin K. S. Hankin

Examples

```
rfrab()
```

`table` *Tables and frab objects*

Description

Various methods and functions to deal with tables in the **frab** package.

Usage

```
## S4 method for signature 'frab'
as.table(x,...)
table_to_frab(x)
```

Arguments

`x`	Object of class `frab` or `table`
`...`	Further arguments, currently ignored

Details

If a `frab` object has non-negative entries it may be interpreted as a table. However, in base R, `table` objects do not have sensible addition methods which is why the **frab** package is needed.

Function `is.1dtable()` checks for its argument being a one-dimensional table. The idea is that a table like `table(sample(letters,30,TRUE))`, being a table of a single observation, is accepted but a table like `table(data.frame(rnorm(20)>0,rnorm(20)>0))` is not acceptable because it is a *two*-dimensional contingency table.

Value

Generally return a table or frab.

Note

The order of the entries may be changed during the coercion, as per **disordR** discipline. Function `as.frab()` takes a table, dispatching to `table_to_frab()`.

Author(s)

Robin K. S. Hankin

Examples

```
X <- table(letters[c(1,1,1,1,2,3,3)])
Y <- table(letters[c(1,1,1,1,3,4,4)])
Z <- table(letters[c(1,1,2,3,4,5,5)])

X+Y  # defined but nonsense

# X+Z  # returns an error


as.frab(X) + as.frab(Y)  # correct answer
```

```
plot(as.table(rfrab()))
```

zero *The zero frab object*

Description

Test for a `frab` object's being zero (empty).

Usage

```
zero(...)
is.zero(x)
is.empty(x)
```

Arguments

`x`	Object of class `frab`
`...`	Further arguments (currently ignored)

Details

Function `zero()` returns the empty `frab` object; this is the additive identity 0 with property $x+0 = 0+x = x$.

Function `is.zero()` returns `TRUE` if its argument is indeed the zero object.

Function `is.empty()` is a synonym for `is.zero()`. Sometimes one is thinking about the free Abelian group, in which case `is.zero()` makes more sense, and sometimes one is thinking about maps and tables, in which case `is.empty()` is more appropriate.

Value

Function `zero()` returns the zero frab object, function `is.zero()` a Boolean

Author(s)

Robin K. S. Hankin

Examples

```
zero()
zero() + zero()

x <- rfrab()

x+zero() == x

is.zero(zero())
```

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