Package ‘funprog’

October 13, 2022

Type Package
Title Functional Programming
Version 0.3.0
Description High-order functions for data manipulation: sort or group data, given one or more auxiliary functions. Functions are inspired by other pure functional programming languages ('Haskell' mainly). The package also provides built-in function operators for creating compact anonymous functions, as well as the possibility to use the 'purrr' package syntax.
License GPL-2
BugReports https://gitlab.com/py_b/funprog/-/issues
Suggests purrr (>= 0.2.3), testthat
Encoding UTF-8
LazyData true
RoxygenNote 7.1.1
NeedsCompilation no
Author Pierre-Yves Berrard [aut, cre]
Maintainer Pierre-Yves Berrard <pyb@gmx.com>
Repository CRAN
Date/Publication 2020-11-07 11:20:03 UTC

R topics documented:

funprog-package .................................................. 2
descending ......................................................... 2
group_if ............................................................. 3
iterate .............................................................. 4
partition ............................................................ 5
sort_by .............................................................. 6
unique_by .......................................................... 7
%on% ............................................................... 7
funprog-package

Implementation of pure functional programming languages functions

Description

The funprog package implements in R some functions existing in other pure functional programming languages.

Main functions

The package provides high-order functions, for example:

• `group_if`, inspired by Haskell’s `groupBy`
• `sort_by`, inspired by Haskell’s `sortBy`

Helper functions

Helper functions can be used in conjunction with the main functions:

• `%on%` combines two functions into one and serves to create a predicate function to `group_if`
• `descending` is used to reverse the output of a sorting function used with `sort_by`

purrr syntax

If the purrr package is installed, you can use its special syntax to create very compact anonymous functions, for example `~ abs(.x - .y) > 1` instead of `function(x, y) abs(x - y) > 1`.

Description

Reverse a sorting function

Transform a function (typically used in `sort_by`), so that its output can be sorted in descending order.

Usage

descending(f)

Arguments

f a function to modify.

Value

A function returning a numeric vector which, if passed to `order`, will be used to sort some data.
Examples

desc_abs <- descending(abs)

x <- -2:1
order(abs(x))
order(desc_abs(x))

Description

Split a vector or a list into groups, given a predicate function.

Usage

group_if(x, predicate, na.rm = FALSE)
group_eq(x, na.rm = FALSE)

Arguments

x

a vector or a list to split into groups.
predicate

a binary function returning a boolean value.
na.rm

if x is atomic, delete missing values before grouping.

Details

predicate will be applied to 2 adjacent elements. If it evaluates to TRUE, those elements belong to the same group, otherwise they belong to different groups.

Grouping on equality is the most natural approach, therefore group_eq is a convenient shortcut defined as

• group_if(x, predicate = `==`) for an atomic vector;
• group_if(x, predicate = identical) for a list.

group_if (resp. group_eq) is inspired by groupBy (resp. group) in Haskell. Note that group_if behaves a little differently : while in Haskell, the comparison is made with the first element in the group, in this R-version the comparison is made with the adjacent element.

The operator %on% may be helpful to create a predicate with readable syntax.

Value

A list where each element is a group (flattening this list should give back the same values in the same order). Element names are kept.
Examples

x1 <- c(3, 4, 2, 2, 1, 1, 1, 3)
group_eq(x1)
group_if(x1, `<=`)
group_if(x1, function(x, y) abs(x - y) > 1)

x2 <- c(3, 4, 2, -2, -1, 1, 1, 3)
group_if(x2, `==` %on% abs)

x3 <- list(1:3, 1:3, 3:5, 1, 2)
group_if(x3, `==` %on% length)

iterate

Apply a function repeatedly

Description

Apply a function to a value, then reapply the same function to the result and so on... until a condition on the result is met (or a certain number of iterations reached).

Usage

iterate(x, f, stop_fun = NULL, stop_n = Inf, accumulate = FALSE)

Arguments

x initial value.
f the function to apply.
stop_fun a predicate (function) evaluated on the current result, which will stop the process if its result is TRUE. If not provided, the process will stop after stop_n iteration (see below).
stop_n maximal number of times the function will be applied (mandatory if stop_fun is not defined).
accumulate by default, the function returns only the last element. To get the list of all intermediate results, turn this parameter to TRUE.

Details

As it is a very generic function (x can be any type of object) and the number of computations cannot be known in advance, iterate can be quite inefficient (particularly if you use accumulate = TRUE).

Value

The last result, or the list of all results if accumulate = TRUE.
Examples

```r
# https://en.wikipedia.org/wiki/Collatz_conjecture
syracuse <- function(x) if (x %% 2) 3 * x + 1 else x / 2
iterate(10, syracuse, stop_fun = function(n) n == 1, accumulate = TRUE)
```

```r
# https://en.wikipedia.org/wiki/H%C3%A9non_map
henon_attractor <-
  iterate(c(-1, 0.1), function(x) c(1 - 1.4 * x[1]^2 + x[2], 0.3 * x[1]),
         stop_n = 5000, accumulate = TRUE)
plot(sapply(henon_attractor, function(.) .[1]),
     sapply(henon_attractor, function(.) .[2]), pch = ".")
```

---

**partition**

*Partition a vector in two*

**Description**

Split a vector or a list in 2 groups, given a predicate function.

**Usage**

```r
partition(x, predicate)
```

**Arguments**

- **x**: vector or list to partition.
- **predicate**: a function returning a boolean value, to apply to each element of x.

**Value**

A list of two elements. The first element contains elements of x satisfying the predicate, the second the rest of x. Missing values will be discarded.

**Examples**

```r
partition(c(2, 1, 3, 4, 1, 5), function(x) x < 3)
p
```
Description

Sort a vector or a list, given one or more auxiliary functions.

Usage

`sort_by(x, ..., method = c("auto", "shell", "radix"))`

Arguments

- `x`: vector or list to sort.
- `...`: one or several functions to apply to `x`. Use `descending` for reversed order.
- `method`: the method for ties (see `order`).

Details

The output of the first function will be used as first key for sorting, the output of the second function as second key, and so on... Therefore, these outputs should be sortable (i.e. atomic vectors).

`sort_by` is inspired by `sortBy` in Haskell.

Value

A vector or list containing rearranged elements of `x`.

See Also

- `order` which is used for rearranging elements.

Examples

- `sort_by(-3:2, abs)`
- `sort_by(-3:2, abs, function(x) -x)`
- `sort_by(list(5:7, 0, 1:4), length)`
- `sort_by(list(1:2, 3:4, 5), length, descending(sum))`
**unique_by**

*Unique with auxiliary function*

**Description**

Remove duplicate elements, given a transformation.

**Usage**

```r
unique_by(x, f, first = TRUE)
```

**Arguments**

- **x**: a vector or a list.
- **f**: a function to apply to each element of `x`. This function must produce comparable results.
- **first**: if several elements are identical after being transformed by `f`, keep the first. Otherwise, keep the last.

**Value**

An object of the same type as `x`. Only elements that are unique after being transformed by `f` are kept.

**Examples**

```r
unique_by(-3:2, abs)
unique_by(-3:2, abs, first = FALSE)
unique_by(c(1, 2, 4, 5, 6), function(x) x %% 3)
unique_by(list(1:2, 2:3, 2:4), length)
```

---

**%on%**

*Transform a binary function with a unary function*

**Description**

Execute the binary function `f` on the results of applying unary function `g` to two arguments `x` and `y`.

**Usage**

```r
f %on% g
```

**Arguments**

- **f**: a binary function.
- **g**: a unary function.
Details

Formally, \%on\% is defined this way: \texttt{function(f, g) function(x, y) f(g(x), g(y))}.

\(f\) can be a function taking two arguments but also a variadic function (i.e. whose first argument is \ldots), which will be fed with exactly two arguments.

A typical usage of this function is in combination with function like \texttt{group_if}.

Value

A binary function. This function transforms 2 inputs (with \(g\)) and combines the outputs (with \(f\)).

Examples

\begin{verbatim}
  h <- max %on% abs
  h(-2, 1)
\end{verbatim}
Index

%on%, 3, 7
descending, 2, 6
funprog-package, 2
group_eq (group_if), 3
group_if, 2, 3, 8
iterate, 4
on (%on%), 7
order, 2, 6
partition, 5
sort_by, 2, 6
unique_by, 7