

Package: vntrs (via r-universe)

September 16, 2024

Title Variable Neighborhood Trust Region Search

Version 0.1.1

Description An implementation of the variable neighborhood trust region algorithm Bierlaire et al. (2009) ``A Heuristic for Nonlinear Global Optimization" <doi:10.1287/ijoc.1090.0343>.

Imports trust

License GPL-3

Encoding UTF-8

Roxygen list(markdown = TRUE)

RoxygenNote 7.2.3

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

URL <https://loelschlaeger.de/vntrs/>

Repository <https://loelschlaeger.r-universe.dev>

RemoteUrl <https://github.com/loelschlaeger/vntrs>

RemoteRef HEAD

RemoteSha 2f118a523e19e0fb24cba620b0c45ce040ff9a8d

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check_controls	<i>Check controls</i>
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Description

This function checks the input controls.

Usage

```
check_controls(controls)
```

Arguments

controls	<p>Either NULL or a named list with the following elements. Missing elements are set to the default values in parentheses.</p> <ul style="list-style-type: none"> • <code>init_runs</code> (5): The number of initial searches. • <code>init_min</code> (-1): The minimum argument value for the random initialization. • <code>init_max</code> (1): The maximum argument value for the random initialization. • <code>init_iterlim</code> (20): The number of iterations for the initial searches. • <code>neighborhoods</code> (5): The number of nested neighborhoods. • <code>neighbors</code> (5): The number of neighbors in each neighborhood. • <code>beta</code> (0.05): A non-negative weight factor to account for the function's curvature in the selection of the neighbors. If <code>beta = 0</code>, the curvature is ignored. The higher the value, the higher the probability of selecting a neighbor in the direction of the highest function curvature. • <code>iterlim</code> (1000): The maximum number of iterations to be performed before the local search is terminated. • <code>tolerance</code> (1e-6): A positive scalar giving the tolerance for comparing different optimal arguments for equality. • <code>time_limit</code> (NULL): The time limit in seconds for the algorithm.
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Value

The checked and filled list controls.

vntrs	<i>Variable neighborhood trust region search</i>
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Description

This function performs variable neighborhood trust region search.

Usage

```
vntrs(f, npar, minimize = TRUE, controls = NULL, quiet = TRUE, seed = NULL)
```

Arguments

<code>f</code>	A function that computes value, gradient, and Hessian of the function to be optimized and returns them as a named list with elements <code>value</code> , <code>gradient</code> , and <code>hessian</code> .
<code>npar</code>	The number of parameters of <code>f</code> .
<code>minimize</code>	If TRUE, <code>f</code> gets minimized. If FALSE, maximized.
<code>controls</code>	Either NULL or a named list with the following elements. Missing elements are set to the default values in parentheses. <ul style="list-style-type: none"> <code>init_runs</code> (5): The number of initial searches. <code>init_min</code> (-1): The minimum argument value for the random initialization. <code>init_max</code> (1): The maximum argument value for the random initialization. <code>init_iterlim</code> (20): The number of iterations for the initial searches. <code>neighborhoods</code> (5): The number of nested neighborhoods. <code>neighbors</code> (5): The number of neighbors in each neighborhood. <code>beta</code> (0.05): A non-negative weight factor to account for the function's curvature in the selection of the neighbors. If <code>beta = 0</code>, the curvature is ignored. The higher the value, the higher the probability of selecting a neighbor in the direction of the highest function curvature. <code>iterlim</code> (1000): The maximum number of iterations to be performed before the local search is terminated. <code>tolerance</code> (1e-6): A positive scalar giving the tolerance for comparing different optimal arguments for equality. <code>time_limit</code> (NULL): The time limit in seconds for the algorithm.
<code>quiet</code>	If TRUE, progress messages are suppressed.
<code>seed</code>	Set a seed for the sampling of the random starting points.

Value

A data frame. Each row contains information of an identified optimum. The first `npar` columns "`p1`", ..., "`p<npar>`" store the argument values, the next column "`value`" has the optimal function values and the last column "`global`" contains TRUE for global optima and FALSE for local optima.

References

Bierlaire et al. (2009) "A Heuristic for Nonlinear Global Optimization" [doi:10.1287/ijoc.1090.0343](https://doi.org/10.1287/ijoc.1090.0343).

Examples

```
rosenbrock <- function(x) {
  stopifnot(is.numeric(x))
  stopifnot(length(x) == 2)
  f <- expression(100 * (x2 - x1^2)^2 + (1 - x1)^2)
  g1 <- D(f, "x1")
  g2 <- D(f, "x2")
  h11 <- D(g1, "x1")
  h12 <- D(g1, "x2")
}
```

```
h22 <- D(g2, "x2")
x1 <- x[1]
x2 <- x[2]
f <- eval(f)
g <- c(eval(g1), eval(g2))
h <- rbind(c(eval(h11), eval(h12)), c(eval(h12), eval(h22)))
list(value = f, gradient = g, hessian = h)
}
vntrs(f = rosenbrock, npar = 2, seed = 1, controls = list(neighborhoods = 1))
```

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