Package 'RMPSH'

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Type Package

Title Recursive Modified Pattern Search on Hyper-Rectangle

Version 1.1.1

Depends R (>= 3.5.0)

Imports Rcpp

Collate 'imports.R' 'RcppExports.R' 'RMPSolveH.R' 'RMPSH-package.R'

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Description Optimization of any Black-Box/Non-Convex Function on Hyper-Rectangular Parameter Space. It uses a Variation of Pattern Search Technique. Described in the paper : Das (2016) <arXiv:1604.08616> .

License GPL-3

NeedsCompilation yes

Encoding UTF-8

LazyData true

LinkingTo Rcpp

RoxygenNote 7.1.0

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Description

'RMPSolveH' can be Used to Minimize any Non-Convex Blackbox Function where Each Parameter has an Upper Bound and Lower Bound.

Usage

```
RMPSolveH(
  x0,
  func,
  lb,
  ub,
  rho_1 = 2,
  rho_2 = 2,
  phi = 1e-06,
  no_runs = 1000,
  max_iter = 10000,
  s_init = 2,
  tol_fun = 1e-06,
  tol_fun_2 = 1e-20,
  max_time = 36000,
  print_output = FALSE
)
```

Arguments

x0	Vector of Initial Guess provided by User.
func	The Function to be Optimized, should be provided by the User.
lb	Vector of Lower Bounds, of same Dimension as 'x0'.
ub	Vector of Upper Bound, of same Dimension as 'x0'
rho_1	'Step Decay Rate' for the First Run Only (Default is 2).
rho_2	'Step Decay Rate' for Second Run Onwards (Default is 2).
phi	Lower Bound for 'Global Step Size'. Default value is 10^{-6}.
no_runs	Max Number of 'Runs'. Default Value is 1000.
max_iter	Max Number of Iterations in each 'Run'. Default Value is 10000.
s_init	Initial 'Global Step Size'. Default Value is 2. It must be set Less than or Equal to 2.
tol_fun	Termination Tolerance on when to decrease the 'Global Step Size'. Default Value is 10^{-6}. For more accuracy, user may set it to a Smaller Value e.g., 10^{-20}. However, for Expensive Objective Functions, for Faster Computation, User should set it to a Larger Value e.g, 10^{-3}.

tol_fun_2	Termination Tolerance on the Difference of Norms of solution points in two Consecutive Runs. Default Value is 10^{-20}. However, for Expensive Objective Functions, for Faster Computation, user should set it to a Larger Value e.g, 10^{-6}.
max_time	Time Alloted (In Seconds) for Execution of RMPSH. Default is 36000 secs (10 Hours).
print_output	Binary Command to Print Optimized Value of Objective Function after Each Iteration. Default is set as FALSE.

Value

The Optimal Solution Point.

References

- Das, Priyam
  "Black-box optimization on hyper-rectangle using Recursive Modified Pattern Search and application to ROC-based Classification Problem"
  (available at 'arXiv http://arxiv.org/abs/1604.08616).

Examples

```
g <- function(y)
 return(-20 * exp(-0.2 * sqrt(0.5 * (y[1] ^ 2 + y[2] ^ 2))) -
 exp(0.5 * (cos(2 * pi * y[1]) + cos(2 * pi * y[2]))) + exp(1) + 20)

starting_point <- rep(1, 10)

g(starting_point)

solution <- RMPSolveH(starting_point, g, rep(-33, 10), rep(33, 10))

g(solution)

RMPSolveH(c(2, 4, 6, 2, 1), g, rep(-3, 5), rep(23, 5), print_output = TRUE)
# Will Print the Updates after Each Iteration


g <- function(y)
 return(sum(y ^ 2))
RMPSolveH(rep(2.3, 100),
         g,
         rep(-11, 100),
         rep(13, 100),
         max_time = 2,
         print = 1)
# Will Exit and Return Result after 2 Seconds
```

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