

RcppGO User Guide

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1 Introduction

RcppGO is a package designed for optimization problems. The code was originally written in *Cpp*. With the use of the *Rcpp* package by (Eddelbuettel et al. 2011) it is now translated into *R*. Newton's laws of gravity and motion are the basis of the algorithm as described in (Kaveh and Talatahari 2010). *RcppGO* is an allusion to the integration of *Rcpp*, the concept of *Gravity* at the core of the algorithm and *Optimization* as the purpose of the package.

2 Installation

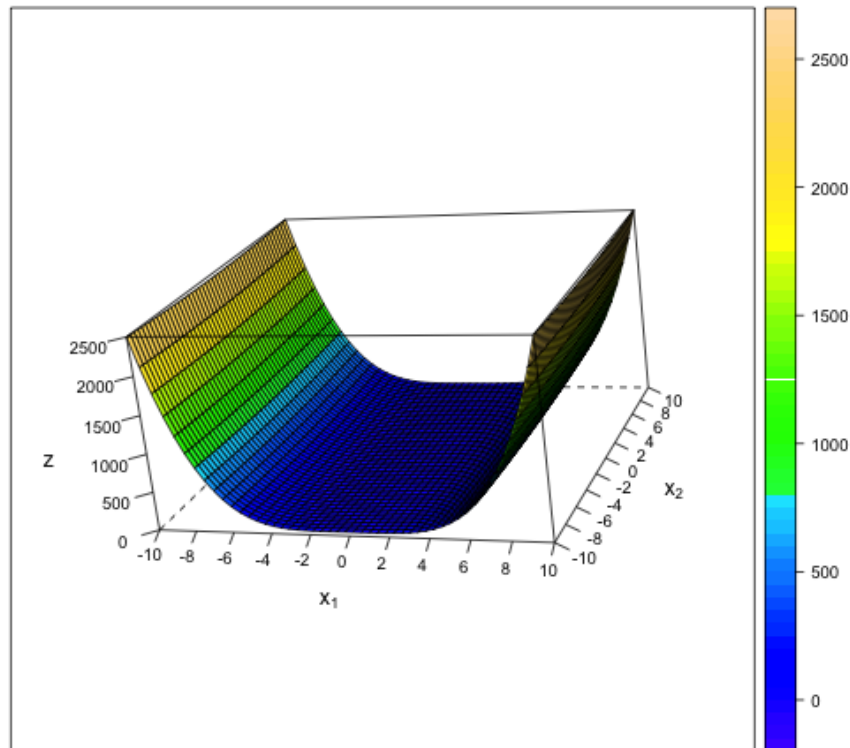
RcppGO is hosted at <https://github.com/peterkehrerjr/RcppGO>. The installation via *github* requires the package *devtools* (Wickham and Chang 2014). Assuming *devtools* is not present in your library, the installation is done via:

```
install.packages("devtools")
library(devtools)
install_github('peterkehrerjr/RcppGO')
```

3 Examples

Let's have a look at our first example, defined by the following objective function:

$$\frac{1}{4}x^4 - \frac{1}{2}x^2 + \frac{1}{10}x + \frac{1}{2}x^2$$



Let's look for the minimum of the function.

After installing the required packages, they have to be loaded into *R*.

```
# defining a benchmark function
# min at -0.352386, X in [-10,10]^2
AluffiPentiny <- function(X)
{
  1/4*X[,1]^4 - 1/2*X[,1]^2 + 1/10*X[,1] + 1/2*X[,2]^2
}

# call and save the optimization process in 'demo01'
demo01 <- RcppG0(ObjectiveFunction=AluffiPentiny,
  Args=2,
  Lower = -10,
  Upper = 10,
  User=FALSE,
  Scale=0.1)

# show the best solutions found
demo01$GMemory
```

```
##      x1  x2 fn_x
## 1  -10 -10 2499
## 2  -10 -10 2499
## 3  -10 -10 2499
## 4  -10 -10 2499
## 5  -10 -10 2499
## 6  -10 -10 2499
## 7  -10 -10 2499
## 8  -10 -10 2499
## 9  -10 -10 2499
## 10 -10 -10 2499
## 11 -10 -10 2499
## 12 -10 -10 2499
## 13 -10 -10 2499
## 14 -10 -10 2499
## 15 -10 -10 2499
## 16 -10 -10 2499
## 17 -10 -10 2499
## 18 -10 -10 2499
## 19 -10 -10 2499
## 20 -10 -10 2499
```

```
plot(x=demo01, plot.type = "wireframe", bestsolution = TRUE)
```

4 The two main functions

5 The RcppGO function

5.1 Parameters

6 The RcppGO.plot method

6.1 Parameters

7 Session Info

```
## R version 3.1.2 (2014-10-31)
## Platform: x86_64-apple-darwin13.4.0 (64-bit)
##
## locale:
## [1] en_GB.UTF-8/en_GB.UTF-8/en_GB.UTF-8/C/en_GB.UTF-8/en_GB.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] devtools_1.6.1
##
## loaded via a namespace (and not attached):
```

```
## [1] digest_0.6.4      evaluate_0.5.5    formatR_1.0      htmltools_0.2.6
## [5] knitr_1.8           packrat_0.4.1.8  rmarkdown_0.3.10 stringr_0.6.2
## [9] tools_3.1.2        yaml_2.1.13
```

References

Eddelbuettel, Dirk, Romain François, J Allaire, John Chambers, Douglas Bates, and Kevin Ushey. 2011. “Rcpp: Seamless R and C++ Integration.” *Journal of Statistical Software* 40 (8): 1–18.

Kaveh, A, and S Talatahari. 2010. “A Novel Heuristic Optimization Method: Charged System Search.” *Acta Mechanica* 213 (3-4): 267–89. doi:[10.1007/s00707-009-0270-4](https://doi.org/10.1007/s00707-009-0270-4).

Wickham, Hadley, and Winston Chang. 2014. *devtools: Tools to Make Developing R Code Easier*. <http://CRAN.R-project.org/package=devtools>.