RcppOctave: Seamless Interface to Octave – and Matlab

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RcppOctave package – Version 0.7.2 [April 10, 2012]

Abstract

The *RcppOctave* package provides a direct interface to *Octave* from *R*. It allows *Octave* functions to be called from an *R* session, in a similar way *C/C++* or *Fortran* functions are called using the base function `.Call`. Since *Octave* uses a language that is mostly compatible with Matlab®, the *RcppOctave* package may also be used to run Matlab m-files.

As a matter of fact, this package was originally developed to facilitate the port and comparison of R and Matlab code. In particular, it provides *Octave* modules that redefine *Octave* default random number generator functions, so that they call *R* own dedicated functions like `runif`, `rnorm`, etc.... This enables to easily reproduce and compare stochastic computations.

Contents

In many research fields, source code of algorithms and statistical methods are published as Matlab files (the so called m-files). While the code is generally released under public Open Source licenses like the GNU Public Licenses (GPLs) [3], effectively running/using it require either to have Matlab®, which is a nice but expensive proprietary software, or to be at least a bit familiar with *Octave* [1], which is free and open source, and is able to read and execute m-files – as long as these do not require Matlab-specific functions. Arguably, *R* users may neither have Matlab, nor the time/will required to become *Octave*-skilled, and yet want to use or incorporate their analysis pipelines algorithms written for Matlab.

Rcpp package[1] [2]

1 Calling Octave functions from R

The *p*ackage provides the function `.CallOctave` to call Octave functions from R, mimicking the way native *C/C++* functions are called with `.Call`:

```
.O$eye(3)

##      [,1] [,2] [,3]
## [1,]    1    0    0
## [2,]    0    1    0
## [3,]    0    0    1

.O$svd(matrix(1:9, 3))
```

[1] http://cran.r-project.org/package=Rcpp

```
##           [,1]
## [1,] 1.685e+01
## [2,] 1.068e+00
## [3,] 5.543e-16
```

2 Calling R functions from Octave

TODO

3 Direct interface: the `.O` object

A convenient shortcut interface in defined by the object `.O` of class `Octave`, exported from *RcppOctave* package namespace:

```
.O$eye(3)

##      [,1] [,2] [,3]
## [1,]    1    0    0
## [2,]    0    1    0
## [3,]    0    0    1

.O$svd(matrix(1:9, 3))

##           [,1]
## [1,] 1.685e+01
## [2,] 1.068e+00
## [3,] 5.543e-16
```

4 Sample session

Comparing equivalent R and Octave functions is therefore as easy as comparing two R functions. For example, one can compare the respective functions `svd` with the following code:

```
# define random data
X <- matrix(runif(25), 5)

# run SVD in R
svd.R <- svd(X)
# run SVD in Octave
svd.O <- .O$svd(X)
# check results
svd.O

##         [,1]
## [1,] 2.39155
## [2,] 0.68473
## [3,] 0.60424
## [4,] 0.22114
## [5,] 0.06577

all.equal(svd.R$d, as.numeric(svd.O))
```

```
## [1] TRUE

# but not exactly identical
all.equal(svd.R$d, as.numeric(svd.O), tol = 10^-16)

## [1] "Mean relative difference: 1.532e-16"
```

We notice here that Octave default `svd` returns only the eigen values as a column vector. This is documented in its documentation that is accessible via the function `o_help`, which will show it in a similar way as R documentation:

```
# show Octave help for svd
o_help(svd)
```

The documentation for – Octave – `svd` states that the complete decomposition is returned, if three output values are provided. This can be done using argument `argout`:

```
# get full output from Octave svd
.O$svd(X, argout = 3)

## [[1]]
##         [,1]     [,2]    [,3]    [,4]     [,5]
## [1,] -0.3892  0.01048  0.5656  0.1334 -0.71464
## [2,] -0.5094 -0.66011 -0.4325  0.3430 -0.01055
## [3,] -0.5573  0.44203 -0.4377 -0.5329 -0.13586
## [4,] -0.3426 -0.33944  0.5254 -0.4840  0.50708
## [5,] -0.4014  0.50352  0.1596  0.5885  0.46216
##
## [[2]]
##       [,1]   [,2]   [,3]   [,4]    [,5]
## [1,] 2.392 0.0000 0.0000 0.0000 0.00000
## [2,] 0.000 0.6847 0.0000 0.0000 0.00000
## [3,] 0.000 0.0000 0.6042 0.0000 0.00000
## [4,] 0.000 0.0000 0.0000 0.2211 0.00000
## [5,] 0.000 0.0000 0.0000 0.0000 0.06577
##
## [[3]]
##         [,1]     [,2]     [,3]    [,4]     [,5]
## [1,] -0.3153  0.28972 -0.45368 -0.5351 -0.56965
## [2,] -0.5920  0.54401  0.34941  0.4676 -0.11309
## [3,] -0.4500 -0.47632 -0.60301  0.4505  0.06398
## [4,] -0.3534 -0.62536  0.55487 -0.2208 -0.35692
## [5,] -0.4719  0.04642  0.02428 -0.4933  0.72885
##
```

Session information

```
R version 2.14.2 (2012-02-29)
Platform: x86_64-pc-linux-gnu (64-bit)

locale:
 [1] LC_CTYPE=en_ZA.UTF-8       LC_NUMERIC=C
```

```
 [3] LC_TIME=en_ZA.UTF-8        LC_COLLATE=en_ZA.UTF-8
 [5] LC_MONETARY=en_ZA.UTF-8    LC_MESSAGES=en_US.UTF-8
 [7] LC_PAPER=C                 LC_NAME=C
 [9] LC_ADDRESS=C               LC_TELEPHONE=C
[11] LC_MEASUREMENT=en_ZA.UTF-8 LC_IDENTIFICATION=C

attached base packages:
[1] methods   stats     graphics  grDevices utils     datasets  base

other attached packages:
[1] RcppOctave_0.7.2 Rcpp_0.9.10      knitr_0.4

loaded via a namespace (and not attached):
[1] codetools_0.2-8 digest_0.5.2    evaluate_0.4.1  formatR_0.3-4
[5] highlight_0.3.1 parser_0.0-14   plyr_1.7.1      stringr_0.6
[9] tools_2.14.2
```

References

[1] John W Eaton. *GNU Octave Manual*. Network Theory Limited, 2002. ISBN: 0-9541617-2-6. URL: http://www.octave.org/.

[2] Dirk Eddelbuettel and Romain François. "Rcpp: Seamless R and C++ Integration". In: *Journal of Statistical Software* 40.8 (2011), pp. 1–18. URL: http://www.jstatsoft.org/v40/i08/.

[3] Free Software Foundation. *GNU General Public License*. 2011. URL: http://www.gnu.org/licenses/gpl.html.