Package ‘RcppClassicExamples’

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Title Examples using 'RcppClassic' to Interface R and C++
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Description The 'Rcpp' package contains a C++ library that facilitates the
integration of R and C++ in various ways via a rich API. This API was
preceded by an earlier version which has been deprecated since 2010 (but is
still supported to provide backwards compatibility in the package
'RcppClassic'). This package 'RcppClassicExamples' provides usage examples for
the older, deprecated API. There is also a corresponding package
'RcppExamples' with examples for the newer, current API which we
strongly recommend as the basis for all new development.
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R topics documented:

  RcppClassicExamples-package ........................................ 2
  RcppDataFrame ...................................................... 3
  RcppDate .......................................................... 4
  RcppExample ....................................................... 6
  RcppParams ......................................................... 8
Description

This package shows some simple examples for the use of the deprecated classic API from the first implementation of Rcpp.

Note that the RcppClassic package has been deprecated since 2010, all new development should use the Rcpp package instead.

Details

The Rcpp package provides a number of C++ classes that ease access to C++ from R. This comprises both passing parameters to functions, as well as returning results back from C++ to R.

Two APIs are supported. The first is an older API which was first introduced mostly in 2006 and extended in 2008. This interface is used by a few other packages and will be supported going forward in the RcppClassic-package package.

A second and newer API that was started in 2009 offers more functionality, see the Rcpp-package package.

The RcppExamples package provides some simple examples for use of Rcpp.

Author(s)

Dominick Samperi wrote the initial versions of Rcpp (and RcppTemplate) during 2005 and 2006. Dirk Eddelbuettel made some additions, and became maintainer in 2008. Dirk Eddelbuettel and Romain Francois have been extending Rcpp since 2009.

See Also

See the RcppExamples-package for examples of the recommended Rcpp API and Rcpp-package for documentation on the recommended API to extend R with C++ code, while the deprecated RcppClassic-package documents the older, deprecated API.
RcppDataFrame  

Description

A DataFrame can be passed C++ and can be instantiated as a corresponding C++ object using the Rcpp API.

This example shows (in the corresponding C++ code) how to access, modify and create a data frame.

Note that the RcppClassic package has been deprecated since 2010, all new development should use the Rcpp package instead.

Details

Usage of Rcpp::DataFrame is fully defined in the respective header file.

The C++ source file corresponding to the this function does the following (inside of a try/catch block):

```cpp
// construct the data.frame object
Rcpp::DataFrame DF = Rcpp::DataFrame(Dsexp);

// and access each column by name
Rcpp::IntegerVector a = DF["a"];
Rcpp::CharacterVector b = DF["b"];
Rcpp::DateVector c = DF["c"];

// do something
a[2] = 42;
b[1] = "foo";
c[0] = c[0] + 7; // move up a week

// create a new data frame
Rcpp::DataFrame NDF =
Rcpp::DataFrame::create(Rcpp::Named("a")=a,
Rcpp::Named("b")=b,
Rcpp::Named("c")=c);

// and return old and new in list
return(Rcpp::List::create(Rcpp::Named("origDataFrame")=DF,
Rcpp::Named("newDataFrame")=NDF));
```

Author(s)

Dirk Eddelbuettel and Romain Francois
See Also

See the RcppExamples-package for examples of the recommended Rcpp API and Rcpp-package for documentation on the recommended API to extend R with C++ code, while the deprecated RcppClassic-package documents the older, deprecated API.

Examples

## Not run:
RcppDataFrame()

## End(Not run)

RcppDate  
C++ classes for interfacing date and datetime R objects – deprecated API

Description

RcppDate, RcppDatetime, RcppDateVector and RcppDatetimeVector are C++ classes defined in their respective headers files. They are part of the ‘classic’ Rcpp API. These classes pass scalars and vectors of R objects of types Date and POSIXct, respectively, to C++ via the .Call() function interface.

Member functions are provided to query the dimension of the vector or matrix object, convert it in a corresponding C representation.

R objects of type Date, and hence the RcppDate and RcppDateVector objects, are internally represented as an integer counting days since the epoch, i.e. January 1, 1970. Similarly, R objects of type POSIXct and the RcppDatetime and RcppDatetimeVector objects, are internally represented as seconds since the epoch. However, R extends the POSIX standard by using a double leading to microsecond precision in timestamps. This is fully supported by Rcpp as well.

The new API currently has the classes Rcpp::Date, Rcpp::Datetime, Rcpp::DateVector and Rcpp::DatetimeVector which are preferred for new developments, as is the rest of the new API in the Rcpp package while the RcppClassic package has been deprecated since 2010.

Details

Usage of the RcppDate, RcppDatetime (and their vector extensions) in C++ is fully defined in the respective header files RcppDate.h and RcppDatetime.h.

As example, consider a call from R to C++ such as

```r
# an R example passing one type of each class to a function
# someFunction in package somePackage
val <- .Call("someFunction",
    Sys.Date(),    # current date
    Sys.time(),    # current timestamp
    as.Date("2000-02-25")
    + 0:5,         # date vector
```
ISOdatetime(1999,12,31,23,59,0) + (0:5)*0.250, # datetime vector
PACKAGE="somePackage")

At the C++ level, the corresponding code to assign these parameter to C++ objects is can be as follows::

```r
SEXP someFunction(SEXP ds, SEXP dts,
                  SEXP dvs, SEXP dtvs) {
    RcppDate d(ds);
    RcppDatetime dt(dts);
    RcppDateVector dv(dvs);
    RcppDatetimeVector dtv(dtvs);
}
```

Standard accessor functions are defined, see RcppDate.h and RcppDatetime.h for details. Objects of these types can also be returned via RcppResultSet.

**Author(s)**

Dominick Samperi wrote the initial versions of Rcpp (and RcppTemplate) during 2005 and 2006. Dirk Eddelbuettel made some additions, and became maintainer in 2008. Dirk Eddelbuettel and Romain Francois have been extending Rcpp since 2009.

**References**

*Writing R Extensions*, available at [https://www.r-project.org](https://www.r-project.org).

**See Also**

RcppResultSet.

See the RcppExamples-package for examples of the recommended Rcpp API and Rcpp-package for documentation on the recommended API to extend R with C++ code, while the deprecated RcppClassic-package documents the older, deprecated API.

**Examples**

```r
# set up date and datetime vectors
dvec <- Sys.Date() + -2:2
dtvec <- Sys.time() + (-2:2)*0.5

# call the underlying C++ function
result <- RcppDateExample(dvec, dtvec)

# inspect returned object
result
```
RcppExample

Description

RcppExample illustrates how the older Rcpp R/C++ interface class library is used. It provides fairly complete coverage for the older 'classic' API.

Note that the RcppClassic package has been deprecated since 2010, all new development should use the Rcpp package instead.

Usage

RcppExample(params, nlist, numvec, nummat, df, datevec, stringvec, fnvec, fnlist)
## S3 method for class 'RcppExample'
print(x,...)

Arguments

params A heterogeneous list specifying method (string), tolerance (double), maxIter (int).
nlist a list of named numeric values (double or int).
numvec a numeric 1D vector (double or int).
nummat a numeric 2D matrix (double or int).
df a data frame.
datevec a vector of Date's.
stringvec a vector of strings.
fnvec an R function with numeric vector argument.
fnlist an R function with list argument.
x Object of type RcppExample.
... Extra named parameters.

Details

The C++ representation of data frames are not passed back to R in a form that R recognizes as a data frame, but it is a simple matter to do the conversion. For example, the return value named PreDF (see return values below) is not seen as a data frame on the R side (thus the name "pre-data frame"), but it can be converted to a data frame using df <- data.frame(result$PreDF).

The print.RcppExample() function is defined so that we can control what gets printed when a variable assigned the return value is entered on a line by itself. It is defined to simply list the names of the fields returned (see RcppExample.R).
Value

RcppExample returns a list containing:

- `method`: string input parameter
- `tolerance`: double input parameter
- `maxIter`: int input parameter
- `nlFirstName`: first name in nlist
- `nlFirstValue`: first value in nlist
- `matD`: R matrix from an RcppMatrix<double> object
- `stlvec`: R vector from a vector<double> object
- `stlmat`: R matrix from a vector<vector<double> > object
- `a`: R matrix from C/C++ matrix
- `v`: R vector from C/C++ vector
- `strings`: R vector of strings from vector<string> object
- `InputDF`: a data frame passed in from R
- `PreDF`: a data frame created on C++ side to be passed back to R
- `params`: input parameter list (this is redundant because we returned the input parameters above)

Author(s)

Dominick Samperi wrote the initial versions of Rcpp (and RcppTemplate) during 2005 and 2006. Dirk Eddelbuettel made some additions, and became maintainer in 2008. Dirk Eddelbuettel and Romain Francois have been extending Rcpp since 2009.

References


See Also

See the RcppExamples-package for examples of the recommended Rcpp API and Rcpp-package for documentation on the recommended API to extend R with C++ code, while the deprecated RcppClassic-package documents the older, deprecated API.

Examples

```r
params <- list(method='BFGS',
               tolerance=1.0e-8,
               maxIter=1000,
               startDate=as.Date('2006-7-15'))

nlist <- list(ibm = 80.50, hp = 53.64, c = 45.41)

numvec <- seq(1,5) # numerical vector
```

nummat <- matrix(seq(1,20),4,5) # numerical matrix

stringvec <- c("hello", "world", "fractal") # string vector

datestr <- c('2006-6-10', '2006-7-12', '2006-8-10')
datevec <- as.Date(datestr, "%Y-%m-%d") # date vector

df <- data.frame(a=c(TRUE, TRUE, FALSE), b=I(c('a', 'b', 'c')),
c=c('beta', 'beta', 'gamma'), dates=datevec)

fnvec <- function(x) { sum(x) } # Add up components of vector

fnlist <- function(l) { # Return vector with 1 added to each component
  vec <- c(l$alpha + 1, l$beta + 1, l$gamma + 1)
  vec
}

result <- RcppExample(params, nlist, numvec, nummat, df, datevec,
  stringvec, fnvec, fnlist)

result

---

### Description

RcppParams is a C++ class defined in Rcpp.h that receive any number of scalar parameters of types in a single named list object from R through the .Call() function.

The parameters can be of different types that are limited to the R types numeric, integer, character, logical or Date. These types are mapped into, respectively, the corresponding C++ types double, int, string, bool and Date (a custom class defined by Rcpp).

RcppParams is part of the old deprecated Rcpp API, and should be replaces by Rcpp::List which is more flexible and can be used for both inputs and outputs. RcppParams is retained for backwards compatibility, but should be avoided in new projects and replaced in old projects.

Note that the RcppClassic package has been deprecated since 2010, all new development should use the Rcpp package instead.

### Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>params</td>
<td>A heterogeneous list specifying method (string), tolerance (double), maxIter (int) and startDate (Date in R, RcppDate in C++).</td>
</tr>
</tbody>
</table>
Details

Usage of RcppParams from R via `.Call()` is as follows:

```r
# an R example passing one type of each class to a function
# someFunction in package somePackage
val <- .Call("someFunction",
  list(pie=3.1415, magicanswer=42, sometext="foo",
       yesno=true, today=Sys.date()),
  PACKAGE="somePackage")
```

At the C++ level, the corresponding code to assign these parameter to C++ objects is

```c++
SEXP someFunction(SEXP params) {
  RcppParams par(params);
  double p = par.getDoubleValue("pie");
  int magic = par.getIntValue("magicanswer");
  string txt = par.getStringValue("sometext");
  bool yn = par.getBoolValue("yesno");
  RcppDate d = par.getDateValue("today");
  // some calculations ... 
  // some return values ...
}
```

As the lookup is driven by the names given at the R level, order is not important. It is however important that the types match. Errors are typically caught and an exception is thrown.

The class member function checkNames can be used to verify that the SEXP object passed to the function contains a given set of named object.

Value

RcppExample returns a list containing:

- method                  string input parameter
- tolerance               double input parameter
- maxIter                 int input parameter
- startDate               Date type with starting date
- params                  input parameter list (this is redundant because we returned the input parameters above)

Author(s)

Dominick Samperi wrote the initial versions of Rcpp (and RcppTemplate) during 2005 and 2006. Dirk Eddelbuettel made some additions, and became maintainer in 2008. Dirk Eddelbuettel and Romain Francois have been extending Rcpp since 2009.
References


See Also

RcppExample.

See the RcppExamples-package for examples of the recommended Rcpp API and Rcpp-package for documentation on the recommended API to extend R with C++ code, while the deprecated RcppClassic-package documents the older, deprecated API.

Examples

```r
# set up some value
params <- list(method='BFGS',
                tolerance=1.0e-5,
                maxIter=100,
                startDate=as.Date('2006-7-15'))

# call the underlying C++ function
result <- RcppParamsExample(params)

# inspect returned object
result
```

RcppResultSet

---

### Description

RcppResultSet is a C++ class defined in RcppResultSet.h that can assign any number of C++ objects to R in a single named list object as the SEXP return value of a .Call() function call. It is part of the classic API.

The C++ objects can be of different types that are limited to types double, int, string, vectors of double or int (with explicit dimensions), matrices of double or int (with explicit dimensions), STL vectors of double, int or string, STL ‘vector of vectors’ of types double or int (all with implicit dimensions), the internal types RcppDate, RcppDateVector, RcppStringVector, RcppVector of types double or int, RcppMatrix of types double or int as well RcppFrame, a type that can be converted into a data.frame, and the R type SEXP.

Where applicable, the C++ types are automatically converted to the corresponding R types structures around types numeric, integer, or character. The C++ code can all be retrieved in R as elements of a named list object.

The new API has more generic templated functions.

Note that the RcppClassic package has been deprecated since 2010, all new development should use the Rcpp package instead.
Details

Usage of RcppResultSet from C++ is fully defined in RcppResultSet.h. An example for returning data to R at the end of a .Call() call follows.

At the C++ level, the corresponding code to assign these parameter to C++ objects is can be as follows (taken from the C++ source of RcppExample):

```cpp
SEXP rl;
RcppResultSet rs;

rs.add("date", aDate); // RcppDate
rs.add("dateVec", dateVec); // RcppDateVec
rs.add("method", method); // string
rs.add("tolerance", tol); // numeric
rs.add("maxIter", maxIter); // int
rs.add("matD", matD); // RcppMatrix
rs.add("stlvec", stlvec); // vector<double> or <int>
rs.add("stlmat", stlmat); // vector<vector<double>>
rs.add("a", a, nrows, ncols); // double** (or int**) with
// two dimension
rs.add("v", v, len); // double* (or int*) with
// one dimension
rs.add("stringVec", strVec); // RcppStringVector
rs.add("strings", svec); // vector<string>
rs.add("InputDF", inframe); // RcppFrame
rs.add("PreDF", frame); // RcppFrame

rl = rs.getReturnList();
return(rl);
```

As the R level, we assign the returned object a list variables from which we select each list element by its name. lookup is driven by the names given at the R level, order is not important. It is however important that the types match. Errors are typically caught and an exception is thrown.

The class member function checkNames can be used to verify that the SEXP object passed to the function contains a given set of named object.

Author(s)

Dominick Samperi wrote the initial versions of Rcpp (and RcppTemplate) during 2005 and 2006. Dirk Eddelbuettel made some additions, and became maintainer in 2008. Dirk Eddelbuettel and Romain Francois have been extending Repp since 2009.

See Also

RcppExample.
See the `RcppExamples-package` for examples of the recommended `Rcpp` API and `Rcpp-package` for documentation on the recommended API to extend R with C++ code, while the deprecated `RcppClassic-package` documents the older, deprecated API.

### Examples

```r
# example from RcppDate
# set up date and datetime vectors
dvec <- Sys.Date() + -2:2
dtvec <- Sys.time() + (-2:2)%*%0.5

# call the underlying C++ function
result <- RcppDateExample(dvec, dtvec)

# inspect returned object
result
```

### Description

`RcppVector`, `RcppMatrix` and `RcppStringVector` are C++ classes that can pass vectors (matrices) of R objects of appropriate types to C++ via the `.Call()` function interface. They are part of the 'classic' Rcpp API.

The vector and matrix types are templated and can operate on R types integer and numeric.

The `RcppVectorView` and `RcppMatrixView` are slightly more lightweight read-only variants.

Member functions are provided to query the dimension of the vector or matrix object, convert it in a corresponding C representation, and also to convert it into a corresponding STL object.

The new API has classes `NumericVector`, `NumericMatrix`, `CharacterVector` (and also an alias `StringVector`).

The files `RcppVectorExample.cpp` and `RcppMatrixExample.cpp` provide examples for both the classic and new APIs.

Note that the `RcppClassic` package has been deprecated since 2010, all new development should use the `Rcpp` package instead.

### Details

Usage of `RcppVector`, `RcppMatrix` and `RcppStringVector` in C++ is fully defined in the respective header files.

As example, consider a call from R to C++ such as

```r
# an R example passing one type of each class to a function
# someFunction in package somePackage
val <- .Call("someFunction",
```
RcppVector

\[
\begin{align*}
\text{rnorm(100),} & \quad \# \text{ numeric vector} \\
\text{sample(1:10, 5, TRUE)} & \quad \# \text{ int vector} \\
\text{search(),} & \quad \# \text{ character vector} \\
\text{as.matrix(rnorm(100),10,10),} & \quad \# \text{ matrix} \\
\text{PACKAGE="somePackage"}
\end{align*}
\]

At the C++ level, the corresponding code to assign these parameter to C++ objects is can be as follows (taken from the C++ source of RcppExample):

```cpp
SEXP someFunction(SEXP nvec, SEXP ivec,
                  SEXP svec, SEXP nmat) {

    RcppVector<double> nv(nvec);
    RcppVector<int> iv(ivec);
    RcppStringVector sv(svec);
    RcppMatrix<double> nm(nmat);
}
```

These C++ objects could then be queried via

```cpp
int n = nv.size();
int d1 = nm.dim1(), d2 = nm.dim2();
```

to retrieve, respectively, vector length and matrix dimensions.

Moreover, the stlVector() and stlMatrix() member functions can be used to convert the objects into STL objects:

```cpp
vector<int> ivstl = iv.stlVector();
vector< vector< double > > = nm.stlMatrix();
```

Author(s)

Dominick Samperi wrote the initial versions of Rcpp (and RcppTemplate) during 2005 and 2006. Dirk Eddelbuettel made some additions, and became maintainer in 2008. Dirk Eddelbuettel and Romain Francois have been extending Rcpp since 2009.

See Also

RcppExample.

See the RcppExamples-package for examples of the recommended Rcpp API and Rcpp-package for documentation on the recommended API to extend R with C++ code, while the deprecated RcppClassic-package documents the older, deprecated API.
Examples

# set up some value
vector <- (seq(1,9))^2

# call the underlying C++ function
result <- RcppVectorExample(vector)

# inspect returned object
result
Index

* interface
  RcppDataFrame, 3
  RcppDate, 4
  RcppExample, 6
  RcppParams, 8
  RcppResultSet, 10
  RcppVector, 12

* package
  RcppClassicExamples-package, 2

* programming
  print.RcppExample (RcppExample), 6
  Rcpp--package, 2, 4, 5, 7, 10, 12, 13
  RcppClassic--package, 2, 4, 5, 7, 10, 12, 13
  RcppClassicExamples
    (RcppClassicExamples-package), 2
  RcppClassicExamples-package, 2
  RcppDataFrame, 3
  RcppDate, 4
  RcppDateExample (RcppDate), 4
  RcppDateTime (RcppDate), 4
  RcppDateTimeVector (RcppDateTime), 4
  RcppDateVector (RcppDate), 4
  RcppExample, 6
  RcppExamples--package, 2, 4, 5, 7, 10, 12, 13
  RcppMatrix (RcppVector), 12
  RcppMatrixExample (RcppVector), 12
  RcppMatrixView (RcppVector), 12
  RcppParams, 8
  RcppParamsExample (RcppParams), 8
  RcppResultSet, 10
  RcppStringVector (RcppVector), 12
  RcppStringVectorExample (RcppVector), 12
  RcppVector, 12
  RcppVectorExample (RcppVector), 12
  RcppVectorView (RcppVector), 12