Package 'RcppBessel'

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Type Package

Title Bessel Functions Rcpp Interface

Version 1.0.0

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Description Exports an 'Rcpp' interface for the Bessel functions in the 'Bessel' package, which can then be called from the 'C++' code of other packages. For the original 'Fortran' implementation of these functions see Amos (1995) <doi:10.1145/212066.212078>.

License GPL (>= 2)

Encoding UTF-8

RoxygenNote 7.3.2

LinkingTo Rcpp

Imports Rcpp (>= 1.0.12), Rdpack

URL https://github.com/alexiosg/RcppBessel

RdMacros Rdpack

Suggests knitr, rmarkdown, roxygen2, Bessel, testthat (>= 3.0.0), microbenchmark

VignetteBuilder knitr

Config/testthat/edition 3

NeedsCompilation yes

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Repository CRAN

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Contents

`airy_a` *The AiryA Function*

Description

Computes the Airy function Ai for real or complex inputs.

Usage

```
airy_a(z, deriv = 0, expon_scaled = FALSE, verbose = 0)
```

Arguments

`z`	A numeric or complex vector representing the input values at which to evaluate the Airy function.
`deriv`	An integer indicating whether to compute the function (`0` for the function itself) or its first derivative (`1` for the first derivative). Defaults to `0`.
`expon_scaled`	A logical value indicating whether to use the exponentially scaled form of the Airy function. Defaults to `FALSE`.
`verbose`	An integer specifying the verbosity level for error messages. Defaults to `0`.

Value

A numeric or complex vector (depending on the input) containing the values of the `airy_a` function evaluated at the points in `z`.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

airy_b *The AiryB Function*

Description

Computes the Airy function Bi for real or complex inputs.

Usage

```
airy_b(z, deriv = 0, expon_scaled = FALSE, verbose = 0)
```

Arguments

z	A numeric or complex vector representing the input values at which to evaluate the Airy function.
deriv	An integer indicating whether to compute the function (0 for the function itself) or its first derivative (1 for the first derivative). Defaults to 0.
expon_scaled	A logical value indicating whether to use the exponentially scaled form of the Airy function. Defaults to FALSE.
verbose	An integer specifying the verbosity level for error messages. Defaults to 0.

Value

A numeric or complex vector (depending on the input) containing the values of the airy_b function evaluated at the points in z.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

bessel_h *The BesselH Function*

Description

Computes the Hankel function (Bessel function of the third kind) for real or complex inputs.

Usage

```
bessel_h(m, z, nu, expon_scaled = FALSE, verbose = 0)
```

Arguments

m	An integer representing the type of Hankel function. It must be either 1 (for the first kind) or 2 (for the second kind).
z	A numeric or complex vector representing the input values at which to evaluate the Hankel function.
nu	A double representing the order of the Hankel function.
expon_scaled	A logical value indicating whether to use the exponentially scaled form of the Hankel function. Defaults to FALSE.
verbose	An integer specifying the verbosity level for error messages. Defaults to 0.

Value

A complex vector containing the values of the bessel_h function evaluated at the points in z.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

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bessel_i *The BesselI Function*

Description

Computes the modified Bessel function of the first kind for real or complex inputs.

Usage

```
bessel_i(z, nu, expon_scaled = FALSE, verbose = 0)
```

Arguments

z	A numeric or complex vector representing the input values at which to evaluate the Bessel function.
nu	A double representing the order of the Bessel function.
expon_scaled	A logical value indicating whether to use the exponentially scaled form of the Bessel function. Defaults to FALSE.
verbose	An integer specifying the verbosity level for error messages. Defaults to 0.

Value

A numeric or complex vector (depending on the input) containing the values of the bessel_i function evaluated at the points in z.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

`bessel_j` *The BesselJ Function*

Description

Computes the Bessel function of the first kind for real or complex inputs.

Usage

```
bessel_j(z, nu, expon_scaled = FALSE, verbose = 0)
```

Arguments

`z`	A numeric or complex vector representing the input values at which to evaluate the Bessel function.
`nu`	A double representing the order of the Bessel function.
`expon_scaled`	A logical value indicating whether to use the exponentially scaled form of the Bessel function. Defaults to `FALSE`.
`verbose`	An integer specifying the verbosity level for error messages. Defaults to `0`.

Value

A numeric or complex vector (depending on the input) containing the values of the `bessel_j` function evaluated at the points in `z`.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

bessel_k *The BesselK Function*

Description

Computes the modified Bessel function of the second kind for real or complex inputs.

Usage

```
bessel_k(z, nu, expon_scaled = FALSE, verbose = 0)
```

Arguments

z	A numeric or complex vector representing the input values at which to evaluate the Bessel function.
nu	A double representing the order of the Bessel function.
expon_scaled	A logical value indicating whether to use the exponentially scaled form of the Bessel function. Defaults to FALSE.
verbose	An integer specifying the verbosity level for error messages. Defaults to 0.

Value

A numeric or complex vector (depending on the input) containing the values of the bessel_k function evaluated at the points in z.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

bessel_y *The BesselY Function*

Description

Computes the Bessel function of the second kind (Neumann function) for real or complex inputs.

Usage

```
bessel_y(z, nu, expon_scaled = FALSE, verbose = 0)
```

Arguments

z	A numeric or complex vector representing the input values at which to evaluate the Bessel function.
nu	A double representing the order of the Bessel function.
expon_scaled	A logical value indicating whether to use the exponentially scaled form of the Bessel function. Defaults to FALSE.
verbose	An integer specifying the verbosity level for error messages. Defaults to 0.

Value

A numeric or complex vector (depending on the input) containing the values of the bessel_y function evaluated at the points in z.

References

Maechler M (2024). *Bessel: Computations and Approximations for Bessel Functions*. R package version 0.6-1, https://CRAN.R-project.org/package=Bessel.
Amos DE (1995). "A remark on Algorithm 644: "A portable package for Bessel functions of a complex argument and nonnegative order"." *ACM Transactions on Mathematical Software (TOMS)*, **21**(4), 388–393.

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