Arbitrarily Accurate Computation with R: Package 'Rmpfr'

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The *R* package **Rmpfr** allows to use arbitrarily precise numbers instead of *R*'s double precision numbers in many *R* computations and functions.

This is achieved by defining S4 classes of such numbers and vectors, matrices, and arrays thereof, where all arithmetic and mathematical functions work via the (GNU) MPFR C library, where MPFR is acronym for "***M**ultiple **P**recision **F**loating-Point **R**eliably*". MPFR is Free Software, available under the LGPL license, and itself is built on the free GNU Multiple Precision arithmetic library (GMP).

Consequently, by using **Rmpfr**, you can often call your *R* function or numerical code with mpfr–numbers instead of simple numbers, and all results will automatically be much more accurate.

```
> options(digits = 17)# to print to full "standard R" precision
> .N <- function(.) mpfr(., precBits = 200)
> exp(   1 )

[1] 2.7182818284590451

> exp(.N(1))

1 'mpfr' number of precision  200   bits
[1] 2.7182818284590452353602874713526624977572470936999595749669679
```

Applications by the package author include testing of Bessel or polylog functions and distribution computations, e.g. for stable distributions. In addition, the **Rmpfr** has been used on the `R-help` or `R-devel` mailing list for high-accuracy computations, e.g., in comparison with results from commercial software such as Maple, and in private communications with Petr Savicky about fixing *R* bug `PR#14491`.

We expect the package to be used in more situations for easy comparison studies about the accuracy of algorithms implemented in *R*, both for "standard *R*" and extension packages.

References

Fousse L, Hanrot G, Lefèvre V, Pélissier P, Zimmermann P (2011). *MPFR: A multiple-precision binary floating-point library with correct rounding*. URL http://mpfr.org/.

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