Package ‘quantities’

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Type Package

Title Quantity Calculus for R Vectors

Version 0.1.6

Description Integration of the 'units' and 'errors' packages for a complete quantity calculus system for R vectors, matrices and arrays, with automatic propagation, conversion, derivation and simplification of magnitudes and uncertainties. Documentation about 'units' and 'errors' is provided in the papers by Pebesma, Mailund & Hiebert (2016, <doi:10.32614/RJ-2016-061>) and by Ucar, Pebesma & Azcorra (2018, <doi:10.32614/RJ-2018-075>), included in those packages as vignettes; see 'citation("quantities")' for details.

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BugReports https://github.com/r-quantities/quantities/issues

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quantities-package  quantities: Quantity Calculus for R Vectors

Description

Support for painless automatic units and uncertainty propagation in numerical operations. Both units and errors are integrated into a complete quantity calculus system within the R language. R vectors, matrices and arrays automatically propagate those attributes when you operate with quantities objects.

Author(s)

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References


as.data.frame.quantities

Coerce to a Data Frame

Description

S3 method for quantities objects (see as.data.frame).

Usage

## S3 method for class 'quantities'
as.data.frame(x, row.names = NULL, optional = FALSE, ...)

Arguments

- **x**: any R object.
- **row.names**: NULL or a character vector giving the row names for the data frame. Missing values are not allowed.
- **optional**: logical. If TRUE, setting row names and converting column names (to syntactic names: see make.names) is optional. Note that all of R’s base package as.data.frame() methods use optional only for column names treatment, basically with the meaning of data.frame(*,check.names = !optional). See also the make.names argument of the matrix method.
- **...**: additional arguments to be passed to or from methods.

Examples

```r
x <- set_quantities(1:3, m/s, 0.1)
y <- set_quantities(4:6, m/s, 0.2)
z <- cbind(x, y)
as.data.frame(z)
```

as.list.quantities

Coerce to a List

Description

S3 method for quantities objects (see as.list).

Usage

## S3 method for class 'quantities'
as.list(x, ...)

Arguments

x  object to be coerced or tested.
... objects, possibly named.

Examples

x <- set_quantities(1:3, m/s, 0.1)
as.list(x)

---

as.matrix.quantities  Coerce to a Matrix

Description

S3 method for quantities objects (see as.matrix).

Usage

## S3 method for class 'quantities'
as.matrix(x, ...)

Arguments

x  an R object.
... additional arguments to be passed to or from methods.

Examples

as.matrix(set_quantities(1:3, m/s, 0.1))

---

c.quantities  Combine Values into a Vector or List

Description

S3 method for quantities objects (see c).

Usage

## S3 method for class 'quantities'
c(...)
cbind.quantities

Arguments

... objects to be concatenated.

Examples

c(set_quantities(1, m/s, 0.2), set_quantities(30, km/h, 0.1))

---

cbind.quantities  Combine R Objects by Rows or Columns

Description

S3 methods for quantities objects (see cbind).

Usage

## S3 method for class 'quantities'
cbind(..., deparse.level = 1)

## S3 method for class 'quantities'
rbind(..., deparse.level = 1)

Arguments

... (generalized) vectors or matrices. These can be given as named arguments. Other R objects may be coerced as appropriate, or S4 methods may be used: see sections ‘Details’ and ‘Value’. (For the "data.frame" method of cbind these can be further arguments to data.frame such as stringsAsFactors.)

deparse.level integer controlling the construction of labels in the case of non-matrix-like arguments (for the default method):
deparse.level = 0 constructs no labels; the default, deparse.level = 1 or 2 constructs labels from the argument names, see the ‘Value’ section below.

See Also

c.quantities

Examples

x <- set_quantities(1, m/s, 0.1)
y <- set_quantities(1:3, m/s, 0.2)
z <- set_quantities(8:10, m/s, 0.1)
(m <- cbind(x, y)) # the '1' (= shorter vector) is recycled
(m <- cbind(m, z)[, c(1, 3, 2)]) # insert a column
(m <- rbind(m, z)) # insert a row
## diff.quantities

### Lagged Differences

**Description**

S3 method for quantities objects (see `diff`).

**Usage**

```r
## S3 method for class 'quantities'
diff(x, lag = 1L, differences = 1L, ...)```

**Arguments**

- `x`: a numeric vector or matrix containing the values to be differenced.
- `lag`: an integer indicating which lag to use.
- `differences`: an integer indicating the order of the difference.
- `...`: further arguments to be passed to or from methods.

**Examples**

```r
diff(set_quantities(1:10, m/s, 0.1), 2)
diff(set_quantities(1:10, m/s, 0.1), 2, 2)
x <- cumsum(cumsum(set_quantities(1:10, m/s, 0.1)))
diff(x, lag = 2)
diff(x, differences = 2)
```

## drop_quantities

### Drop Units and Errors

**Description**

Drop Units and Errors

**Usage**

```r
drop_quantities(x)

drop_units(x)

drop_errors(x)
```

```r
## S3 method for class 'quantities'
drop_quantities(x)

## S3 method for class 'quantities'
drop_units(x)

## S3 method for class 'quantities'
drop_errors(x)

## S3 method for class 'data.frame'
drop_quantities(x)
```
errors

Arguments
x a quantities object.

Details
drop_quantities is equivalent to quantities(x) <-NULL or set_quantities(x,NULL,NULL).
drop_units is equivalent to units(x) <-NULL or set_units(x,NULL).
drop_errors is equivalent to errors(x) <-NULL or set_errors(x,NULL).

Value
the numeric without any units or errors attributes, while preserving other attributes like dimensions or other classes.

errors Handle Measurement Uncertainty on a Numeric Vector

Description
Set or retrieve measurement uncertainty to/from numeric vectors (extensions to the errors package for quantities and units objects).

Usage
## S3 method for class 'quantities'
errors(x)

## S3 method for class 'units'
errors(x)

## S3 method for class 'mixed_units'
errors(x)

## S3 replacement method for class 'quantities'
errors(x) <- value

## S3 replacement method for class 'units'
errors(x) <- value

## S3 replacement method for class 'mixed_units'
errors(x) <- value

## S3 method for class 'quantities'
set_errors(x, value = 0)

## S3 method for class 'units'
set_errors(x, value = 0)
## S3 method for class 'mixed_units'
set_errors(x, value = 0)

## S3 method for class 'quantities'
errors_max(x)

## S3 method for class 'quantities'
errors_min(x)

### Arguments

- **x**: a numeric object, or object of class `errors`.
- **value**: a numeric vector of length 1 or the same length as `x`.

### See Also

`errors`.  

---

### Extract.quantities

**Extract or Replace Parts of an Object**

### Description

S3 operators to extract or replace parts of quantities objects.

### Usage

```r
## S3 method for class 'quantities'
x[...]

## S3 method for class 'quantities'
x[[...]]

## S3 replacement method for class 'quantities'
x[...] <- value

## S3 replacement method for class 'quantities'
x[[...]] <- value
```

### Arguments

- **x**: object from which to extract element(s) or in which to replace element(s).
- **...**: additional arguments to be passed to base methods (see `Extract`).
- **value**: typically an array-like R object of a similar class as `x`.  

Examples

```r
x <- set_quantities(1:3, m/s, 0.1)
y <- set_quantities(4:6, m/s, 0.2)
(z <- rbind(x, y))
z[2, 2]
z[2, 2] <- -1
errors(z[[1, 2]]) <- 0.8
z[, 2]
```

---

**groupGeneric.quantities**

*S3 Group Generic Functions*

Description

Math, Ops and Summary group generic methods for quantities objects (see `groupGeneric` for a comprehensive list of available methods).

Usage

```r
## S3 method for class 'quantities'
Math(x, ...)

## S3 method for class 'quantities'
Ops(e1, e2)

## S3 method for class 'quantities'
Summary(..., na.rm = FALSE)
```

Arguments

- `x` objects.
- `...` further arguments passed to methods.
- `e1` objects.
- `e2` objects.
- `na.rm` logical: should missing values be removed?

Details

See `groupGeneric.errors`, `Ops.units`, `Math.units`, for further details.
Examples

```r
x <- set_quantities(1:3, m/s, 0.1)
log(x)
cumsum(x)
cumprod(x)

a <- set_quantities(1:3, m/s, 0.1)
b <- set_quantities(1:3, m/s, 0.1)
a + b
a * b
a / b
a = set_quantities(1:5, m, 0.1)
a %/% a
a %/% set_quantities(2)
set_quantities(1:5, m^2, 0.1) %/% set_quantities(2, m, 0.1)
a %/% a
a %/% set_quantities(2)
c(min(x), max(x))
range(x)
sum(x)
```

---

**parse_quantities**  
*Parse Units and Errors*

**Description**

Functions to parse character vectors into quantities.

**Usage**

```r
parse_quantities(x, decimal_mark)
parse_units(x, decimal_mark)
parse_errors(x, decimal_mark)
```

**Arguments**

- `x`  
a character vector to parse.
- `decimal_mark`  
the dot (.) if not provided.

**Details**

Each `parse_*(.)` function returns an object of the corresponding type, no matter what it is found. This means that, for parse_units, if errors are found, they are dropped with a warning. Similarly for parse_errors, if units are found, they are dropped with a warning. On the other hand, parse_quantities always returns a valid quantities object, even if no errors or units are found (then, zero error and dimensionless units are applied).
quantities

Value

A quantities, units or errors object respectively.

Examples

parse_quantities("(1.6021766208 +/- .0000000098) e-19 C")
parse_quantities("1.6021766208(98) e-19 C")
parse_units("1.6021766208 e-19 C")
parse_errors("1.6021766208(98) e-19")

# quantities are converted to the first unit
parse_quantities(c("12.34(2) m/s", "36.5(1) km/h"))

# or kept as a list of mixed units
parse_quantities(c("1.02(5) g", "2.51(0.01) V", "(3.23 +/- 0.12) m"))

quantities

Handle Measurement Units and Uncertainty on a Numeric Vector

Description

Set or retrieve measurement units and uncertainty to/from numeric vectors.

Usage

quantities(x)
quantities(x) <- value
set_quantities(x, unit, errors = 0, ..., 
mode = units_options("set_units_mode"))

Arguments

x a numeric object, or object of class quantities, units or errors.
value a list of two components: an object of class units or symbolic_units (see units), and a numeric vector of length 1 or the same length as x (see errors).
unit a units object, or something coercible to one with as_units (see set_units).
errors a numeric vector of length 1 or the same length as x (see set_errors).
... passed on to other methods.
mode if "symbols" (the default), then unit is constructed from the expression supplied. Otherwise, if mode = "standard", standard evaluation is used for the supplied value. This argument can be set via a global option units_options(set_units_mode = "standard")
rep.quantities

Details

quantities returns a named list with the units and errors attributes.

`quantities<-` sets the units and error values (and converts x into an object of class quantities).

set_quantities is a pipe-friendly version of `quantities<-` and returns an object of class quantities.

See Also

ers, units, groupGeneric.quantities, Extract.quantities, c.quantities, rep.quantities,
cbind.quantities, as.data.frame.quantities, as.matrix.quantities, t.quantities.

Examples

x = 1:3
class(x)
x
quantities(x) <- list("m/s", 0.1)
class(x)
x

(x <- set_quantities(x, m/s, seq(0.1, 0.3, 0.1)))

rep.quantities Replicate Elements of Vectors and Lists

Description

S3 method for quantities objects (see rep).

Usage

## S3 method for class 'quantities'
rep(x, ...)

Arguments

x a vector (of any mode including a list) or a factor or (for rep only) a POSIXct
or POSIXlt or Date object; or an S4 object containing such an object.

... further arguments to be passed to or from other methods. For the internal default
method these can include:

times an integer-valued vector giving the (non-negative) number of times to
repeat each element if of length length(x), or to repeat the whole vector if
of length 1. Negative or NA values are an error. A double vector is accepted,
other inputs being coerced to an integer or double vector.
length.out non-negative integer. The desired length of the output vector. Other inputs will be coerced to a double vector and the first element taken. Ignored if NA or invalid.

each non-negative integer. Each element of x is repeated each times. Other inputs will be coerced to an integer or double vector and the first element taken. Treated as 1 if NA or invalid.

Examples

rep(set_quantities(1, m/s, 0.1), 4)

t.quantities  Matrix Transpose

Description

S3 method for quantities objects (see t).

Usage

## S3 method for class 'quantities'
t(x)

Arguments

x a matrix or data frame, typically.

Examples

a <- matrix(1:30, 5, 6)
quantities(a) <- list("m/s", 1:30)
t(a)

units Handle Measurement Units on a Numeric Vector

Description

Set or retrieve measurement units to/from numeric vectors and convert units (extensions to the units package for quantities and errors objects).
Usage

## S3 replacement method for class 'quantities'
units(x) <- value

## S3 replacement method for class 'errors'
units(x) <- value

## S3 method for class 'quantities'
set_units(x, value, ..., mode = units_options("set_units_mode"))

## S3 method for class 'errors'
set_units(x, value, ..., mode = units_options("set_units_mode"))

## S3 method for class 'quantities'
mixed_units(x, values, ...)

## S3 method for class 'errors'
mixed_units(x, values, ...)

Arguments

x        numeric vector, or object of class units.
value    object of class units or symbolic_units, or in the case of set_units expression with symbols (see examples).
...      passed on to other methods.
mode     if "symbols" (the default), then unit is constructed from the expression supplied. Otherwise, if mode = "standard", standard evaluation is used for the supplied value. This argument can be set via a global option units_options(set_units_mode = "standard")
values   character vector with units encodings, or list with symbolic units of class mixed_symbolic_units

See Also

units, set_units.
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