

Package: rstream (via r-universe)

September 9, 2024

Version 1.3.7

Date 2022-10-18

Title Streams of Random Numbers

Author Josef Leydold <josef.leydold@wu.ac.at>

Maintainer Josef Leydold <josef.leydold@wu.ac.at>

Depends R (>= 2.0.0)

Imports methods, stats

Description Unified object oriented interface for multiple independent streams of random numbers from different sources.

License GPL-2

URL <https://statmath.wu.ac.at/arvag/>

NeedsCompilation yes

Date/Publication 2022-10-19 10:02:36 UTC

Repository <https://jleydold.r-universe.dev>

RemoteUrl <https://github.com/cran/rstream>

RemoteRef HEAD

RemoteSha e319d8cdb7db1fc2d4cff5c5b7890973e7aa7123

Contents

rstream-package	2
rstream-class	3
rstream.antithetic-methods	5
rstream.clone-methods	6
rstream.incprecision-methods	7
rstream.lecuyer-class	8
rstream.mrg32k3a-class	11
rstream.name-methods	14
rstream.packed-methods	15
rstream.reset-methods	16

rstream.resetstream-methods	17
rstream.RNG	18
rstream.runif-class	19
rstream.sample-methods	22
rstream.version	23

Index	25
--------------	-----------

rstream-package	<i>"rstream" – A package for multiple streams of uniform random numbers</i>
-----------------	---

Description

Unified interface to uniform random number generators

Details

Package: rstream
 Type: Package
 Version: 1.3.7
 Date: 2022-10-18
 License: GPL 2 or later

This package provides a unified interface to uniform random number Objects of its classes act as a source of streams for random numbers that can be handled by a set of methods and which can be used as arguments of functions that require sources of randomness, e.g. discrete event models, Monte Carlo integration or other stochastic simulations.

The instances of objects are independent, i.e., sampling random numbers from one instance or resetting and changing its state does not effect any other instance. (However, different streams may not be *stochastically* independent if they are not carefully seeded!)

Additionally there is a mechanism interface to save and restore such streams, e.g. for the next R session, for a rerunning some stochastic calculations with identical input, or for sending the stream object to a slave node in parallel computing via MPI.

The interface to these classes is inspired by Pierre L'Ecuyers RngStreams package.

For an overview of classes and methods, see [rstream](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

References

P. L'Ecuyer and J. Leydold (2005): rstream: Streams of Random Numbers for Stochastic Simulation, R News 5(2), 16–20.

See Also

[rstream](#).

 rstream-class

 Class "rstream" – Multiple streams of uniform random numbers

Description

The virtual class "rstream" provides a unified interface to uniform random number generators. Objects of its subclasses act as a source of streams for random numbers that can be handled by a set of methods and which can be used as arguments of functions that require sources of randomness, e.g. discrete event models, Monte Carlo integration or other stochastic simulations.

The instances of objects of this class and its subclasses are independent, i.e., sampling random numbers from one instance or resetting and changing its state does not effect any other instance. (However, different streams may not be *stochastically* independent if they are not carefully seeded!)

Additionally there is a mechanism interface to save and restore such streams, e.g. for the next R session, for a reruning some stochastic calculations with identical input, or for sending the stream object to a slave node in parallel computing via MPI.

The interface to these classes is inspired by Pierre L'Ecuyers RngStreams package.

Objects from the Class

A virtual Class: No objects may be created from it.

Methods

The virtual class "rstream" prepares the following methods for handling random stream objects. Some methods that return parameters of the stream object have a variant that uses <- to change the respective parameters. See the man pages for the respective methods for details.

Notice: Some subclasses only implement a subset of these interfaces. The methods that do not work produce an error message.

Methods to use the stream (available for all subclasses):

rstream.sample signature(object = "rstream"): Get a random sample from the stream object.

r signature(object = "rstream"): Same as rstream.sample.

rstream.reset signature(object = "rstream"): Reset stream into initial state.

Some subclasses have implemented the concept of substreams. This is especially usefull if two or more streams should be synchronized:

rstream.nextsubstream signature(object = "rstream"): Set state of stream to next substream.

rstream.resetsubstream signature(object = "rstream"): Reset current substream into starting state.

Antithetic random streams return numbers which have smallest possible correlation (i.e. -1) to their respective counterparts:

rstream.antithetic signature(object = "rstream"): Whether or not the stream object returns antithetic random numbers.

rstream.antithetic<- signature(object = "rstream"): Change antithetic flag (TRUE or FALSE).

Most sources of pseudo random numbers generate random numbers of precision $2^{-32} \approx 2 \times 10^{-10}$. For some streams this can be increased to machine epsilon (i.e. $\approx 10^{-16}$) by combining two random numbers of lower precision:

rstream.incprecision signature(object = "rstream"): Whether or not the stream object returns random numbers with increased precision.

rstream.incprecision<- signature(object = "rstream"): Change flag for increased precision (TRUE or FALSE).

Handling "rstream" objects:

print signature(x = "rstream"): Print state of the stream object.

show signature(x = "rstream"): Same as print.

rstream.name signature(object = "rstream"): The name of the stream object.

rstream.name<- signature(object = "rstream"): Change the name of the stream object.

rstream.clone signature(object = "rstream"): Make a copy (clone) of stream object.

When a "rstream" object should be used in another R session or saved for some kind of later reuse all information about the object must be packed. Notice no method other than unpacking can be applied to a packed object. It must be unpacked before.

rstream.packed signature(object = "rstream"): Whether or not the stream object is packed.

rstream.packed<- signature(object = "rstream"): Pack or unpack object: set packed to TRUE or FALSE.

Warning

When "rstream" objects should be used in later R sessions they must be packed before the current R session is stopped and unpacked after the new R session has been started and the workspace image has been reloaded.

Note

"rstream" objects cannot simply be copied by `<-`. The new variable does not hold a copy of an "rstream" object but just points to the old object which might not be the wanted result (similar to R environments). Use `rstream.clone` instead.

The actual interface is implemented in subclasses, one for each source (package/library) of random numbers. The slots of this class and of all its subclasses must not be accessed directly. Use the above methods instead.

One may miss a method for reseeding a random stream. However, there is no need for such a method as there is a method for resetting the stream to its initial state. If one needs a stream with a different stream, then a new rstream object should be created at all.

Packed objects must be unpacked before any other method can be applied.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

References

L'Ecuyer, P., Simard, R., Chen, E. J., and Kelton, W. D. (2002) *An object-oriented random-number package with many long streams and substreams*. Operations Research 50(6), 1073-1075.

See Also

[rstream.mrg32k3a](#), [rstream.runif](#), [rstream.antithetic-methods](#), [rstream.clone-methods](#), [rstream.incprecision-methods](#), [rstream.name-methods](#), [rstream.packed-methods](#), [rstream.reset-methods](#), [rstream.sample-methods](#), [rstream.nextsubstream-methods](#), [rstream.RNG](#).

rstream.antithetic-methods

Methods for Function rstream.antithetic in Package 'rstream'

Description

Get and change the antithetic flag for an "rstream" object in package **rstream**.

If the antithetic flag is on (TRUE) the "rstream" object returns antithetic random numbers.

Antithetic random streams return numbers which have smallest possible correlation (i.e. -1) to their respective counterparts. Thus instead of a number u the number $1 - u$ is returned.

This is useful for variance reduction techniques in Monte Carlo computations.

Usage

```
## S4 method for signature 'rstream'  
rstream.antithetic(stream)  
rstream.antithetic(stream) <- value
```

Arguments

stream	an "rstream" object.
value	a boolean (TRUE or FALSE) to change the status of the flag.

Methods

Methods available for the following "rstream" subclasses: [rstream.mrg32k3a](#), [rstream.runif](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#).

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## set antithetic flag of rstream object
rstream.antithetic(s) <- TRUE

## get antithetic flag of rstream object
rstream.antithetic(s)
```

rstream.clone-methods *Methods for Function rstream.clone in Package 'rstream'*

Description

Make a copy (clone) of an "rstream" object in package **rstream**.

"rstream" objects cannot simply be copied by <-. The new variable does not hold a copy of an "rstream" object but just points to the old object which might not be the wanted result (similar to R environments). To get a copy of the whole "rstream" object the clone method must be used.

Usage

```
## S4 method for signature 'rstream'
rstream.clone(stream)
```

Arguments

stream an "rstream" object.

Methods

Methods available for all "rstream" subclasses: [rstream.mrg32k3a](#), [rstream.runif](#).

Note

The label (name) of the new copy has a dot "." appended to distinguish the original object from its copy.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream.](#)

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## make a copy (clone)
clone <- rstream.clone(s)
```

rstream.inprecision-methods

Methods for Function rstream.inprecision in Package 'rstream'

Description

Get and change the flag for increased precision of an "rstream" object in package **rstream**.

If the increased precision flag is on (TRUE) the "rstream" object returns random numbers with precision close to machine epsilon.

Most sources of pseudo random numbers generate random numbers of precision $2^{-32} \approx 2 \times 10^{-10}$. When the flag is on the precision is increased to machine epsilon (i.e. $\approx 10^{-16}$) by combining two random numbers of default precision.

Usage

```
## S4 method for signature 'rstream'
rstream.inprecision(stream)
rstream.inprecision(stream) <- value
```

Arguments

stream	an "rstream" object.
value	a boolean (TRUE or FALSE) to change the status of the flag.

Methods

Methods available for the following "rstream" subclasses: [rstream.mrg32k3a](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream.](#)

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## set increased precision flag of rstream object
rstream.increasedprecision(s) <- TRUE

## get increased precision flag of rstream object
rstream.increasedprecision(s)
```

rstream.lecuyer-class *Class "rstream.lecuyer" – Multiple streams with MRG32k3a backbone generator from Pierre L'Ecuyer's RngStreams package*

Description

This class is obsolete and should be replaced by class "rstream.mrg32k3a"!

This is the old class that implements the "rstream" interface for Pierre L'Ecuyer's RngStreams package with the MRG32K3a multiple recursive generator as its backbone generator. This package is well suited for multiple independent streams of uniform random numbers. In particular it provides antithetic variates and substreams. A very important feature is that different streams are stochastically independent (in opposition to many other random number generators where the user has to choose seeds carefully). For that reason there only exists a package seed for all streams and individual seeds should be avoided (and requires expertise).

Objects from the Class

Objects can be created by calls of the form `new("rstream.lecuyer", name, seed, force.seed, antithetic, increasedprecision)`.

name: An arbitrary string to name the stream object. If omitted a string that consists of `lecuyer` and some number (which is increased every time when a new *rstream* object is created).

seed: An array of six numbers. The seed for the RngStreams package. If omitted a random seed is used. It should only be set at the first creation of an instance of an *rstream.lecuyer* object.

force.seed: A boolean. If the RngStreams package should be reseeded (which is not recommended) it must be TRUE. Default is FALSE.

antithetic: A boolean. Whether or not antithetic random numbers should be produced. Default is FALSE.

increasedprecision: A boolean. Whether or not random numbers with increased precision should be produced. Default is FALSE.

Extends

Class "rstream", directly.

Methods

The class "rstream.lecuyer" provides the following methods for handling "rstream.lecuyer" objects. Some methods that return parameters of the stream object have a variant that uses <- to change the respective parameters. See the man pages for the respective methods for details.

Methods to use the stream:

rstream.sample signature(object = "rstream.lecuyer"): Get a random sample from the stream object.

r signature(object = "rstream.lecuyer"): Same as rstream.sample.

rstream.reset signature(object = "rstream.lecuyer"): Reset stream into initial state.

rstream.nextsubstream signature(object = "rstream.lecuyer"): Set state of stream to next substream.

rstream.resetsubstream signature(object = "rstream.lecuyer"): Reset current substream into starting state.

Antithetic random streams and increased precision:

rstream.antithetic signature(object = "rstream.lecuyer"): Whether or not the stream object returns antithetic random numbers.

rstream.antithetic<- signature(object = "rstream.lecuyer"): Change antithetic flag (TRUE or FALSE).

rstream.increprecision signature(object = "rstream.lecuyer"): Whether or not the stream object returns random numbers with increased precision.

rstream.increprecision<- signature(object = "rstream.lecuyer"): Change flag for increased precision (TRUE or FALSE).

Handling "rstream.lecuyer" objects:

print signature(x = "rstream.lecuyer"): Print state of the stream object.

rstream.name signature(object = "rstream.lecuyer"): The name of the stream object.

rstream.name<- signature(object = "rstream.lecuyer"): Change the name of the stream object.

rstream.clone signature(object = "rstream.lecuyer"): Make a copy (clone) of stream object.

initialize signature(.Object = "rstream.lecuyer"): Initialize rstream object. (For Internal usage only).

When a "rstream.lecuyer" object should be used in another R session or saved for some kind of later reuse all information about the object must be packed. Notice no method other than unpacking can be applied to a packed object. It must be unpacked before.

rstream.packed signature(object = "rstream.lecuyer"): Whether or not the stream object is packed.

rstream.packed<- signature(object = "rstream.lecuyer"): Pack or unpack object: set packed to TRUE or FALSE.

Warning

The underlying RngStreams library uses a global variable to store the package seed. This variable is also stored inside R. Whenever a new instance of a "rstream.lecuyer" object is created the value of global variable is set to the value of the R object. Thus there is no problem when such "rstream.lecuyer" objects are packed for using in later R sessions. However, if such packed objects are not stored in the workspace image, then the R variable gets lost and there is a (extremely small) chance that newly created objects are not stochastically independent from restored objects.

Note

The slots of this class must not be accessed directly. Use the above methods instead.

"rstream" objects cannot simply be copied by <-. The new variable does not hold a copy of an "rstream" object but just points to the old object which might not be the wanted result (similar to R environments). Use `rstream.clone` instead.

One may miss a method for reseeding a random stream. However, there is no need for such a method as there is a method for resetting the stream to its initial state. I one needs a stream with a different stream, then a new rstream object should be created at all.

Packed objects must be unpacked before any other method can be applied.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

underlying generator: Pierre L'Ecyuer and Richard Simard

References

L'Ecyuer, P., Simard, R., Chen, E. J., and Kelton, W. D. (2002) *An object-oriented random-number package with many long streams and substreams*. Operations Research 50(6), 1073-1075.

See Also

[rstream](#), [rstream.mrg32k3a](#), [rstream.antithetic-methods](#), [rstream.clone-methods](#), [rstream.incprecision-methods](#), [rstream.name-methods](#), [rstream.packed-methods](#), [rstream.reset-methods](#), [rstream.sample-methods](#), [rstream.nextsubstream-methods](#), [rstream.RNG](#).

Examples

```
## create a new rstream.lecuyer object
s <- new("rstream.lecuyer")

## show state of this object
print(s)

## show and change name of stream object
rstream.name(s)
rstream.name(s) <- "mystream"

## get a random number
x <- rstream.sample(s)
```

```

## get a random sample of size 100
x <- rstream.sample(s,100)

## reset random stream
rstream.reset(s)

## show and set antithetic flag
rstream.antithetic(s)
rstream.antithetic(s) <- TRUE

## jump to next substream
rstream.nextsubstream(s)

## make a clone of the rstream object
sc <- rstream.clone(s)

## pack and unpack the rstream object
rstream.packed(s) <- TRUE
rstream.packed(s) <- FALSE

```

rstream.mrg32k3a-class

Class "rstream.mrg32k3a" – Multiple streams with MRG32k3a backbone generator from Pierre L'Ecuyers RngStreams package

Description

This class implements the "rstream" interface for Pierre L'Ecuyer's RngStreams package with the MRG32K3a multiple recursive generator as its backbone generator. This package is well suited for multiple independent streams of uniform random numbers. In particular it provides antithetic variates and substreams. A very important feature is that different streams are stochastically independent (in opposition to many other random number generators where the user has to choose seeds carefully). For that reason there only exists a package seed for all streams and individual seeds should be avoided (and requires expertise).

Objects from the Class

Objects can be created by calls of the form `new("rstream.mrg32k3a", name, seed, force.seed, antithetic, inprecision)`.

name: An arbitrary string to name the stream object. If omitted a string that consists of `mrg32k3a` and some number (which is increased every time when a new *rstream* object is created).

seed: An array of six numbers. The seed for the RngStreams package. If omitted a random seed is used. It should only be set at the first creation of an instance of an *rstream.mrg32k3a* object.

force.seed: A boolean. If the RngStreams package should be reseeded (which is not recommended) it must be TRUE. Default is FALSE.

antithetic: A boolean. Whether or not antithetic random numbers should be produced. Default is FALSE.

incprecision: A boolean. Whether or not random numbers with increased precision should be produced. Default is FALSE.

Extends

Class "rstream", directly.

Methods

The class "rstream.mrg32k3a" provides the following methods for handling "rstream.mrg32k3a" objects. Some methods that return parameters of the stream object have a variant that uses <- to change the respective parameters. See the man pages for the respective methods for details.

Methods to use the stream:

rstream.sample signature(object = "rstream.mrg32k3a"): Get a random sample from the stream object.

r signature(object = "rstream.mrg32k3a"): Same as rstream.sample.

rstream.reset signature(object = "rstream.mrg32k3a"): Reset stream into initial state.

rstream.nextsubstream signature(object = "rstream.mrg32k3a"): Set state of stream to next substream.

rstream.resetsubstream signature(object = "rstream.mrg32k3a"): Reset current substream into starting state.

Antithetic random streams and increased precision:

rstream.antithetic signature(object = "rstream.mrg32k3a"): Whether or not the stream object returns antithetic random numbers.

rstream.antithetic<- signature(object = "rstream.mrg32k3a"): Change antithetic flag (TRUE or FALSE).

rstream.incprecision signature(object = "rstream.mrg32k3a"): Whether or not the stream object returns random numbers with increased precision.

rstream.incprecision<- signature(object = "rstream.mrg32k3a"): Change flag for increased precision (TRUE or FALSE).

Handling "rstream.mrg32k3a" objects:

print signature(x = "rstream.mrg32k3a"): Print state of the stream object.

rstream.name signature(object = "rstream.mrg32k3a"): The name of the stream object.

rstream.name<- signature(object = "rstream.mrg32k3a"): Change the name of the stream object.

rstream.clone signature(object = "rstream.mrg32k3a"): Make a copy (clone) of stream object.

initialize signature(.Object = "rstream.mrg32k3a"): Initialize rstream object. (For Internal usage only).

When a "rstream.mrg32k3a" object should be used in another R session or saved for some kind of later reuse all information about the object must be packed. Notice no method other than unpacking can be applied to a packed object. It must be unpacked before.

rstream.packed signature(object = "rstream.mrg32k3a"): Whether or not the stream object is packed.

rstream.packed<- signature(object = "rstream.mrg32k3a"): Pack or unpack object: set packed to TRUE or FALSE.

Warning

The underlying RngStreams library uses a global variable to store the package seed. This variable is also stored inside R. Whenever a new instance of a "rstream.mrg32k3a" object is created the value of global variable is set to the value of the R object. Thus there is no problem when such "rstream.mrg32k3a" objects are packed for using in later R sessions. However, if such packed objects are not stored in the workspace image, then the R variable gets lost and there is a (extremely small) chance that newly created objects are not stochastically independent from restored objects.

Note

The slots of this class must not be accessed directly. Use the above methods instead.

"rstream" objects cannot simply be copied by <-. The new variable does not hold a copy of an "rstream" object but just points to the old object which might not be the wanted result (similar to R environments). Use [rstream.clone](#) instead.

One may miss a method for reseeding a random stream. However, there is no need for such a method as there is a method for resetting the stream to its initial state. I one needs a stream with a different stream, then a new rstream object should be created at all.

Packed objects must be unpacked before any other method can be applied.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

underlying generator: Pierre L'Ecyuer and Richard Simard

References

L'Ecyuer, P., Simard, R., Chen, E. J., and Kelton, W. D. (2002) *An object-oriented random-number package with many long streams and substreams*. Operations Research 50(6), 1073-1075.

See Also

[rstream](#), [rstream.antithetic-methods](#), [rstream.clone-methods](#), [rstream.inprecision-methods](#), [rstream.name-methods](#), [rstream.packed-methods](#), [rstream.reset-methods](#), [rstream.sample-methods](#), [rstream.nextsubstream-methods](#), [rstream.RNG](#).

Examples

```
## create a new rstream.mrg32k3a object
s <- new("rstream.mrg32k3a")

## show state of this object
print(s)

## show and change name of stream object
rstream.name(s)
rstream.name(s) <- "mystream"

## get a random number
x <- rstream.sample(s)

## get a random sample of size 100
x <- rstream.sample(s,100)

## reset random stream
rstream.reset(s)

## show and set antithetic flag
rstream.antithetic(s)
rstream.antithetic(s) <- TRUE

## jump to next substream
rstream.nextsubstream(s)

## make a clone of the rstream object
sc <- rstream.clone(s)

## pack and unpack the rstream object
rstream.packed(s) <- TRUE
rstream.packed(s) <- FALSE
```

rstream.name-methods *Methods for Function rstream.name in Package 'rstream'*

Description

Get and change the name for an "rstream" object in package **rstream**.

The name is a character string that gives a user the possibility to label an "rstream" object. Any name can be used.

Usage

```
## S4 method for signature 'rstream'
rstream.name(stream)
rstream.name(stream) <- value
```

Arguments

stream an "rstream" object.
value a character string that holds the label (name).

Methods

Methods available for all "rstream" subclasses: [rstream.mrg32k3a](#), [rstream.runif](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#).

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## set name of rstream object
rstream.name(s) <- "mystream"

## get name of rstream object
rstream.name(s)
```

rstream.packed-methods

Methods for Function rstream.packed in Package 'rstream'

Description

Get status (packed/unpacked) of an "rstream" object in package **rstream**.

Pack and unpack an "rstream" object in package **rstream**.

When a "rstream" object should be used in another R session or saved for some kind of later reuse all information about the object must be packed. Notice no method other than unpacking can be applied to a packed object. It must be unpacked before.

Usage

```
## S4 method for signature 'rstream'
rstream.packed(stream)
rstream.packed(stream) <- value
```

Arguments

stream an "rstream" object.
value a boolean (TRUE or FALSE) to change the status of the object.
 TRUE: pack the object.
 FALSE: unpack the object.

Methods

Methods available for all "rstream" subclasses: [rstream.mrg32k3a](#), [rstream.runif](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#).

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## pack rstream object
rstream.packed(s) <- TRUE

## status of object
rstream.packed(s)

## pack rstream object
rstream.packed(s) <- FALSE
```

rstream.reset-methods *Methods for Function rstream.reset in Package 'rstream'*

Description

Reset "rstream" object in package **rstream** into its initial state.

By resetting the stream object the same stream of random numbers can be generated.

Usage

```
## S4 method for signature 'rstream'
rstream.reset(stream)
```

Arguments

stream an "rstream" object.

Methods

Methods available for all "rstream" subclasses: [rstream.mrg32k3a](#), [rstream.runif](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#).

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## generate a sample
x <- rstream.sample(s,10)

## reset the stream object
rstream.reset(s)

## the new sample y is identical to x
y <- rstream.sample(s,10)
if (identical(x,y)) print("x and y are identical samples")
```

rstream.resetsubstream-methods

*Methods for Function [rstream.resetsubstream](#) and
[rstream.nextsubstream](#) in Package 'rstream'*

Description

Some subclasses have implemented the concept of substreams. This is especially useful if two or more streams should be synchronized.

This interface allows to jump to the beginning of the next substream and to reset the stream object to the beginning of the current substream.

Usage

```
## S4 method for signature 'rstream'
rstream.resetsubstream(stream)
## S4 method for signature 'rstream'
rstream.nextsubstream(stream)
```

Arguments

stream an "rstream" object.

Methods

Methods available for the following "rstream" subclasses: [rstream.mrg32k3a](#).

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#).

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## jump to beginning of next substream
rstream.nextsubstream(s)

## generate a sample
x <- rstream.sample(s,10)

## reset substream
rstream.resetsubstream(s)

## the new sample y is identical to x
y <- rstream.sample(s,10)
if (identical(x,y)) print("x and y are identical samples")
```

rstream.RNG

Get and set "rstream" object from/to R global generator

Description

The function `rstream.RNG(stream)` is used to set a given "rstream" object `stream` as current global R uniform random number generators.

Without an argument (or `NULL`) it returns an "rstream" object that contains the current global generator. It is a copy (clone) of the global generator and thus it can be handled independently from the global generator.

Usage

```
rstream.RNG(stream = NULL)
```

Arguments

stream NULL or an "rstream" object

Value

rstream.RNG returns an "rstream" object.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream.](#)

Examples

```
## create a new rstream.runif object
s <- new("rstream.mrg32k3a")

## use this stream as global R uniform RNG
rstream.RNG(s)

## get a (idenpendent) copy of the stream
## that contains the global R uniform RNG
gs <- rstream.RNG()

## change the state of the global generator
gs <- rstream.RNG()
rstream.nextsubstream(gs)
rstream.RNG(gs)
```

rstream.runif-class *Class "rstream.runif" – Interface to R internal uniform random number generators*

Description

This class implements the "rstream" interface for the R internal uniform RNGs. This class allows to access and handle these generators in exactly the same way as external generators. In particular, one can create copies of generators. There is no need to deal with [RNGkind](#) and [set.seed](#) when different RNGs should be used.

Objects from the Class

Objects can be created by calls of the form `new("rstream.runif", name, kind, seed, antithetic)`.

name: An arbitrary string to name the stream object. If omitted a string that consists of `runif` and some number (which is increased every time when a new *rstream* object is created).

kind: A character string. The new "rstream" object uses the RNG of type `kind`. The same strings as for `RNGkind` can be used. Additionally the string "current" is available to use the type of generator to which R is currently set (this is the default if no `kind` is given). User-supplied generators cannot be used.

seed: The seed for the generator as used by the `set.seed` call. If omitted a random seed is used.

antithetic: A boolean. Whether or not antithetic random numbers should be produced. Default is `FALSE`.

Extends

Class "rstream", directly.

Methods

The class "rstream.runif" provides the following methods for handling "rstream.runif" objects. Some methods that return parameters of the stream object have a variant that uses `<-` to change the respective parameters. See the man pages for the respective methods for details.

Methods to use the stream:

rstream.sample signature(object = "rstream.runif"): Get a random sample from the stream object.

r signature(object = "rstream.runif"): Same as `rstream.sample`.

rstream.reset signature(object = "rstream.runif"): Reset stream into initial state.

Antithetic random streams:

rstream.antithetic signature(object = "rstream.runif"): Whether or not the stream object returns antithetic random numbers.

rstream.antithetic<- signature(object = "rstream.runif"): Change antithetic flag (`TRUE` or `FALSE`).

Handling "rstream.runif" objects:

print signature(x = "rstream.runif"): Print state of the stream object.

rstream.name signature(object = "rstream.runif"): The name of the stream object.

rstream.name<- signature(object = "rstream.runif"): Change the name of the stream object.

rstream.clone signature(object = "rstream.runif"): Make a copy (clone) of stream object.

initialize signature(.Object = "rstream.runif"): Initialize `rstream` object. (For Internal usage only).

When a "rstream.runif" object should be used in another R session or saved for some kind of later reuse all information about the object must be packed. Notice no method other than unpacking can be applied to a packed object. It must be unpacked before.

rstream.packed signature(object = "rstream.runif"): Whether or not the stream object is packed.

rstream.packed<- signature(object = "rstream.runif"): Pack or unpack object: set packed to TRUE or FALSE.

Note

The slots of this class must not be accessed directly. Use the above methods instead.

"rstream" objects cannot simply be copied by <-. The new variable does not hold a copy of an "rstream" object but just points to the old object which might not be the wanted result (similar to R environments). Use [rstream.clone](#) instead.

One may miss a method for reseeding a random stream. However, there is no need for such a method as there is a method for resetting the stream to its initial state. I one needs a stream with a different stream, then a new rstream object should be created at all.

Packed objects must be unpacked before any other method can be applied.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#), [rstream.antithetic-methods](#), [rstream.clone-methods](#), [rstream.name-methods](#), [rstream.packed-methods](#), [rstream.reset-methods](#), [rstream.sample-methods](#), [rstream.RNG](#).

Examples

```
## create a new rstream.runif object
s <- new("rstream.runif")

## show state of this object
print(s)

## show and change name of stream object
rstream.name(s)
rstream.name(s) <- "mystream"

## get a random number
x <- rstream.sample(s)

## get a random sample of size 100
x <- rstream.sample(s,100)

## reset random stream
rstream.reset(s)
```

```
## show and set antithetic flag
rstream.antithetic(s)
rstream.antithetic(s) <- TRUE

## make a clone of the rstream object
sc <- rstream.clone(s)

## pack and unpack the rstream object
rstream.packed(s) <- TRUE
rstream.packed(s) <- FALSE
```

rstream.sample-methods

Methods for Function rstream.sample in Package 'rstream'

Description

Get random sample from an "rstream" object in package **rstream**.

Usage

```
## S4 method for signature 'rstream,numeric'
rstream.sample(stream,n=1)
## S4 method for signature 'rstream,numeric'
r(stream,n=1)
```

Arguments

stream	an "rstream" object.
n	sample size.

Methods

Methods available for all "rstream" subclasses: [rstream.mrg32k3a-class](#), [rstream.runif-class](#).

Note

r is equivalent to rstream.sample.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream](#).

Examples

```
## create a new rstream object (of subclass rstream.mrg32k3a)
s <- new("rstream.mrg32k3a")

## get a random number
x <- rstream.sample(s)

## get a random sample of size 100
x <- rstream.sample(s,100)

## alternatively ...
x <- r(s,100)
```

rstream.version	<i>Switch to behavior of earlier version of package</i>
-----------------	---

Description

rstream.version can be used to switch to the behavior as it was in an earlier version of package **rstream** (for reproducibility).

Usage

```
rstream.version(version)
```

Arguments

version	a character string containing a version number of the form "xx.yy" or "xx.yy.zz", e.g., "1.2.5".
---------	--

Details

Bug fixes may influence a generated random stream (see NEWS file, news(package="rstream")). However, it is sometimes necessary to reproduce the same sequence with a newer version of the package. Thus one can switch to this behavior by means of rstream.version.

version is a character string that contains the requested version number. Notice that only the major number and the first minor number are relevant. The string "default" can be used to switch back to the new behavior. When version is omitted than the actual version number is shown.

Author(s)

Josef Leydold <josef.leydold@wu.ac.at>

See Also

[rstream.](#)

Examples

```
## Switch to version 1.2
rstream.version("1.2")
## Show current version
rstream.version()
## Switch back to default
rstream.version("default")
rstream.version()
```

Index

- * **classes**
 - [rstream-class](#), 3
 - [rstream.lecuyer-class](#), 8
 - [rstream.mrg32k3a-class](#), 11
 - [rstream.runif-class](#), 19
- * **datagen**
 - [rstream-class](#), 3
 - [rstream-package](#), 2
 - [rstream.antithetic-methods](#), 5
 - [rstream.clone-methods](#), 6
 - [rstream.incprecision-methods](#), 7
 - [rstream.lecuyer-class](#), 8
 - [rstream.mrg32k3a-class](#), 11
 - [rstream.name-methods](#), 14
 - [rstream.packed-methods](#), 15
 - [rstream.reset-methods](#), 16
 - [rstream.resetsubstream-methods](#), 17
 - [rstream.RNG](#), 18
 - [rstream.runif-class](#), 19
 - [rstream.sample-methods](#), 22
- * **distribution**
 - [rstream-class](#), 3
 - [rstream-package](#), 2
 - [rstream.antithetic-methods](#), 5
 - [rstream.clone-methods](#), 6
 - [rstream.incprecision-methods](#), 7
 - [rstream.lecuyer-class](#), 8
 - [rstream.mrg32k3a-class](#), 11
 - [rstream.name-methods](#), 14
 - [rstream.packed-methods](#), 15
 - [rstream.reset-methods](#), 16
 - [rstream.resetsubstream-methods](#), 17
 - [rstream.RNG](#), 18
 - [rstream.runif-class](#), 19
 - [rstream.sample-methods](#), 22
 - [rstream.version](#), 23
- * **methods**
 - [rstream.antithetic-methods](#), 5
 - [rstream.clone-methods](#), 6
 - [rstream.incprecision-methods](#), 7
 - [rstream.name-methods](#), 14
 - [rstream.packed-methods](#), 15
 - [rstream.reset-methods](#), 16
 - [rstream.resetsubstream-methods](#), 17
 - [rstream.RNG](#), 18
 - [rstream.sample-methods](#), 22
- [initialize, rstream.lecuyer-method \(rstream.lecuyer-class\)](#), 8
- [initialize, rstream.mrg32k3a-method \(rstream.mrg32k3a-class\)](#), 11
- [initialize, rstream.runif-method \(rstream.runif-class\)](#), 19
- [print, rstream-method \(rstream-class\)](#), 3
- [print, rstream.lecuyer-method \(rstream.lecuyer-class\)](#), 8
- [print, rstream.mrg32k3a-method \(rstream.mrg32k3a-class\)](#), 11
- [print, rstream.runif-method \(rstream.runif-class\)](#), 19
- [r \(rstream.sample-methods\)](#), 22
- [r, rstream, numeric-method \(rstream.sample-methods\)](#), 22
- [r, rstream-method \(rstream.sample-methods\)](#), 22
- [r, rstream.lecuyer-method \(rstream.sample-methods\)](#), 22
- [r, rstream.mrg32k3a-method \(rstream.sample-methods\)](#), 22
- [r, rstream.runif-method \(rstream.sample-methods\)](#), 22
- [r-methods \(rstream.sample-methods\)](#), 22
- [RNGkind](#), 19, 20
- [rstream](#), 2, 3, 6, 7, 10, 13, 15–19, 21–23
- [rstream \(rstream-package\)](#), 2
- [rstream-class](#), 3
- [rstream-package](#), 2

- rstream.antithetic
(rstream.antithetic-methods), 5
- rstream.antithetic,rstream-method
(rstream.antithetic-methods), 5
- rstream.antithetic,rstream.lecuyer-method
(rstream.antithetic-methods), 5
- rstream.antithetic,rstream.mrg32k3a-method
(rstream.antithetic-methods), 5
- rstream.antithetic,rstream.runif-method
(rstream.antithetic-methods), 5
- rstream.antithetic-methods, 5
- rstream.antithetic<-
(rstream.antithetic-methods), 5
- rstream.antithetic<-,rstream-method
(rstream.antithetic-methods), 5
- rstream.antithetic<-,rstream.lecuyer-method
(rstream.antithetic-methods), 5
- rstream.antithetic<-,rstream.mrg32k3a-method
(rstream.antithetic-methods), 5
- rstream.antithetic<-,rstream.runif-method
(rstream.antithetic-methods), 5
- rstream.antithetic<--methods
(rstream.antithetic-methods), 5
- rstream.clone, 4, 10, 13, 21
- rstream.clone(rstream.clone-methods), 6
- rstream.clone,rstream-method
(rstream.clone-methods), 6
- rstream.clone,rstream.lecuyer-method
(rstream.clone-methods), 6
- rstream.clone,rstream.mrg32k3a-method
(rstream.clone-methods), 6
- rstream.clone,rstream.runif-method
(rstream.clone-methods), 6
- rstream.clone-methods, 6
- rstream.incprecision
(rstream.incprecision-methods), 7
- rstream.incprecision,rstream-method
(rstream.incprecision-methods), 7
- rstream.incprecision,rstream.lecuyer-method
(rstream.incprecision-methods), 7
- rstream.incprecision,rstream.mrg32k3a-method
(rstream.incprecision-methods), 7
- rstream.incprecision-methods, 7
- rstream.incprecision<-
(rstream.incprecision-methods), 7
- rstream.incprecision<-,rstream-method
(rstream.incprecision-methods), 7
- rstream.incprecision<-,rstream.lecuyer-method
(rstream.incprecision-methods), 7
- rstream.incprecision<-,rstream.mrg32k3a-method
(rstream.incprecision-methods), 7
- rstream.incprecision<--methods
(rstream.incprecision-methods), 7
- rstream.lecuyer-class, 8
- rstream.mrg32k3a, 5–7, 10, 15–18
- rstream.mrg32k3a-class, 11
- rstream.name(rstream.name-methods), 14
- rstream.name,rstream-method
(rstream.name-methods), 14
- rstream.name,rstream.lecuyer-method
(rstream.name-methods), 14
- rstream.name,rstream.mrg32k3a-method
(rstream.name-methods), 14
- rstream.name,rstream.runif-method
(rstream.name-methods), 14
- rstream.name-methods, 14
- rstream.name<-(rstream.name-methods), 14
- rstream.name<-,rstream-method
(rstream.name-methods), 14
- rstream.name<-,rstream.lecuyer-method
(rstream.name-methods), 14
- rstream.name<-,rstream.mrg32k3a-method
(rstream.name-methods), 14
- rstream.name<-,rstream.runif-method
(rstream.name-methods), 14
- rstream.name<--methods
(rstream.name-methods), 14
- rstream.nextsubstream
(rstream.resetsubstream-methods), 17
- rstream.nextsubstream,rstream-method
(rstream.resetsubstream-methods), 17
- rstream.nextsubstream,rstream.lecuyer-method
(rstream.resetsubstream-methods), 17

- rstream.nextsubstream, rstream.mrg32k3a-method (rstream.resetsubstream-methods), 17
- rstream.nextsubstream-methods (rstream.resetsubstream-methods), 17
- rstream.packed (rstream.packed-methods), 15
- rstream.packed, rstream-method (rstream.packed-methods), 15
- rstream.packed, rstream.lecuyer-method (rstream.packed-methods), 15
- rstream.packed, rstream.mrg32k3a-method (rstream.packed-methods), 15
- rstream.packed, rstream.runif-method (rstream.packed-methods), 15
- rstream.packed-methods, 15
- rstream.packed<- (rstream.packed-methods), 15
- rstream.packed<-, rstream-method (rstream.packed-methods), 15
- rstream.packed<-, rstream.lecuyer-method (rstream.packed-methods), 15
- rstream.packed<-, rstream.mrg32k3a-method (rstream.packed-methods), 15
- rstream.packed<-, rstream.runif-method (rstream.packed-methods), 15
- rstream.packed<--methods (rstream.packed-methods), 15
- rstream.reset (rstream.reset-methods), 16
- rstream.reset, rstream-method (rstream.reset-methods), 16
- rstream.reset, rstream.lecuyer-method (rstream.reset-methods), 16
- rstream.reset, rstream.mrg32k3a-method (rstream.reset-methods), 16
- rstream.reset, rstream.runif-method (rstream.reset-methods), 16
- rstream.reset-methods, 16
- rstream.resetsubstream (rstream.resetsubstream-methods), 17
- rstream.resetsubstream, rstream-method (rstream.resetsubstream-methods), 17
- rstream.resetsubstream, rstream.lecuyer-method (rstream.resetsubstream-methods), 17
- rstream.resetsubstream, rstream.mrg32k3a-method (rstream.resetsubstream-methods), 17
- rstream.RNG, 5, 10, 13, 18, 21
- rstream.runif, 5, 6, 15–17
- rstream.runif-class, 19
- rstream.sample (rstream.sample-methods), 22
- rstream.sample, rstream, numeric-method (rstream.sample-methods), 22
- rstream.sample, rstream-method (rstream.sample-methods), 22
- rstream.sample, rstream.lecuyer-method (rstream.sample-methods), 22
- rstream.sample, rstream.mrg32k3a-method (rstream.sample-methods), 22
- rstream.sample, rstream.runif-method (rstream.sample-methods), 22
- rstream.sample-methods, 22
- rstream.version, 23
- set.seed, 19, 20
- show, rstream-method (rstream-class), 3