

Package ‘RandVar’

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Title Implementation of random variables

Description Implementation of random variables by means of S4 classes and methods

Depends R (>= 2.7.0), methods, startupmsg, distr(>= 2.0), distrEx(>= 2.0)

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RandVar-package	<i>Implementation of random variables</i>
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Description

Implementation of random variables by means of S4 classes and methods.

Details

Package:	RandVar
Version:	0.8
Date:	2010-12-03
Depends:	R (>= 2.7.0), methods, startupmsg, distr(>= 2.0), distrEx(>= 2.0)
LazyLoad:	yes
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Package versions

Note: The first two numbers of package versions do not necessarily reflect package-individual development, but rather are chosen for the RobAStXXX family as a whole in order to ease updating "depends" information.

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References

M. Kohl (2005). Numerical Contributions to the Asymptotic Theory of Robustness. Dissertation. University of Bayreuth.

See Also

[distr-package](#), [distrEx-package](#)

Examples

```
library(RandVar)
#vignette("RandVar")
```

EuclRandMatrix *Generating function for EuclRandMatrix-class*

Description

Generates an object of class "EuclRandMatrix".

Usage

```
EuclRandMatrix(Map = list(function(x){1}), nrow = 1, ncol = 1,
               Domain = NULL, dimension = 1, Range)
```

Arguments

Map	list of functions forming the map.
nrow	number of rows.
ncol	number of columns.
Domain	object of class "OptionalrSpace": domain of Map
dimension	positive integer: dimension of the range of Map
Range	object of class "OptionalrSpace": range of Map

Value

Object of class "EuclRandMatrix"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[EuclRandMatrix-class](#)

Examples

```

L1 <- list(function(x){x}, function(x){x^2}, function(x){x^3}, function(x){x^4},
           function(x){x^5}, function(x){x^6})
L2 <- list(function(x){exp(x)}, function(x){abs(x)},
           function(x){sin(x)}, function(x){floor(x)})

R1 <- EuclRandMatrix(Map = L1, nrow = 3, Domain = Reals(), dimension = 1)
R1[1:2, 2]
R1[1:2, 1:2]
Map(R1[1,2])
Map(t(R1)[2,1])

R2 <- EuclRandMatrix(Map = L2, ncol = 2, Domain = Reals(), dimension = 1)
(DL <- imageDistr(R2, Norm()))
plot(DL)

Map(gamma(R2)) # "Math" group

## "Arith" group
Map(2/R1)
Map(R2 * R2)

## The function is currently defined as
function(Map = list(function(x){1}), nrow = 1, ncol = 1,
         Domain = NULL, dimension = 1) {
  if (missing(nrow))
    nrow <- ceiling(length(Map)/ncol)
  else if (missing(ncol))
    ncol <- ceiling(length(Map)/nrow)

  if(missing(Range))
    return(new("EuclRandMatrix", Map = Map, Domain = Domain,
              Range = EuclideanSpace(dimension = dimension),
              Dim = as.integer(c(nrow, ncol))))
  else
    return(new("EuclRandMatrix", Map = Map, Domain = Domain,
              Range = Range, Dim = as.integer(c(nrow, ncol))))
}

```

EuclRandMatrix-class *Euclidean random matrix*

Description

Class of Euclidean random matrices.

Objects from the Class

Objects can be created by calls of the form `new("EuclRandMatrix", ...)`. More frequently they are created via the generating function `EuclRandMatrix`.

Slots

Dim vector of positive integers: Dimensions of the random matrix.
Map Object of class "list": list of functions.
Domain Object of class "OptionalRSpace" domain of the random matrix.
Range Object of class "OptionalRSpace" range of the random matrix.

Extends

Class "EuclRandVariable", directly.
 Class "RandVariable", by class "EuclRandVariable".

Methods

coerce signature(from = "EuclRandMatrix", to = "EuclRandVarList"): create a "EuclRandVarList" object from a Euclidean random matrix.

[signature(x = "EuclRandMatrix"): generates a new Euclidean random variable/matrix by extracting elements of the slot Map of x.

Dim signature(object = "EuclRandMatrix"): accessor function for slot Dim.

Dim<- signature(object = "EuclRandMatrix",): replacement function for slot Dim.

ncol signature(x = "EuclRandMatrix"): number of columns of x.

nrow signature(x = "EuclRandMatrix"): number of rows of x.

dimension signature(object = "EuclRandMatrix"): dimension of the Euclidean random variable.

evalRandVar signature(RandVar = "EuclRandMatrix", x = "numeric"): evaluate the slot Map of RandVar at x.

evalRandVar signature(RandVar = "EuclRandMatrix", x = "matrix"): evaluate the slot Map of RandVar at x.

evalRandVar signature(RandVar = "EuclRandMatrix", x = "numeric", distr = "Distribution"): evaluate the slot Map of RandVar at x assuming a probability space with distribution distr. In case x does not lie in the support of distr NA is returned.

evalRandVar signature(RandVar = "EuclRandMatrix", x = "matrix", distr = "Distribution"): evaluate the slot Map of RandVar at rows of x assuming a probability space with distribution distr. For those rows of x which do not lie in the support of distr NA is returned.

t signature(x = "EuclRandMatrix"): transposes x. In addition, the results of the functions in the slot Map of x are transposed.

show signature(object = "EuclRandMatrix")

%*% signature(x = "matrix", y = "EuclRandMatrix"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

%*% signature(x = "numeric", y = "EuclRandMatrix"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

%*% signature(x = "EuclRandVariable", y = "EuclRandMatrix"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

```

%% signature(x = "EuclRandMatrix", y = "matrix"): matrix multiplication of x and y.
    Generates an object of class "EuclRandMatrix".
%% signature(x = "EuclRandMatrix", y = "numeric"): matrix multiplication of x and y.
    Generates an object of class "EuclRandMatrix".
%% signature(x = "EuclRandMatrix", y = "EuclRandMatrix"): matrix multiplication of
    x and y. Generates an object of class "EuclRandMatrix".
%% signature(x = "EuclRandMatrix", y = "EuclRandVariable"): matrix multiplication
    of x and y. Generates an object of class "EuclRandMatrix".
Arith signature(e1 = "numeric", e2 = "EuclRandMatrix"): Given a numeric vector e1, a
    Euclidean random matrix e2 and an arithmetic operator op, the Euclidean random matrix e1
    op e2 is returned.
Arith signature(e1 = "EuclRandMatrix", e2 = "numeric"): Given a Euclidean random
    matrix e1, a numeric vector e2, and an arithmetic operator op, the Euclidean random matrix
    e1 op e2 is returned.
Arith signature(e1 = "EuclRandMatrix", e2 = "EuclRandMatrix"): Given two Euclidean
    random matrices e1 and e2, and an arithmetic operator op, the Euclidean random matrix e1
    op e2 is returned.
Math signature(x = "EuclRandMatrix"): Given a "Math" group generic fct, the Euclidean
    random matrix fct(x) is returned.
E signature(object = "UnivariateDistribution", fun = "EuclRandMatrix", cond =
    "missing"): expectation of fun under univariate distributions.
E signature(object = "AbscontDistribution", fun = "EuclRandMatrix", cond =
    "missing"): expectation of fun under absolutely continuous univariate distributions.
E signature(object = "DiscreteDistribution", fun = "EuclRandMatrix", cond =
    "missing"): expectation of fun under discrete univariate distributions.
E signature(object = "MultivariateDistribution", fun = "EuclRandMatrix", cond =
    "missing"): expectation of fun under multivariate distributions.
E signature(object = "DiscreteMVDistribution", fun = "EuclRandMatrix", cond =
    "missing"): expectation of fun under discrete multivariate distributions.
E signature(object = "UnivariateCondDistribution", fun = "EuclRandMatrix", cond =
    "numeric"): conditional expectation of fun under conditional univariate distributions.
E signature(object = "AbscontCondDistribution", fun = "EuclRandMatrix", cond =
    "numeric"): conditional expectation of fun under absolutely continuous conditional univari-
    ate distributions.
E signature(object = "DiscreteCondDistribution", fun = "EuclRandMatrix", cond =
    "numeric"): conditional expectation of fun under discrete conditional univariate distribu-
    tions.

```

Author(s)

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See Also

[EuclRandMatrix](#), [RandVariable-class](#), [EuclRandVariable-class](#), [EuclRandVarList-class](#), [Distribution-class](#), [Arith](#), [Math](#), [E](#)

Examples

```

L1 <- list(function(x){x}, function(x){x^2}, function(x){x^3}, function(x){x^4},
           function(x){x^5}, function(x){x^6})
L2 <- list(function(x){exp(x)}, function(x){abs(x)},
           function(x){sin(x)}, function(x){floor(x)})

R1 <- new("EuclRandMatrix", Map = L1, Dim = as.integer(c(3,2)),
         Domain = Reals(), Range = Reals())

dimension(R1)
R1[1:2, 2]
R1[1:2, 1:2]
Map(R1[1,2])
Map(t(R1)[2,1])

R2 <- EuclRandMatrix(Map = L2, ncol = 2, Domain = Reals(), dimension = 1)
dimension(R2)
(DL <- imageDistr(R2, Norm()))
plot(DL)

Map(gamma(R2)) # "Math" group

## "Arith" group
Map(2/R1)
Map(R2 * R2)

```

EuclRandVariable	<i>Generating function for EuclRandVariable-class</i>
------------------	---

Description

Generates an object of class "EuclRandVariable".

Usage

```
EuclRandVariable(Map = list(function(x){1}), Domain = NULL,
                 dimension = 1, Range)
```

Arguments

Map	list of functions forming the map.
Domain	object of class "OptionalrSpace": domain of Map
dimension	positive integer: dimension of the range of Map
Range	object of class "OptionalrSpace": range of Map

Value

Object of class "EuclRandVariable"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[EuclRandVariable-class](#)

Examples

```
L1 <- list(function(x){x}, function(x){x^2}, function(x){x^3}, function(x){x^4})
L2 <- list(function(x){exp(x)}, function(x){abs(x)},
           function(x){sin(x)}, function(x){floor(x)})
```

```
R1 <- EuclRandVariable(Map = L1, Domain = Reals(), dimension = 1)
Map(R1)
Range(R1)
Range(R1) <- Reals()
R1[2]
Map(R1[3])
Map(R1[c(1,2,4)])
Map(R1[2:4])
evalRandVar(R1, rnorm(1))
x <- as.matrix(rnorm(10))
res.R1 <- evalRandVar(R1, x)
res.R1[2,,] # results for Map(R1)[[2]](x)
res.R1[2,1,] # results for Map(R1)[[2]](x[1,])
```

```
R2 <- EuclRandVariable(L2, Domain = Reals(), dimension = 1)
DL1 <- imageDistr(R2, Norm())
plot(DL1)
```

```
Domain(R2) <- EuclideanSpace(dimension = 2)
Range(R2) <- EuclideanSpace(dimension = 2)
(X <- matrix(c(x, rnorm(10)), ncol = 2))
res.R2 <- evalRandVar(R2, X)
res.R2[3,,1] # results for Map(R2)[[3]](X[,1])
```

```
Map(log(abs(R2))) # "Math" group generic
```

```
# "Arith" group generic
Map(3 + R1)
Map(c(1,3,5) * R1)
try(1:5 * R1) # error
Map(1:2 * R2)
Map(R2 - 5)
Map(R1 ^ R1)
```

```
## The function is currently defined as
function(Map = list(function(x){1}), Domain = NULL, dimension = 1, Range) {
  if(missing(Range))
    return(new("EuclRandVariable", Map = Map, Domain = Domain,
```

```

        Range = EuclideanSpace(dimension = dimension)))
    else
      return(new("EuclRandVariable", Map = Map, Domain = Domain,
                Range = Range))
  }

```

 EuclRandVariable-class

Euclidean random variable

Description

Class of Euclidean random variables.

Objects from the Class

Objects can be created by calls of the form `new("EuclRandVariable", ...)`. More frequently they are created via the generating function `EuclRandVariable`.

Slots

`Map` Object of class "list": list of functions.

`Domain` Object of class "OptionalrSpace": domain of the random variable.

`Range` Object of class "EuclideanSpace": range of the random variable.

Extends

Class "RandVariable", directly.

Methods

coerce signature(from = "EuclRandVariable", to = "EuclRandMatrix"): create a "EuclRandMatrix" object from a Euclidean random variable.

coerce signature(from = "EuclRandVariable", to = "EuclRandVarList"): create a "EuclRandVarList" object from a Euclidean random variable.

Range<- signature(object = "EuclRandVariable"): replacement function for the slot Range.

[signature(x = "EuclRandVariable"): generates a new Euclidean random variable by extracting elements of the slot Map of x.

evalRandVar signature(RandVar = "EuclRandVariable", x = "numeric", distr = "missing"): evaluate the slot Map of RandVar at x.

evalRandVar signature(RandVar = "EuclRandVariable", x = "matrix", distr = "missing"): evaluate the slot Map of RandVar at rows of x.

evalRandVar signature(RandVar = "EuclRandVariable", x = "numeric", distr = "Distribution"): evaluate the slot Map of RandVar at x assuming a probability space with distribution distr. In case x does not lie in the support of distr NA is returned.

evalRandVar signature(RandVar = "EuclRandVariable", x = "matrix", distr = "Distribution"): evaluate the slot Map of RandVar at rows of x assuming a probability space with distribution distr. For those rows of x which do not lie in the support of distr NA is returned.

imageDistr signature(RandVar = "EuclRandVariable", distr = "Distribution"): image distribution of distr under RandVar. Returns an object of class "DistrList".

dimension signature(object = "EuclRandVariable"): dimension of the Euclidean random variable.

t signature(x = "EuclRandVariable"): returns an object of class "EuclRandMatrix" where the results of the functions in the slot Map of x are transposed.

%% signature(x = "matrix", y = "EuclRandVariable"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

%% signature(x = "EuclRandVariable", y = "matrix"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

%% signature(x = "numeric", y = "EuclRandVariable"): generates an object of class "EuclRandMatrix" (1 x 1 matrix) by multiplying (scalar/inner product) x and y.

%% signature(x = "EuclRandVariable", y = "numeric"): generates an object of class "EuclRandMatrix" (1 x 1 matrix) by multiplying (scalar/inner product) x and y.

%% signature(x = "EuclRandVariable", y = "EuclRandVariable"): generates an object of class "EuclRandMatrix" (1 x 1 matrix) by multiplying (scalar/inner product) x and y.

%% signature(x = "EuclRandVariable", y = "EuclRandMatrix"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

%% signature(x = "EuclRandMatrix", y = "EuclRandVariable"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

Arith signature(e1 = "numeric", e2 = "EuclRandVariable"): Given a numeric vector e1, a Euclidean random variable e2 and an arithmetic operator op, the Euclidean random variable $e1 \text{ op } e2$ is returned.

Arith signature(e1 = "EuclRandVariable", e2 = "numeric"): Given a numeric vector e2, a Euclidean random variable e1 and an arithmetic operator op, the Euclidean random variable $e1 \text{ op } e2$ is returned.

Arith signature(e1 = "EuclRandVariable", e2 = "EuclRandVariable"): Given two Euclidean random variables e1, e2 and an arithmetic operator op, the Euclidean random variable $e1 \text{ op } e2$ is returned.

Math signature(x = "EuclRandVariable"): Given a "Math" group generic fct, the Euclidean random variable $\text{fct}(x)$ is returned.

E signature(object = "UnivariateDistribution", fun = "EuclRandVariable", cond = "missing"): expectation of fun under univariate distributions.

E signature(object = "AbscontDistribution", fun = "EuclRandVariable", cond = "missing"): expectation of fun under absolutely continuous univariate distributions.

E signature(object = "DiscreteDistribution", fun = "EuclRandVariable", cond = "missing"): expectation of fun under discrete univariate distributions.

E signature(object = "MultivariateDistribution", fun = "EuclRandVariable", cond = "missing"): expectation of fun under multivariate distributions.

- E** signature(object = "DiscreteMVDistribution", fun = "EuclRandVariable", cond = "missing"): expectation of fun under discrete multivariate distributions.
- E** signature(object = "UnivariateCondDistribution", fun = "EuclRandVariable", cond = "numeric"): conditional expectation of fun under conditional univariate distributions.
- E** signature(object = "UnivariateCondDistribution", fun = "EuclRandVariable", cond = "numeric"): conditional expectation of fun under absolutely continuous conditional univariate distributions.
- E** signature(object = "UnivariateCondDistribution", fun = "EuclRandVariable", cond = "numeric"): conditional expectation of fun under discrete conditional univariate distributions.

Author(s)

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See Also

[EuclRandVariable](#), [RandVariable-class](#), [EuclRandMatrix-class](#), [EuclRandVarList-class](#), [Distribution-class](#), [Arith](#), [Math](#), [E](#)

Examples

```
L1 <- list(function(x){x}, function(x){x^2}, function(x){x^3}, function(x){x^4})
L2 <- list(function(x){exp(x)}, function(x){abs(x)},
           function(x){sin(x)}, function(x){floor(x)})

R1 <- new("EuclRandVariable", Map = L1, Domain = Reals(), Range = Reals())
dimension(R1)
Map(R1)
Range(R1)
R1[2]
Map(R1[3])
Map(R1[c(1,2,4)])
Map(R1[2:4])
evalRandVar(R1, rnorm(1))
x <- as.matrix(rnorm(10))
res.R1 <- evalRandVar(R1, x)
res.R1[2,,] # results for Map(R1)[[2]](x)
res.R1[2,1,] # results for Map(R1)[[2]](x[1,])

R2 <- EuclRandVariable(L2, Domain = Reals(), dimension = 1)
dimension(R2)
DL1 <- imageDistr(R2, Norm())
plot(DL1)

Domain(R2) <- EuclideanSpace(dimension = 2)
Range(R2) <- EuclideanSpace(dimension = 2)
dimension(R2)
(X <- matrix(c(x, rnorm(10)), ncol = 2))
res.R2 <- evalRandVar(R2, X)
```

```

res.R2[3,,1] # results for Map(R2)[[3]](X[,1])

Map(log(abs(R2))) # "Math" group generic

# "Arith" group generic
Map(3 + R1)
Map(c(1,3,5) * R1)
try(1:5 * R1) # error
Map(1:2 * R2)
Map(R2 - 5)
Map(R1 ^ R1)

```

EuclRandVarList

Generating function for EuclRandVarList-class

Description

Generates an object of class "EuclRandVarList".

Usage

```
EuclRandVarList(...)
```

Arguments

... Objects of class "EuclRandVariable" which shall form the list of Euclidean random variables.

Value

Object of class "EuclRandVarList"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[EuclRandVarList-class](#)

Examples

```

L1 <- list(function(x){x}, function(x){x^2}, function(x){x^3}, function(x){x^4},
           function(x){x^5}, function(x){x^6})
L2 <- list(function(x){exp(x)}, function(x){abs(x)},
           function(x){sin(x)}, function(x){floor(x)})

R1 <- new("EuclRandVariable", Map = L2, Domain = Reals(), Range = Reals())
R2 <- EuclRandMatrix(Map = L1, ncol = 2, Domain = Reals(), dimension = 1)

```

```

R3 <- EuclRandMatrix(Map = L2, ncol = 2, Domain = Reals(), dimension = 1)

(RL1 <- EuclRandVarList(R1, R2, R3))
is(R1, "EuclRandVarList")
as(R1, "EuclRandVarList")
is(R2, "EuclRandVarList")
as(R2, "EuclRandVarList")

Map(exp(RL1)[[1]]) # "Math" group

## "Arith" group
Map((1 + RL1)[[1]])
Map((RL1 * 2)[[2]])
Map((RL1 / RL1)[[3]])

## The function is currently defined as
function(...){
  new("EuclRandVarList", list(...))
}

```

EuclRandVarList-class *List of Euclidean random variables*

Description

Create a list of Euclidean random variables

Objects from the Class

Objects can be created by calls of the form `new("EuclRandVarList", ...)`. More frequently they are created via the generating function `EuclRandVarList`.

Slots

`.Data` Object of class "list". A list of Euclidean random variables.

Extends

Class "list", from data part.
Class "vector", by class "list".

Methods

coerce signature(from = "EuclRandVariable", to = "EuclRandVarList"): create a "EuclRandVarList" object from a Euclidean random variable.

coerce signature(from = "EuclRandMatrix", to = "EuclRandVarList"): create a "EuclRandVarList" object from a Euclidean random matrix.

numberOfMaps signature(object = "EuclRandVarList"): number of functions contained in the slots Map of the members of object.

dimension signature(object = "EuclRandVarList"): dimension of the Euclidean random variable.

evalRandVar signature(RandVar = "EuclRandVarList", x = "numeric"): evaluate the elements of RandVar at x.

evalRandVar signature(RandVar = "EuclRandVarList", x = "matrix"): evaluate the elements of RandVar at rows of x.

evalRandVar signature(RandVar = "EuclRandVarList", x = "numeric", distr = "Distribution"): evaluate the elements of RandVar at x assuming a probability space with distribution distr. In case x does not lie in the support of distr NA is returned.

evalRandVar signature(RandVar = "EuclRandVarList", x = "matrix", distr = "Distribution"): evaluate the elements of RandVar at rows of x assuming a probability space with distribution distr. For those rows of x which do not lie in the support of distr NA is returned.

imageDistr signature(RandVar = "EuclRandVarList", distr = "Distribution"): image distribution of distr under RandVar. Returns an object of class "DistrList".

show signature(object = "EuclRandVarList")

t signature(x = "EuclRandVarList"): returns an object of class "EuclRandVarList" where the results of the functions in the slots Map of the members of x are transposed.

%m% signature(x = "EuclRandVarList", y = "EuclRandVarList"): matrix multiplication for objects of class "EuclRandVarList". Generates an object of class "EuclRandVarList".

%*% signature(x = "matrix", y = "EuclRandVarList"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

%*% signature(x = "EuclRandVarList", y = "matrix"): matrix multiplication of x and y. Generates an object of class "EuclRandMatrix".

Arith signature(e1 = "numeric", e2 = "EuclRandVarList"): Given a numeric vector e1, a list of Euclidean random variables e2 and an arithmetic operator op, the list of Euclidean random variables e1 op e2 is returned.

Arith signature(e1 = "EuclRandVarList", e2 = "numeric"): Given a numeric vector e2, a list of Euclidean random variables e1 and an arithmetic operator op, the list of Euclidean random variables e1 op e2 is returned.

Arith signature(e1 = "EuclRandVarList", e2 = "EuclRandVarList"): Given two lists of Euclidean random variables e1, e2 and an arithmetic operator op, the list of Euclidean random variables e1 op e2 is returned.

Math signature(x = "EuclRandVarList"): Given a "Math" group generic fct, the list of Euclidean random variables fct(x) is returned.

E signature(object = "UnivariateDistribution", fun = "EuclRandVarList", cond = "missing"): expectation of fun under univariate distributions.

E signature(object = "AbscontDistribution", fun = "EuclRandVarList", cond = "missing"): expectation of fun under absolutely continuous univariate distributions.

E signature(object = "DiscreteDistribution", fun = "EuclRandVarList", cond = "missing"): expectation of fun under discrete univariate distributions.

E signature(object = "MultivariateDistribution", fun = "EuclRandVarList", cond = "missing"): expectation of fun under multivariate distributions.

E signature(object = "DiscreteMVDistribution", fun = "EuclRandVarList", cond = "missing"): expectation of fun under discrete multivariate distributions.

E signature(object = "UnivariateCondDistribution", fun = "EuclRandVarList", cond = "numeric"): expectation of fun under conditional univariate distributions.

E signature(object = "AbscontCondDistribution", fun = "EuclRandVarList", cond = "numeric"): expectation of fun under absolutely continuous conditional univariate distributions.

E signature(object = "DiscreteCondDistribution", fun = "EuclRandVarList", cond = "numeric"): expectation of fun under discrete conditional univariate distributions.

Author(s)

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See Also

[EuclRandMatrix](#), [RandVariable-class](#), [EuclRandVariable-class](#), [EuclRandMatrix-class](#), [Distribution-class](#), [Arith](#), [Math](#), [E](#)

Examples

```
L1 <- list(function(x){x}, function(x){x^2}, function(x){x^3}, function(x){x^4},
           function(x){x^5}, function(x){x^6})
L2 <- list(function(x){exp(x)}, function(x){abs(x)},
           function(x){sin(x)}, function(x){floor(x)})

R1 <- new("EuclRandVariable", Map = L2, Domain = Reals(), Range = Reals())
R2 <- EuclRandMatrix(Map = L1, ncol = 2, Domain = Reals(), dimension = 1)
R3 <- EuclRandMatrix(Map = L2, ncol = 2, Domain = Reals(), dimension = 1)

(RL1 <- new("EuclRandVarList", list(R1, R2, R3)))
dimension(RL1)
as(R1, "EuclRandVarList")
as(R2, "EuclRandVarList")

Map(exp(RL1)[[1]]) # "Math" group

## "Arith" group
Map((1 + RL1)[[1]])
Map((RL1 * 2)[[2]])
Map((RL1 / RL1)[[3]])
```

OptionalrSpace-class *Optional rSpace*

Description

Optional object of class "rSpace".

Objects from the Class

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[rSpace-class](#)

RandVariable

Generating function for RandVariable-class

Description

Generates an object of class "RandVariable".

Usage

```
RandVariable(Map = list(function(x){}), Domain = NULL, Range = NULL)
```

Arguments

Map	list of functions forming the map.
Domain	domain of Map: object of class "OptionalrSpace" (default = NULL).
Range	range of Map: object of class "OptionalrSpace" (default = NULL).

Value

Object of class "RandVariable"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[RandVariable-class](#)

Examples

```

(R1 <- RandVariable())
Map(R1)
Domain(R1)
Range(R1)
Map(R1) <- list(function(x){ceiling(x)}, function(x){floor(x)})
Domain(R1) <- Reals()
Range(R1) <- Naturals()
R1
Map(R1)
length(R1)

R2 <- R1
Domain(R2) <- Naturals()
compatibleDomains(R1, R2)
Domain(R2) <- NULL
compatibleDomains(R1, R2)
Domain(R2) <- EuclideanSpace(dimension = 1)
compatibleDomains(R1, R2)
Domain(R2) <- EuclideanSpace(dimension = 2)
compatibleDomains(R1, R2)

## The function is currently defined as
function(Map = list(function(x){ }), Domain = NULL, Range = NULL) {
  return(new("RandVariable", Map = Map, Domain = Domain, Range = Range))
}

```

RandVariable-class *Random variable*

Description

Class of random variables; i.e., measurable maps from Domain to Range. The elements contained in the list Map are functions in one(!) argument named “x”.

Objects from the Class

Objects can be created by calls of the form `new("RandVariable", ...)`. More frequently they are created via the generating function `RandVariable`.

Slots

Map Object of class "list": list of functions.

Domain Object of class "OptionalrSpace": domain of the random variable.

Range Object of class "OptionalrSpace": range of the random variable.

Methods

Map signature(object = "RandVariable"): accessor function for the slot Map.

Domain signature(object = "RandVariable"): accessor function for the slot Domain.

Range signature(object = "RandVariable"): accessor function for the slot Range.

Map<- signature(object = "RandVariable"): replacement function for the slot Map.

Domain<- signature(object = "RandVariable"): replacement function for the slot Domain.

Range<- signature(object = "RandVariable"): replacement function for the slot Range.

compatibleDomains signature(e1 = "RandVariable", e2 = "RandVariable"): test if the domains of two random variables are compatible.

length signature(object = "RandVariable"): length of the list of functions in slot Map.

show signature(object = "RandVariable")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[RandVariable](#), [EuclRandVariable-class](#), [EuclRandMatrix-class](#), [EuclRandVarList-class](#)

Examples

```
(R1 <- new("RandVariable"))
Map(R1)
Domain(R1)
Range(R1)
Map(R1) <- list(function(x){ceiling(x)}, function(x){floor(x)})
Domain(R1) <- Reals()
Range(R1) <- Naturals()
R1
Map(R1)
length(R1)

R2 <- R1
Domain(R2) <- Naturals()
compatibleDomains(R1, R2)
Domain(R2) <- NULL
compatibleDomains(R1, R2)
Domain(R2) <- EuclideanSpace(dimension = 1)
compatibleDomains(R1, R2)
Domain(R2) <- EuclideanSpace(dimension = 2)
compatibleDomains(R1, R2)
```

RealRandVariable *Generating function for RealRandVariable-class*

Description

Generates an object of class "RealRandVariable".

Usage

```
RealRandVariable(Map = list(function(x) {1}), Domain = NULL, Range)
```

Arguments

Map	list of functions forming the map.
Domain	domain of Map: object of class "OptionalrSpace".
Range	range of Map: object of class "Reals".

Value

Object of class "RealRandVariable"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[RealRandVariable-class](#)

Examples

```
RealRandVariable(Map = list(function(x){x}), Domain = Reals())

## The function is currently defined as
function(Map = list(function(x){1}), Domain = NULL, Range) {
  if(missing(Range)) Range <- Reals()
  if(!is(Range, "Reals"))
    stop("'Range' has to be of class 'Reals'")

  return(new("RealRandVariable", Map = Map,
            Domain = Domain, Range = Reals()))
}
```

RealRandVariable-class

Real random variable

Description

Class of real random variables.

Objects from the Class

Objects can be created by calls of the form `new("RealRandVariable", ...)`. More frequently they are created via the generating function `EuclRandVariable`.

Slots

Map Object of class "list": list of functions.

Domain Object of class "OptionalrSpace": domain of the random variable.

Range Object of class "Reals": range of the random variable.

Extends

Class "EuclRandVariable", directly.

Class "RandVariable", by class "EuclRandVariable".

Methods

Range<- `signature(object = "EuclRandVariable")`: replacement function for the slot Range.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[EuclRandVariable-class](#)

Examples

```
new("RealRandVariable", Map=list(function(x){x}), Range = Reals())
```

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