

Package ‘FuzzyNumbers’

July 2, 2014

Title Tools to deal with fuzzy numbers

Type Package

Description The FuzzyNumbers package provides S4 classes and methods to deal with Fuzzy Numbers that allow for computations of arithmetic operations, approximation by trapezoidal and piecewise linear FNs, visualization, etc.

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URL <http://FuzzyNumbers.rexamine.com>

BugReports <http://github.com/Rexamine/FuzzyNumbers/issues>

License LGPL (>= 3)

ByteCompile TRUE

Depends R (>= 2.12.0), methods, grDevices, graphics, stats

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Description

FuzzyNumbers is an open source (LGPL 3) package for R. It provides S4 classes and methods to deal with Fuzzy Numbers. The package may be used by the practitioners as well as by the researchers in fuzzy numbers theory (e.g. for testing new algorithms, generating numerical examples, preparing figures).

Details

Fuzzy set theory lets us quite intuitively represent imprecise or vague information. Fuzzy numbers, which form a particular subclass of fuzzy sets of the real line, play a significant role in many important theoretical and/or practical considerations. This is because we often describe our knowledge about objects through numbers, e.g. "I'm about 180 cm tall" or "The rocket was launched between 2 and 3 p.m."

For the formal definition of a fuzzy number please refer to the [FuzzyNumber](#) man page. Note that this package also deals with particular types of fuzzy numbers like trapezoidal, piecewise linear, or "parametric" FNs (see [TrapezoidalFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [PowerFuzzyNumber](#), and [*EXPERIMENTAL* DiscontinuousFuzzyNumber](#))

The package aims to provide the following functionality:

1. Representation of arbitrary fuzzy numbers (including FNs with discontinuous side functions and/or alpha-cuts), as well as their particular types, e.g. trapezoidal and piecewise linear fuzzy numbers,
2. Defuzzification and approximation by triangular and piecewise linear FNs (see e.g. [expectedValue](#), [value](#), [trapezoidalApproximation](#), [piecewiseLinearApproximation](#)),
3. Visualization of FNs (see [plot](#), [as.character](#)),
4. Basic operations on FNs (see e.g. [fapply](#) and [Arithmetic](#)),
5. Aggregation of FNs ****TO DO****,
6. Ranking of FNs ****TO DO****,
7. Random FN generation ****TO DO****,
8. ...

Please feel free to send any comments and feature requests to the author (see his homepage at <http://gagolewski.rexamine.com/>).

For a complete list of classes and methods call `help(package="FuzzyNumbers")`. Moreover, you will surely be interested in a step-by-step guide to the package usage and features which is available at the project's webpage.

Keywords: Fuzzy Numbers, Fuzzy Sets, Shadowed Sets, Trapezoidal Approximation, Piecewise Linear Approximation, Approximate Reasoning, Imprecision, Vagueness, Randomness.

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Author(s)

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 alphacut

Calculate Alpha-Cuts

Description

If A is a fuzzy numbers, then its α -cuts are always in form of intervals. Moreover, the α -cuts form a nonincreasing chain w.r.t. α .

Usage

```
## S4 method for signature 'FuzzyNumber,numeric'
alphacut(object, alpha)
```

Arguments

object	a fuzzy numbers
alpha	numeric vector with elements in [0,1]

Value

Returns a matrix with two columns (left and right alpha cut bounds). if some elements in alpha are not in [0,1], then NA is set.

See Also

Other FuzzyNumber-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `*`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `*`, `TrapezoidalFuzzyNumber`, `numeric-method`, `*`, `numeric`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `+`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `+`, `numeric`, `FuzzyNumber-method`, `-`, `FuzzyNumber`, `ANY-method`, `-`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `-`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `-`, `numeric`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `Arithmetic`; `FuzzyNumber-class`; `FuzzyNumber`; `alphaInterval`, `alphaInterval`, `FuzzyNumber-method`, `alphaInterval`, `PiecewiseLinearFuzzyNumber-method`, `alphaInterval`, `PowerFuzzyNumber-method`, `alphaInterval`, `TrapezoidalFuzzyNumber-method`; `ambiguity`, `ambiguity`, `FuzzyNumber-method`; `as.FuzzyNumber`, `as.FuzzyNumber`, `FuzzyNumber-method`, `as.FuzzyNumber`, `numeric-method`; `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`; `as.PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `TrapezoidalFuzzyNumber`, `numeric-method`; `as.PowerFuzzyNumber`, `as.PowerFuzzyNumber`, `FuzzyNumber-method`, `as.PowerFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `as.PowerFuzzyNumber`, `PowerFuzzyNumber-method`, `as.PowerFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.PowerFuzzyNumber`, `numeric-method`; `as.TrapezoidalFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `FuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `PowerFuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`; `as.TrapezoidalFuzzyNumber`, `numeric-method`; `as.character`, `as.character`, `FuzzyNumber-method`, `as.character`, `PiecewiseLinearFuzzyNumber-method`, `as.character`, `PowerFuzzyNumber-method`, `as.character`, `TrapezoidalFuzzyNumber-method`; `core`, `core`, `FuzzyNumber-method`; `distance`, `distance`, `DiscontinuousFuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `DiscontinuousFuzzyNumber`, `distance`, `FuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `FuzzyNumber`, `FuzzyNumber-method`; `evaluate`, `evaluate`, `FuzzyNumber`, `numeric-method`; `expectedInterval`, `expectedInterval`, `FuzzyNumber-method`, `expectedInterval`, `PiecewiseLinearFuzzyNumber-method`, `expectedInterval`, `PowerFuzzyNumber-method`, `expectedInterval`, `TrapezoidalFuzzyNumber-method`; `expectedValue`, `expectedValue`, `FuzzyNumber-method`; `integrateAlpha`, `integrateAlpha`, `DiscontinuousFuzzyNumber`, `character`, `numeric`, `numeric-method`, `integrateAlpha`, `FuzzyNumber`, `character`, `numeric`, `numeric-method`; `piecewiseLinearApproximation`, `piecewiseLinearApproximation`, `FuzzyNumber-method`; `plot`, `plot`, `DiscontinuousFuzzyNumber`, `missing-method`, `plot`, `FuzzyNumber`, `missing-method`, `plot`, `PiecewiseLinearFuzzyNumber`, `missing-method`, `plot`, `TrapezoidalFuzzyNumber`, `show`, `show`, `FuzzyNumber-method`; `supp`, `supp`, `FuzzyNumber-method`; `trapezoidalApproximation`, `trapezoidalApproximation`, `FuzzyNumber-method`; `value`, `value`, `FuzzyNumber-method`; `weightedExpectedValue`, `weightedExpectedValue`, `FuzzyNumber-method`; `width`, `width`, `FuzzyNumber-method`

Other `alpha_cuts`: `core`, `core`, `FuzzyNumber-method`; `supp`, `supp`, `FuzzyNumber-method`

Examples

```
A <- TrapezoidalFuzzyNumber(1, 2, 3, 4)
alphacut(A, c(-1, 0.4, 0.2))
```

<code>alphaInterval</code>	<i>Calculate the Alpha-Interval of a Fuzzy Number</i>
----------------------------	---

Description

We have $\alpha - \text{Int}(A) := [\int_0^1 \alpha A_L(\alpha) d\alpha, \int_0^1 \alpha A_U(\alpha) d\alpha]$.

Usage

```
## S4 method for signature 'FuzzyNumber'
alphaInterval(object, ...)

## S4 method for signature 'TrapezoidalFuzzyNumber'
alphaInterval(object)

## S4 method for signature 'PiecewiseLinearFuzzyNumber'
alphaInterval(object)

## S4 method for signature 'PowerFuzzyNumber'
alphaInterval(object)
```

Arguments

<code>object</code>	a fuzzy number
<code>...</code>	for <code>FuzzyNumber</code> and <code>DiscontinuousFuzzyNumber</code> - additional arguments passed to integrateAlpha

Details

Note that if an instance of the `FuzzyNumber` or `DiscontinuousFuzzyNumber` class is given, the calculation is performed via numerical integration. Otherwise, the computation is exact.

Value

Returns numeric vector of length 2.

See Also

Other `FuzzyNumber`-method: [*, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method](#)

-, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric
 -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method,
 /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNu
 /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber;
 alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method;
 as. FuzzyNumber, as. FuzzyNumber, FuzzyNumber-method, as. FuzzyNumber, numeric-method;
 as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as. PiecewiseLinearFuz
 as. PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, numeric-m
 as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-method, as. PowerFuzzyNumber, PiecewiseLinearFuzzy
 as. PowerFuzzyNumber, PowerFuzzyNumber-method, as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as. PowerFuzzyNumber, numeric-method; as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-
 as. TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. TrapezoidalFuzzyNumber, PowerFuzzyNum
 as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as. TrapezoidalFuzzyNumber, numeric-method;
 as. character, as. character, FuzzyNumber-method, as. character, PiecewiseLinearFuzzyNumber-method,
 as. character, PowerFuzzyNumber-method, as. character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-me
 distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-
 distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNum
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric
 *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, Fu
 +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
 +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
 -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNum
 -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
 -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzy
 /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class;
 PiecewiseLinearFuzzyNumber; as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, FuzzyNumber-
 as. PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, Trape
 as. PiecewiseLinearFuzzyNumber, numeric-method; as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-me
 as. PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. PowerFuzzyNumber, PowerFuzzyNumber-method,
 as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PowerFuzzyNumber, numeric-method;
 as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-method, as. TrapezoidalFuzzyNumber, Pi
 as. TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-
 as. TrapezoidalFuzzyNumber, numeric-method; as. character, as. character, FuzzyNumber-method,
 as. character, PiecewiseLinearFuzzyNumber-method, as. character, PowerFuzzyNumber-method,
 as. character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method,
 expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
 expectedInterval, TrapezoidalFuzzyNumber-method; fapply, fapply, PiecewiseLinearFuzzyNumber, function-me

plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

Other PowerFuzzyNumber-method: PowerFuzzyNumber-class; PowerFuzzyNumber; as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-method, as. PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. PowerFuzzyNumber, PowerFuzzyNumber-method, as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PowerFuzzyNumber, numeric-method; as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-method, as. TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as. TrapezoidalFuzzyNumber, numeric-method; as. character, as. character, FuzzyNumber-method, as. character, PiecewiseLinearFuzzyNumber-method, as. character, PowerFuzzyNumber-method, as. character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber-class; TrapezoidalFuzzyNumber; TriangularFuzzyNumber; as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber, as. PiecewiseLinearFuzzyNumber, numeric-method; as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-method, as. PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. PowerFuzzyNumber, PowerFuzzyNumber-method, as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PowerFuzzyNumber, numeric-method; as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-method, as. TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber, as. TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as. TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

ambiguity

Calculate the Ambiguity of a Fuzzy Number

Description

The ambiguity (Delgado et al, 1998) is a measure of nonspecificity of a fuzzy number.

Usage

```
## S4 method for signature 'FuzzyNumber'
ambiguity(object, ...)
```


Arguments

object a fuzzy number
 ... additional arguments passed to `alphaInterval`

Details

The ambiguity is defined as $amb(A) := \int_0^1 \alpha (A_U(\alpha) - A_L(\alpha)) d\alpha$.

Value

Returns a single numeric value.

References

Delgado M., Vila M.A., Voxman W. (1998), On a canonical representation of a fuzzy number, *Fuzzy Sets and Systems* 93, pp. 125-135.

See Also

Other FuzzyNumber-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `*`, `PiecewiseLinearFuzzyNumber`, `*`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `*`, `TrapezoidalFuzzyNumber`, `numeric-method`, `*`, `numeric`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `+`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `+`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `+`, `numeric`, `FuzzyNumber-method`, `-`, `FuzzyNumber`, `ANY-method`, `-`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `-`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `-`, `numeric`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `/`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `Arithmetic`; `FuzzyNumber-class`; `FuzzyNumber`; `alphaInterval`, `alphaInterval`, `FuzzyNumber-method`, `alphaInterval`, `PiecewiseLinearFuzzyNumber-method`, `alphaInterval`, `PowerFuzzyNumber-method`, `alphaInterval`, `TrapezoidalFuzzyNumber-method`; `alphacut`, `alphacut`, `FuzzyNumber`, `numeric-method`; `as.FuzzyNumber`, `as.FuzzyNumber`, `FuzzyNumber-method`, `as.FuzzyNumber`, `numeric-method`; `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `TrapezoidalFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `numeric-method`; `as.PowerFuzzyNumber`, `as.PowerFuzzyNumber`, `FuzzyNumber-method`, `as.PowerFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `as.PowerFuzzyNumber`, `PowerFuzzyNumber-method`, `as.PowerFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.PowerFuzzyNumber`, `numeric-method`; `as.TrapezoidalFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `FuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `PowerFuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `numeric-method`; `as.character`, `as.character`, `FuzzyNumber-method`, `as.character`, `PiecewiseLinearFuzzyNumber-method`, `as.character`, `PowerFuzzyNumber-method`, `as.character`, `TrapezoidalFuzzyNumber-method`; `core`, `core`, `FuzzyNumber-method`; `distance`, `distance`, `DiscontinuousFuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `DiscontinuousFuzzyNumber`, `distance`, `FuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `FuzzyNumber`, `FuzzyNumber-method`; `evaluate`, `evaluate`, `FuzzyNumber`, `numeric-method`; `expectedInterval`, `expectedInterval`, `FuzzyNumber-method`, `expectedInterval`, `PiecewiseLinearFuzzyNumber-method`, `expectedInterval`, `PowerFuzzyNumber-method`, `expectedInterval`, `TrapezoidalFuzzyNumber-method`; `expectedValue`, `expectedValue`, `FuzzyNumber-method`; `integrateAlpha`, `integrateAlpha`, `DiscontinuousFuzzyNumber`, `character`, `numeric`, `numeric-method`, `integrateAlpha`, `FuzzyNumber`, `character`, `numeric`, `numeric-method`; `piecewiseLinearApproximation`,

[piecewiseLinearApproximation](#), [FuzzyNumber-method](#); [plot](#), [plot](#), [DiscontinuousFuzzyNumber](#), [missing-method](#), [plot](#), [FuzzyNumber](#), [missing-method](#), [plot](#), [PiecewiseLinearFuzzyNumber](#), [missing-method](#), [plot](#), [TrapezoidalFuzzyNumber](#), [show](#), [show](#), [FuzzyNumber-method](#); [supp](#), [supp](#), [FuzzyNumber-method](#); [trapezoidalApproximation](#), [trapezoidalApproximation](#), [FuzzyNumber-method](#); [value](#), [value](#), [FuzzyNumber-method](#); [weightedExpectedValue](#), [weightedExpectedValue](#), [FuzzyNumber-method](#); [width](#), [width](#), [FuzzyNumber-method](#)

Other characteristics: [expectedValue](#), [expectedValue](#), [FuzzyNumber-method](#); [value](#), [value](#), [FuzzyNumber-method](#); [weightedExpectedValue](#), [weightedExpectedValue](#), [FuzzyNumber-method](#); [width](#), [width](#), [FuzzyNumber-method](#)

approxInvert

Approximate the Inverse of a Given Function

Description

The function may be used to create side generating functions from alpha-cut generators and inversely.

Usage

```
approxInvert(f, method = c("monoH.FC", "linear", "hyman"), n = 500)
```

Arguments

f	a monotonic, continuous function $f: [0,1] \rightarrow [0,1]$
method	interpolation method: "monoH.FC", "hyman" or "linear"
n	number of interpolation points

Details

The function is a wrapper to [splinefun](#) and [approxfun](#). Thus, interpolation is used.

Value

Returns a new function, the approximate inverse of the input.

See Also

[FuzzyNumber](#)

Other auxiliary: [convertAlpha](#); [convertSide](#)

Description

Applies arithmetic operations using the extension principle and interval-based calculations.

Usage

```

## S4 method for signature 'numeric,FuzzyNumber'
e1 + e2 # e2 + e1

## S4 method for signature 'TrapezoidalFuzzyNumber,TrapezoidalFuzzyNumber'
e1 + e2

## S4 method for signature
## 'PiecewiseLinearFuzzyNumber,PiecewiseLinearFuzzyNumber'
e1 + e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,numeric'
e1 + e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,FuzzyNumber'
e1 + e2 # calls as.PiecewiseLinearFuzzyNumber()

## S4 method for signature 'numeric,FuzzyNumber'
e1 - e2 # e2*(-1) + e1

## S4 method for signature 'TrapezoidalFuzzyNumber,TrapezoidalFuzzyNumber'
e1 - e2

## S4 method for signature
## 'PiecewiseLinearFuzzyNumber,PiecewiseLinearFuzzyNumber'
e1 - e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,numeric'
e1 - e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,FuzzyNumber'
e1 - e2 # calls as.PiecewiseLinearFuzzyNumber()

## S4 method for signature 'FuzzyNumber,ANY'
e1 - e2 # -e1

## S4 method for signature 'numeric,FuzzyNumber'
e1 * e2 # e2 * e1

```

```

## S4 method for signature 'TrapezoidalFuzzyNumber,numeric'
e1 * e2

## S4 method for signature
## 'PiecewiseLinearFuzzyNumber,PiecewiseLinearFuzzyNumber'
e1 * e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,FuzzyNumber'
e1 * e2 # calls as.PiecewiseLinearFuzzyNumber()

## S4 method for signature 'PiecewiseLinearFuzzyNumber,numeric'
e1 * e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,numeric'
e1 / e2

## S4 method for signature
## 'PiecewiseLinearFuzzyNumber,PiecewiseLinearFuzzyNumber'
e1 / e2

## S4 method for signature 'PiecewiseLinearFuzzyNumber,FuzzyNumber'
e1 / e2 # calls as.PiecewiseLinearFuzzyNumber()

```

Arguments

e1 a fuzzy number or single numeric value
e2 a fuzzy number or single numeric value

Details

Implemented operators: +, -, *, / for piecewise linear fuzzy numbers. Also some versions may be applied on numeric values and trapezoidal fuzzy numbers.

Note that according to the theory the class of PLFNs is not closed under the operations * and /. However, if you operate on a large number of knots, the results should be satisfactory.

Value

Returns a fuzzy number of the class [PiecewiseLinearFuzzyNumber](#) or [TrapezoidalFuzzyNumber](#).

See Also

Other FuzzyNumber-method: [FuzzyNumber-class](#); [FuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber-method](#), [alphaInterval](#), [PiecewiseLinearFuzzyNumber-method](#), [alphaInterval](#), [PowerFuzzyNumber-method](#), [alphaInterval](#), [TrapezoidalFuzzyNumber-method](#); [alphacut](#), [alphacut](#), [FuzzyNumber](#), [numeric-method](#); [ambiguity](#), [ambiguity](#), [FuzzyNumber-method](#); [as.FuzzyNumber](#), [as.FuzzyNumber](#), [FuzzyNumber-method](#), [as.FuzzyNumber](#), [numeric-method](#); [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#); [as.PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber](#), [TrapezoidalFuzzyNumber](#); [as.PiecewiseLinearFuzzyNumber](#), [numeric-method](#); [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber-method](#); [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [PowerFuzzyNumber-method](#),

as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method;
 as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, Pi
 as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-m
 as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method,
 as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method,
 as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance,
 distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber
 distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method;
 evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method,
 expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
 expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method;
 integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, character, numeric, numeric-method,
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: PiecewiseLinearFuzzyNumber-class; PiecewiseLinearFuzzyNumber;
 alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuz
 as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-m
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-m
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 fapply, fapply, PiecewiseLinearFuzzyNumber, function-method; plot, plot, DiscontinuousFuzzyNumber, missing
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy

Other TrapezoidalFuzzyNumber-method: TrapezoidalFuzzyNumber-class; TrapezoidalFuzzyNumber;
 TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearF
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuz
 as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-m
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-m
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method,
 plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

Other extension_principle: [fapply](#), [fapply](#), [PiecewiseLinearFuzzyNumber](#), [function-method](#)

as.character

Get Basic Information on a Fuzzy Number in a String

Description

This method is especially useful if you would like to generate LaTeX equations defining a fuzzy numbers.

Usage

```
## S4 method for signature 'FuzzyNumber'
as.character(x, toLaTeX=FALSE, varnameLaTeX="A")

## S4 method for signature 'TrapezoidalFuzzyNumber'
as.character(x, toLaTeX=FALSE, varnameLaTeX="A")

## S4 method for signature 'PiecewiseLinearFuzzyNumber'
as.character(x, toLaTeX=FALSE, varnameLaTeX="A")

## S4 method for signature 'PowerFuzzyNumber'
as.character(x, toLaTeX=FALSE, varnameLaTeX="A")
```

Arguments

x	a fuzzy number
toLaTeX	logical; should LaTeX code be output?
varnameLaTeX	character; variable name to be included in equations

Details

Consider calling the [cat](#) function on the resulting string.

Thanks to Jan Caha for suggesting the toLaTeX arg.

Value

Returns a character vector.

See Also

Other FuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric](#)

-, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class; PiecewiseLinearFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; fapply, fapply, PiecewiseLinearFuzzyNumber, function-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber

Other PowerFuzzyNumber-method: PowerFuzzyNumber-class; PowerFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method

Other conversion: as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method, as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method

as.FuzzyNumber

Converts an Object to a Fuzzy Number

Description

Please note that applying this function on a [FuzzyNumber](#) child class causes information loss, as it drops all additional slots defined in the child classes. [FuzzyNumber](#) is the base class for all FNs. Note that some functions for TFNs or PLFNs work much faster and are more precise. This function shouldn't be used in normal computations.

Usage

```
## S4 method for signature 'numeric'
as.FuzzyNumber(object)

## S4 method for signature 'FuzzyNumber'
as.FuzzyNumber(object)
```

Arguments

object a fuzzy number or a single numeric value (crisp number) or vector of length two (interval)

Value

Returns an object of class [FuzzyNumber](#).

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other conversion: as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method

```
as.PiecewiseLinearFuzzyNumber
```

Converts an Object to a Piecewise Linear Fuzzy Number

Description

This method is only for exact conversion. For other cases (e.g. general FNs), use [piecewiseLinearApproximation](#).

Usage

```
## S4 method for signature 'TrapezoidalFuzzyNumber'
as.PiecewiseLinearFuzzyNumber(object, knot.n=0,
  knot.alpha=seq(0, 1, length.out=knot.n+2)[-c(1,knot.n+2)])

## S4 method for signature 'numeric'
as.PiecewiseLinearFuzzyNumber(object, knot.n=0,
  knot.alpha=seq(0, 1, length.out=knot.n+2)[-c(1,knot.n+2)])

## S4 method for signature 'FuzzyNumber'
as.PiecewiseLinearFuzzyNumber(object, knot.n=0,
  knot.alpha=seq(0, 1, length.out=knot.n+2)[-c(1,knot.n+2)])

## S4 method for signature 'PiecewiseLinearFuzzyNumber'
as.PiecewiseLinearFuzzyNumber(object, knot.n=0,
  knot.alpha=seq(0, 1, length.out=knot.n+2)[-c(1,knot.n+2)])
```

Arguments

object	a fuzzy number or a single numeric value (crisp number) or vector of length two (interval)
knot.n	the number of knots
knot.alpha	knot.n alpha-cut values at knots, defaults to uniformly distributed knots

Value

Returns an object of class [PiecewiseLinearFuzzyNumber](#).

See Also

Other FuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#)

/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber;
 alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method;
 as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method;
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method,
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method,
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method,
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method,
 distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method,
 distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method,
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber-method,
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber-method,
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method,
 *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method,
 +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
 -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method,
 /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class;
 PiecewiseLinearFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method,
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method,
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method,
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method,
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 fapply, fapply, PiecewiseLinearFuzzyNumber, function-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber-method

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method

```

*, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, F
+, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
+, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
-, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumb
-, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
-, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzy
/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber-class;
TrapezoidalFuzzyNumber; TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method,
alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method,
alphaInterval, TrapezoidalFuzzyNumber-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-met
as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method,
as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method;
as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, Pi
as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-m
as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method,
expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
expectedInterval, TrapezoidalFuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy

```

Other conversion: as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method;
as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-m
as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method

as.PowerFuzzyNumber *Converts an Object to a Power Fuzzy Number*

Description

This method is only for exact conversion.

Usage

```

## S4 method for signature 'numeric'
as.PowerFuzzyNumber(object)

## S4 method for signature 'FuzzyNumber'
as.PowerFuzzyNumber(object)

## S4 method for signature 'PowerFuzzyNumber'
as.PowerFuzzyNumber(object)

## S4 method for signature 'PiecewiseLinearFuzzyNumber'
as.PowerFuzzyNumber(object)

```

```
## S4 method for signature 'TrapezoidalFuzzyNumber'
as.PowerFuzzyNumber(object)
```

Arguments

object a fuzzy number or a single numeric value (crisp number) or vector of length two (interval)

Value

Returns an object of class `PowerFuzzyNumber`.

See Also

Other FuzzyNumber-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `*`, `PiecewiseLinearFuzzyNumber`, `*`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `*`, `TrapezoidalFuzzyNumber`, `numeric-method`, `*`, `numeric`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `+`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `+`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `+`, `numeric`, `FuzzyNumber-method`, `-`, `FuzzyNumber`, `ANY-method`, `-`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `-`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `-`, `numeric`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `/`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `Arithmetic`; `FuzzyNumber-class`; `FuzzyNumber`; `alphaInterval`, `alphaInterval`, `FuzzyNumber-method`, `alphaInterval`, `PiecewiseLinearFuzzyNumber-method`, `alphaInterval`, `PowerFuzzyNumber-method`, `alphaInterval`, `TrapezoidalFuzzyNumber-method`; `alphacut`, `alphacut`, `FuzzyNumber`, `numeric-method`; `ambiguity`, `ambiguity`, `FuzzyNumber-method`; `as.FuzzyNumber`, `as.FuzzyNumber`, `FuzzyNumber-method`, `as.FuzzyNumber`, `numeric-method`; `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `numeric-method`; `as.TrapezoidalFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `FuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `PowerFuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`; `as.TrapezoidalFuzzyNumber`, `numeric-method`; `as.character`, `as.character`, `FuzzyNumber-method`, `as.character`, `PiecewiseLinearFuzzyNumber-method`, `as.character`, `PowerFuzzyNumber-method`, `as.character`, `TrapezoidalFuzzyNumber-method`; `core`, `core`, `FuzzyNumber-method`; `distance`, `distance`, `DiscontinuousFuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `DiscontinuousFuzzyNumber`, `distance`, `FuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `FuzzyNumber`, `FuzzyNumber-method`; `evaluate`, `evaluate`, `FuzzyNumber`, `numeric-method`; `expectedInterval`, `expectedInterval`, `FuzzyNumber-method`, `expectedInterval`, `PiecewiseLinearFuzzyNumber-method`, `expectedInterval`, `PowerFuzzyNumber-method`, `expectedInterval`, `TrapezoidalFuzzyNumber-method`; `expectedValue`, `expectedValue`, `FuzzyNumber-method`; `integrateAlpha`, `integrateAlpha`, `DiscontinuousFuzzyNumber`, `character`, `numeric`, `numeric-method`, `integrateAlpha`, `FuzzyNumber`, `character`, `numeric`, `numeric-method`; `piecewiseLinearApproximation`, `piecewiseLinearApproximation`, `FuzzyNumber-method`; `plot`, `plot`, `DiscontinuousFuzzyNumber`, `missing-method`, `plot`, `FuzzyNumber`, `missing-method`, `plot`, `PiecewiseLinearFuzzyNumber`, `missing-method`, `plot`, `TrapezoidalFuzzyNumber`, `show`, `show`, `FuzzyNumber-method`; `supp`, `supp`, `FuzzyNumber-method`; `trapezoidalApproximation`, `trapezoidalApproximation`, `FuzzyNumber-method`; `value`, `value`, `FuzzyNumber-method`; `weightedExpectedValue`, `weightedExpectedValue`, `FuzzyNumber-method`; `width`, `width`, `FuzzyNumber-method`

Other PiecewiseLinearFuzzyNumber-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `*`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `*`, `PiecewiseLinearFuzzyNumber`, `numeric-method`

*, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class; PiecewiseLinearFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method; as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; fapply, fapply, PiecewiseLinearFuzzyNumber, function-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

Other PowerFuzzyNumber-method: PowerFuzzyNumber-class; PowerFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method; as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber-class; TrapezoidalFuzzyNumber; TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber, as.PiecewiseLinearFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;

plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

Other conversion: as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method

as.TrapezoidalFuzzyNumber

Converts an Object to a Trapezoidal Fuzzy Number

Description

This method is only for exact conversion. For other cases (e.g. general FNs), use [trapezoidalApproximation](#).

Usage

```
## S4 method for signature 'numeric'
as.TrapezoidalFuzzyNumber(object)

## S4 method for signature 'FuzzyNumber'
as.TrapezoidalFuzzyNumber(object)

## S4 method for signature 'PowerFuzzyNumber'
as.TrapezoidalFuzzyNumber(object)

## S4 method for signature 'PiecewiseLinearFuzzyNumber'
as.TrapezoidalFuzzyNumber(object)

## S4 method for signature 'TrapezoidalFuzzyNumber'
as.TrapezoidalFuzzyNumber(object)
```

Arguments

object	a fuzzy number or a single numeric value (crisp number) or vector of length two (interval)
--------	--

Value

Returns an object of class [TrapezoidalFuzzyNumber](#).

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, character, numeric, numeric-method, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber-method; show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class; PiecewiseLinearFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,

as.PowerFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method,
 as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method,
 as.character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method,
 expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
 expectedInterval, TrapezoidalFuzzyNumber-method; fapply, fapply, PiecewiseLinearFuzzyNumber, function-me
 plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method,
 plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

Other PowerFuzzyNumber-method: PowerFuzzyNumber-class; PowerFuzzyNumber; alphaInterval,
 alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyN
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method,
 as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method,
 as.character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method,
 expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
 expectedInterval, TrapezoidalFuzzyNumber-method

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric
 *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, F
 +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
 +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
 -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNum
 -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
 -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzy
 /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber-class;
 TrapezoidalFuzzyNumber; TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method,
 alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method,
 alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNum
 as.PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, Trape
 as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-me
 as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method,
 as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method,
 plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

Other conversion: as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method;
 as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuz
 as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-m
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method,
 as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method,
 as.character, TrapezoidalFuzzyNumber-method

convertAlpha	<i>Convert a Given Upper/Lower Alpha-Cut Function to an Alpha-Cut Generating Function</i>
--------------	---

Description

The resulting function calls the original function and then linearly scales its output.

Usage

```
convertAlpha(f, y1, y2)
```

Arguments

f	a function into [y1,y2]
y1	numeric vector of length 1
y2	numeric vector of length 1

Value

Returns a new function defined on [0,1] (scaled input).

See Also

[FuzzyNumber](#)

Other auxiliary: [approxInvert](#); [convertSide](#)

convertSide	<i>Convert a Given Side Function to Side Generating Function</i>
-------------	--

Description

The resulting function linearly scales the input and passes it to the original function.

Usage

```
convertSide(f, x1, x2)
```

Arguments

f	a function defined on [x1,x2]
x1	numeric vector of length 1; if longer, only the first element is used
x2	numeric vector of length 1; if longer, only the first element is used

Details

The function works for $x_1 < x_2$ and $x_1 > x_2$.

Value

Returns a new function defined on $[0,1]$ (scaled input).

See Also

[FuzzyNumber](#)

Other auxiliary: [approxInvert](#); [convertAlpha](#)

core

*Calculate the Core of a Fuzzy Number***Description**

We have $\text{core}(A) := [a_2, a_3]$. This gives the values that a fuzzy number necessarily represents.

Usage

```
## S4 method for signature 'FuzzyNumber'
core(object)
```

Arguments

object a fuzzy number

Value

Returns a numeric vector of length 2.

See Also

Other FuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [Arithmetic](#); [FuzzyNumber-class](#); [FuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber-method](#), [alphaInterval](#), [PiecewiseLinearFuzzyNumber-method](#), [alphaInterval](#), [PowerFuzzyNumber-method](#), [alphaInterval](#), [TrapezoidalFuzzyNumber-method](#); [alphacut](#), [alphacut](#), [FuzzyNumber](#), [numeric-method](#); [ambiguity](#), [ambiguity](#), [FuzzyNumber-method](#); [as.FuzzyNumber](#), [as.FuzzyNumber](#), [FuzzyNumber-method](#), [as.FuzzyNumber](#), [numeric-method](#);

as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, character, numeric, numeric-method, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other alpha_cuts: alphacut, alphacut, FuzzyNumber, numeric-method; supp, supp, FuzzyNumber-method

DiscontinuousFuzzyNumber

Creates a Fuzzy Number with Possibly Discontinuous Side Functions or Alpha-Cut Bounds

Description

For convenience, objects of class `DiscontinuousFuzzyNumber` may be created with this function.

Usage

```

DiscontinuousFuzzyNumber(a1, a2, a3, a4, lower = function(a) rep(NA_real_,
  length(a)), upper = function(a) rep(NA_real_, length(a)),
  left = function(x) rep(NA_real_, length(x)), right = function(x)
  rep(NA_real_, length(x)), discontinuities.left = numeric(0),
  discontinuities.right = numeric(0), discontinuities.lower = numeric(0),
  discontinuities.upper = numeric(0))

```

Arguments

a1	a number specifying left bound of the support
a2	a number specifying left bound of the core
a3	a number specifying right bound of the core

a4	a number specifying right bound of the support
lower	lower alpha-cut bound generator; a nondecreasing function $[0,1] \rightarrow [0,1]$ or returning NA_real_
upper	upper alpha-cut bound generator; a nonincreasing function $[0,1] \rightarrow [1,0]$ or returning NA_real_
left	lower side function generator; a nondecreasing function $[0,1] \rightarrow [0,1]$ or returning NA_real_
right	upper side function generator; a nonincreasing function $[0,1] \rightarrow [1,0]$ or returning NA_real_
discontinuities.left	nondecreasingly sorted numeric vector with elements in $(0,1)$, possibly of length 0
discontinuities.right	nondecreasingly sorted numeric vector with elements in $(0,1)$, possibly of length 0
discontinuities.lower	nondecreasingly sorted numeric vector with elements in $(0,1)$, possibly of length 0
discontinuities.upper	nondecreasingly sorted numeric vector with elements in $(0,1)$, possibly of length 0

Value

Object of class `DiscontinuousFuzzyNumber`

See Also

Other DiscontinuousFuzzyNumber-method: [DiscontinuousFuzzyNumber-class](#); [distance](#), [distance](#), [DiscontinuousFuzzyNumber-distance](#), [DiscontinuousFuzzyNumber](#), [FuzzyNumber-method](#), [distance](#), [FuzzyNumber](#), [DiscontinuousFuzzyNumber-distance](#), [FuzzyNumber](#), [FuzzyNumber-method](#); [integrateAlpha](#), [integrateAlpha](#), [DiscontinuousFuzzyNumber](#), [character](#), [integrateAlpha](#), [FuzzyNumber](#), [character](#), [numeric](#), [numeric-method](#); [plot](#), [plot](#), [DiscontinuousFuzzyNumber](#), [missing-method](#), [plot](#), [FuzzyNumber](#), [missing-method](#), [plot](#), [PiecewiseLinearFuzzyNumber](#), [missing-method](#), [plot](#), [TrapezoidalFuzzyNumber](#)

DiscontinuousFuzzyNumber-class

***EXPERIMENTAL** S4 Class Representing a Fuzzy Number with Discontinuous Side Functions or Alpha-Cut Bounds*

Description

Discontinuity information increase the precision of some numerical integration-based algorithms, e.g. of [piecewiselinearApproximation](#). It also allows for making more valid fuzzy number plots.

Slots

`a1, a2, a3, a4, lower, upper, left, right`: Inherited from the [FuzzyNumber](#) class.
`discontinuities.left`: nondecreasingly sorted numeric vector with elements in (0,1); discontinuity points for the left side generating function
`discontinuities.right`: nondecreasingly sorted numeric vector with elements in (0,1); discontinuity points for the right side generating function
`discontinuities.lower`: nondecreasingly sorted numeric vector with elements in (0,1); discontinuity points for the lower alpha-cut bound generator
`discontinuities.upper`: nondecreasingly sorted numeric vector with elements in (0,1); discontinuity points for the upper alpha-cut bound generator

Extends

Class [FuzzyNumber](#), directly.

See Also

[DiscontinuousFuzzyNumber](#) for a convenient constructor

Other [DiscontinuousFuzzyNumber](#)-method: [DiscontinuousFuzzyNumber](#); [distance](#), [distance](#), [DiscontinuousFuzzyNumber-distance](#), [DiscontinuousFuzzyNumber,FuzzyNumber-method](#), [distance,FuzzyNumber,DiscontinuousFuzzyNumber-distance](#), [FuzzyNumber,FuzzyNumber-method](#); [integrateAlpha](#), [integrateAlpha,DiscontinuousFuzzyNumber,character](#), [integrateAlpha,FuzzyNumber,character](#), [numeric,numeric-method](#); [plot](#), [plot,DiscontinuousFuzzyNumber,missing-method](#), [plot,FuzzyNumber,missing-method](#), [plot,PiecewiseLinearFuzzyNumber,missing-method](#), [plot,TrapezoidalFuzzyNumber,missing-method](#)

Examples

```
showClass("DiscontinuousFuzzyNumber")
showMethods(classes="DiscontinuousFuzzyNumber")
```

distance

Calculate the Distance Between Two Fuzzy Numbers

Description

Currently, only Euclidean distance may be calculated. We have $d_E^2(A, B) := \int_0^1 (A_L(\alpha) - B_L(\alpha))^2 d\alpha + \int_0^1 (A_U(\alpha) - B_U(\alpha))^2 d\alpha$, see (Grzegorzewski, 1988).

Usage

```
## S4 method for signature 'FuzzyNumber,FuzzyNumber'
distance(e1, e2, type=c("Euclidean", "EuclideanSquared"), ...)

## S4 method for signature 'FuzzyNumber,DiscontinuousFuzzyNumber'
distance(e1, e2, type=c("Euclidean", "EuclideanSquared"), ...)

## S4 method for signature 'DiscontinuousFuzzyNumber,FuzzyNumber'
```

```
distance(e1, e2, type=c("Euclidean", "EuclideanSquared"), ...)

## S4 method for signature 'DiscontinuousFuzzyNumber,DiscontinuousFuzzyNumber'
distance(e1, e2, type=c("Euclidean", "EuclideanSquared"), ...)
```

Arguments

e1	a fuzzy number
e2	a fuzzy number
type	one of "Euclidean", "EuclideanSquared"
...	additional arguments passed to integrate

Details

The calculation are done using numerical integration,

Value

Returns the calculated distance, i.e. a single numeric value.

References

Grzegorzewski P., Metrics and orders in space of fuzzy numbers, *Fuzzy Sets and Systems* 97, 1998, pp. 83-94.

See Also

Other `DiscontinuousFuzzyNumber`-method: [DiscontinuousFuzzyNumber-class](#); [DiscontinuousFuzzyNumber](#); [integrateAlpha](#), [integrateAlpha,DiscontinuousFuzzyNumber,character,numeric,numeric-method](#), [integrateAlpha,FuzzyNumber,character,numeric,numeric-method](#); [plot](#), [plot,DiscontinuousFuzzyNumber,missing-method](#), [plot,FuzzyNumber,missing-method](#), [plot,PiecewiseLinearFuzzyNumber,missing-method](#), [plot,TrapezoidalFuzzyNumber,missing-method](#)

Other `FuzzyNumber`-method: [*](#), [PiecewiseLinearFuzzyNumber,FuzzyNumber-method,*](#), [PiecewiseLinearFuzzyNumber,numeric-method,*](#), [TrapezoidalFuzzyNumber,numeric-method,*](#), [numeric,FuzzyNumber-method,+](#), [PiecewiseLinearFuzzyNumber,FuzzyNumber-method,+](#), [PiecewiseLinearFuzzyNumber,numeric-method,+](#), [TrapezoidalFuzzyNumber,TrapezoidalFuzzyNumber-method,+](#), [numeric,FuzzyNumber-method,-](#), [FuzzyNumber,ANY-method,-](#), [PiecewiseLinearFuzzyNumber,FuzzyNumber-method,-](#), [PiecewiseLinearFuzzyNumber,PiecewiseLinearFuzzyNumber-method,-](#), [PiecewiseLinearFuzzyNumber,numeric-method,-](#), [TrapezoidalFuzzyNumber,TrapezoidalFuzzyNumber-method,-](#), [numeric,FuzzyNumber-method,/](#), [PiecewiseLinearFuzzyNumber,FuzzyNumber-method,/](#), [PiecewiseLinearFuzzyNumber,PiecewiseLinearFuzzyNumber-method,/](#), [PiecewiseLinearFuzzyNumber,numeric-method](#); [Arithmetic](#); [FuzzyNumber-class](#); [FuzzyNumber](#); [alphaInterval](#), [alphaInterval,FuzzyNumber-method](#), [alphaInterval,PiecewiseLinearFuzzyNumber-method](#), [alphaInterval,PowerFuzzyNumber-method](#), [alphaInterval,TrapezoidalFuzzyNumber-method](#); [alphacut](#), [alphacut,FuzzyNumber,numeric-method](#); [ambiguity](#), [ambiguity,FuzzyNumber-method](#); [as.FuzzyNumber](#), [as.FuzzyNumber,FuzzyNumber-method](#), [as.FuzzyNumber,numeric-method](#); [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber,FuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber,numeric-method](#); [as.PiecewiseLinearFuzzyNumber,TrapezoidalFuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber,numeric-method](#); [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber,FuzzyNumber-method](#), [as.PowerFuzzyNumber,PiecewiseLinearFuzzyNumber-method](#); [as.PowerFuzzyNumber,PowerFuzzyNumber-method](#), [as.PowerFuzzyNumber,TrapezoidalFuzzyNumber-method](#),

as.PowerFuzzyNumber,numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber ,FuzzyNumber-
 as.TrapezoidalFuzzyNumber,PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber,PowerFuzzyNum
 as.TrapezoidalFuzzyNumber,TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber ,numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character ,PiecewiseLinearFuzzyNumber-method,
 as.character,PowerFuzzyNumber-method, as.character ,TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber ,numeric-method; expectedInterval,
 expectedInterval, FuzzyNumber-method, expectedInterval ,PiecewiseLinearFuzzyNumber-method,
 expectedInterval,PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumbe
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

evaluate

Evaluate the Membership Function

Description

This function returns the value(s) of the membership function of a fuzzy number at given point(s).

Usage

```
## S4 method for signature 'FuzzyNumber,numeric'
evaluate(object, x)
```

Arguments

object	a fuzzy numbers
x	numeric vector

Value

Returns a numeric vector.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumbe
 *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method,
 *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzy
 +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
 +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-meth
 -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric
 -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method,
 /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNum

/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber;
 alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method;
 as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method;
 as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber,
 as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method;
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method,
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method,
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method,
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method,
 distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method,
 distance, FuzzyNumber, FuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method,
 expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
 expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method;
 integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, character, numeric, numeric-method,
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber,
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Examples

```
T <- TrapezoidalFuzzyNumber(1,2,3,4)
evaluate(T, seq(0, 5, by=0.5))
```

expectedInterval	<i>Calculate the Expected Interval of a Fuzzy Number</i>
------------------	--

Description

We have $EI(A) := [\int_0^1 A_L(\alpha) d\alpha, \int_0^1 A_U(\alpha) d\alpha]$, see (Duboid, Prade, 1987).

Usage

```
## S4 method for signature 'FuzzyNumber'
expectedInterval(object, ...)

## S4 method for signature 'TrapezoidalFuzzyNumber'
expectedInterval(object)
```

```
## S4 method for signature 'PiecewiseLinearFuzzyNumber'
expectedInterval(object)
```

```
## S4 method for signature 'PowerFuzzyNumber'
expectedInterval(object)
```

Arguments

object a fuzzy number

... for `FuzzyNumber` and `DiscontinuousFuzzyNumber` - additional arguments passed to [integrateAlpha](#)

Details

Note that if an instance of the `FuzzyNumber` or `DiscontinuousFuzzyNumber` class is given, the calculation is performed via numerical integration. Otherwise, the computation is exact.

Value

Returns a numeric vector of length 2.

References

Dubois D., Prade H. (1987), The mean value of a fuzzy number, *Fuzzy Sets and Systems* 24, pp. 279-300.

See Also

Other `FuzzyNumber`-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `*`, `PiecewiseLinearFuzzyNumber`, `*`, `PiecewiseLinearFuzzyNumber`, `numeric`-method, `*`, `TrapezoidalFuzzyNumber`, `numeric`-method, `*`, `numeric`, `FuzzyNumber`-method, `+`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `+`, `PiecewiseLinearFuzzyNumber`, `+`, `PiecewiseLinearFuzzyNumber`, `numeric`-method, `+`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `+`, `numeric`, `FuzzyNumber`-method, `-`, `FuzzyNumber`, `ANY`-method, `-`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `-`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`-method, `-`, `PiecewiseLinearFuzzyNumber`, `numeric`-method, `-`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `-`, `numeric`, `FuzzyNumber`-method, `/`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `/`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `/`, `PiecewiseLinearFuzzyNumber`, `numeric`-method, `Arithmetic`; `FuzzyNumber`-class; `FuzzyNumber`; `alphaInterval`, `alphaInterval`, `FuzzyNumber`-method, `alphaInterval`, `PiecewiseLinearFuzzyNumber`-method, `alphaInterval`, `PowerFuzzyNumber`-method, `alphaInterval`, `TrapezoidalFuzzyNumber`-method; `alphacut`, `alphacut`, `FuzzyNumber`, `numeric`-method; `ambiguity`, `ambiguity`, `FuzzyNumber`-method; `as.FuzzyNumber`, `as.FuzzyNumber`, `FuzzyNumber`-method, `as.FuzzyNumber`, `numeric`-method; `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `as.PiecewiseLinearFuzzyNumber`, `numeric`-method; `as.PowerFuzzyNumber`, `as.PowerFuzzyNumber`, `FuzzyNumber`-method, `as.PowerFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `as.PowerFuzzyNumber`, `PowerFuzzyNumber`-method, `as.PowerFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `as.PowerFuzzyNumber`, `numeric`-method; `as.TrapezoidalFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `FuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `PiecewiseLinearFuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `PowerFuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `numeric`-method; `as.character`, `as.character`, `FuzzyNumber`-method, `as.character`, `PiecewiseLinearFuzzyNumber`-method,

as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-me
 distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-
 distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method;
 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumbe
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric
 *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, Fu
 +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
 +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
 -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumbe
 -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
 -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzy
 /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class;
 PiecewiseLinearFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLin
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuz
 as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-m
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 fapply, fapply, PiecewiseLinearFuzzyNumber, function-method; plot, plot, DiscontinuousFuzzyNumber, missing-
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy

Other PowerFuzzyNumber-method: PowerFuzzyNumber-class; PowerFuzzyNumber; alphaInterval,
 alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric
 *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, Fu
 +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
 +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,

```

-, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber,
-, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
-, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber,
/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber-class;
TrapezoidalFuzzyNumber; TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method,
alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method,
alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber,
as.PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber,
as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method,
as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method,
as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method;
as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber,
as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
as.TrapezoidalFuzzyNumber, numeric-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber,

```

expectedValue

Calculate the Expected Value of a Fuzzy Number

Description

The calculation of the so-called expected value is one of possible methods to defuzzify a fuzzy number.

Usage

```

## S4 method for signature 'FuzzyNumber'
expectedValue(object, ...)

```

Arguments

object	a fuzzy number
...	additional arguments passed to expectedInterval

Details

The expected value of A is defined as $EV(A) := (EI_U(A) + EI_L(A))/2$, where EI is the [expectedInterval](#).

Value

Returns a single numeric value.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, character, numeric, numeric-method, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other characteristics: ambiguity, ambiguity, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other defuzzification: value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method

 Extract

FuzzyNumber Slot Accessors

Description

For possible slot names see man pages for the [FuzzyNumber](#) class and its derivatives

Usage

```
## S4 method for signature 'FuzzyNumber,character'
x[i]

## S4 method for signature 'PiecewiseLinearFuzzyNumber,character'
x[i]

## S4 method for signature 'PowerFuzzyNumber,character'
x[i]

## S4 method for signature 'DiscontinuousFuzzyNumber,character'
x[i]
```

Arguments

x	a fuzzy number
i	character; slot name

Details

All slot accessors are read-only.

Value

Returns the slot value.

Examples

```
A <- FuzzyNumber(1,2,3,4)
A["a1"]
A["right"]
```

fapply

Apply a Function on a Fuzzy Number

Description

Applies a given monotonic function using the extension principle (i.e. the function is applied on alpha-cuts).

Usage

```
## S4 method for signature 'PiecewiseLinearFuzzyNumber,function'
fapply(object, fun, ...)
```

Arguments

object	a fuzzy number
fun	a monotonic, vectorized R function
...	additional arguments passed to fun

Details

Currently only a method for the [PiecewiseLinearFuzzyNumber](#) class has been defined. The computations are exact (up to a numeric error) at knots. So, make sure you have a sufficient number of knots if you want good approximation.

For other types of fuzzy numbers, consider using [piecewiseLinearApproximation](#).

Value

Returns a [PiecewiseLinearFuzzyNumber](#).

See Also

Other [PiecewiseLinearFuzzyNumber](#)-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [*](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#)-method, [*](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [*](#), [TrapezoidalFuzzyNumber](#), numeric-method, [*](#), numeric, [FuzzyNumber](#)-method, [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [+](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#)-method, [+](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [+](#), numeric, [FuzzyNumber](#)-method, [-](#), [FuzzyNumber](#), [ANY](#)-method, [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [-](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [-](#), numeric, [FuzzyNumber](#)-method, [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [Arithmetic](#); [PiecewiseLinearFuzzyNumber](#)-class; [PiecewiseLinearFuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber](#)-method, [alphaInterval](#), [PiecewiseLinearFuzzyNumber](#), [alphaInterval](#), [PowerFuzzyNumber](#)-method, [alphaInterval](#), [TrapezoidalFuzzyNumber](#)-method; [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.PiecewiseLinearFuzzyNumber](#), numeric-method; [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [as.PowerFuzzyNumber](#), [PowerFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), numeric-method; [as.TrapezoidalFuzzyNumber](#), [as.TrapezoidalFuzzyNumber](#), [FuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [PowerFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), numeric-method; [as.character](#), [as.character](#), [FuzzyNumber](#)-method, [as.character](#), [PiecewiseLinearFuzzyNumber](#)-method, [as.character](#), [PowerFuzzyNumber](#)-method, [as.character](#), [TrapezoidalFuzzyNumber](#)-method; [expectedInterval](#), [expectedInterval](#), [FuzzyNumber](#)-method, [expectedInterval](#), [PiecewiseLinearFuzzyNumber](#)-method, [expectedInterval](#), [PowerFuzzyNumber](#)-method, [expectedInterval](#), [TrapezoidalFuzzyNumber](#)-method; [plot](#), [plot](#), [DiscontinuousFuzzyNumber](#), [missing](#)-method, [plot](#), [FuzzyNumber](#), [missing](#)-method, [plot](#), [PiecewiseLinearFuzzyNumber](#), [missing](#)-method, [plot](#), [TrapezoidalFuzzyNumber](#), [missing](#)-method

Other [extension_principle](#): [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [*](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [*](#), [TrapezoidalFuzzyNumber](#), numeric-method, [*](#), numeric, [FuzzyNumber](#)-method, [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [+](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [+](#), numeric, [FuzzyNumber](#)-method, [-](#), [FuzzyNumber](#), [ANY](#)-method, [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [-](#), numeric, [FuzzyNumber](#)-method, [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), numeric-method, [/](#), [Arithmetic](#); [PiecewiseLinearFuzzyNumber](#)-class; [PiecewiseLinearFuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber](#)-method, [alphaInterval](#), [PiecewiseLinearFuzzyNumber](#), [alphaInterval](#), [PowerFuzzyNumber](#)-method, [alphaInterval](#), [TrapezoidalFuzzyNumber](#)-method; [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#)-method, [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.PiecewiseLinearFuzzyNumber](#), numeric-method; [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [as.PowerFuzzyNumber](#), [PowerFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), numeric-method; [as.TrapezoidalFuzzyNumber](#), [as.TrapezoidalFuzzyNumber](#), [FuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [PowerFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), numeric-method; [as.character](#), [as.character](#), [FuzzyNumber](#)-method, [as.character](#), [PiecewiseLinearFuzzyNumber](#)-method, [as.character](#), [PowerFuzzyNumber](#)-method, [as.character](#), [TrapezoidalFuzzyNumber](#)-method; [expectedInterval](#), [expectedInterval](#), [FuzzyNumber](#)-method, [expectedInterval](#), [PiecewiseLinearFuzzyNumber](#)-method, [expectedInterval](#), [PowerFuzzyNumber](#)-method, [expectedInterval](#), [TrapezoidalFuzzyNumber](#)-method; [plot](#), [plot](#), [DiscontinuousFuzzyNumber](#), [missing](#)-method, [plot](#), [FuzzyNumber](#), [missing](#)-method, [plot](#), [PiecewiseLinearFuzzyNumber](#), [missing](#)-method, [plot](#), [TrapezoidalFuzzyNumber](#), [missing](#)-method

```
-, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric
-, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method,
/, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber
/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic
```

FuzzyNumber

Creates a Fuzzy Number

Description

For convenience, objects of class `FuzzyNumber` may be created with this function.

Usage

```
FuzzyNumber(a1, a2, a3, a4, lower = function(a) rep(NA_real_, length(a)),
  upper = function(a) rep(NA_real_, length(a)), left = function(x)
  rep(NA_real_, length(x)), right = function(x) rep(NA_real_, length(x)))
```

Arguments

a1	a number specifying left bound of the support
a2	a number specifying left bound of the core
a3	a number specifying right bound of the core
a4	a number specifying right bound of the support
lower	lower alpha-cut bound generator; a nondecreasing function $[0,1] \rightarrow [0,1]$ or returning <code>NA_real_</code>
upper	upper alpha-cut bound generator; a nonincreasing function $[0,1] \rightarrow [1,0]$ or returning <code>NA_real_</code>
left	lower side function generator; a nondecreasing function $[0,1] \rightarrow [0,1]$ or returning <code>NA_real_</code>
right	upper side function generator; a nonincreasing function $[0,1] \rightarrow [1,0]$ or returning <code>NA_real_</code>

Value

Object of class `FuzzyNumber`

See Also

Other `FuzzyNumber`-method: `*, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric`

-, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method,
/, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNu
/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; alphaInterval,
alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method;
as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method;
as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuz
as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-m
as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-
as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-me
distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-
distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method;
expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNum
integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

FuzzyNumber-class

S4 class Representing a Fuzzy Number

Description

Formally, a fuzzy number A (Dubois, Prade, 1978) is a fuzzy subset of the real line R with membership function μ given by:

$$\mu(x) = \begin{cases} 0 & \text{if } x < a_1, \\ \text{left}((x - a_1)/(a_2 - a_1)) & \text{if } a_1 \leq x < a_2, \\ 1 & \text{if } a_2 \leq x \leq a_3, \\ \text{right}((x - a_3)/(a_4 - a_3)) & \text{if } a_3 < x \leq a_4, \\ 0 & \text{if } a_4 < x, \end{cases}$$

where $a_1, a_2, a_3, a_4 \in R$, $a_1 \leq a_2 \leq a_3 \leq a_4$, $\text{left} : [0, 1] \rightarrow [0, 1]$ is a nondecreasing function called the *left side generator of A*, and $\text{right} : [0, 1] \rightarrow [0, 1]$ is a nonincreasing function called the

right side generator of A .

Alternatively, it may be shown that each fuzzy number A may be uniquely determined by specifying its α -cuts, $A(\alpha)$. We have $A(0) = [a1, a4]$ and

$$A(\alpha) = [a1 + (a2 - a1) * lower(\alpha), a3 + (a4 - a3) * upper(\alpha)]$$

for $0 < \alpha \leq 1$, where $lower : [0, 1] \rightarrow [0, 1]$ and $upper : [0, 1] \rightarrow [0, 1]$ are, respectively, strictly increasing and decreasing functions satisfying $lower(\alpha) = \inf\{x : \mu(x) \geq \alpha\}$ and $upper(\alpha) = \sup\{x : \mu(x) \geq \alpha\}$.

Details

Please note that many algorithms that deal with fuzzy numbers often use α -cuts rather than side functions.

Note that the **FuzzyNumbers** package also deals with particular types of fuzzy numbers like trapezoidal, piecewise linear, or “parametric” FNs.

Slots

a1: Single numeric value specifying the left bound for the support.

a2: Single numeric value specifying the left bound for the core.

a3: Single numeric value specifying the right bound for the core.

a4: Single numeric value specifying the right bound for the support.

lower: A nondecreasing function $[0,1] \rightarrow [0,1]$ that gives the lower alpha-cut bound.

upper: A nonincreasing function $[0,1] \rightarrow [1,0]$ that gives the upper alpha-cut bound.

left: A nondecreasing function $[0,1] \rightarrow [0,1]$ that gives the left side function.

right: A nonincreasing function $[0,1] \rightarrow [1,0]$ that gives the right side function.

Child/sub classes

[TrapezoidalFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [PowerFuzzyNumber](#), and [DiscontinuousFuzzyNumber](#)

See Also

[FuzzyNumber](#) for a convenient constructor, and [as.FuzzyNumber](#) for conversion of objects to this class. Also, see [convertSide](#) for creating side functions generators, [convertAlpha](#) for creating alpha-cut bounds generators, [approxInvert](#) for inverting side functions/alpha-cuts numerically.

Other FuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [Arithmetic](#); [FuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber-method](#), [alphaInterval](#), [PiecewiseLinearFuzzyNumber-method](#),

alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method;
 as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method;
 as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber,
 as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-m
 as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzy
 as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-m
 as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNum
 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-me
 distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-m
 distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNum
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue,
 weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Examples

```
showClass("FuzzyNumber")
showMethods(classes="FuzzyNumber")
```

integrateAlpha

Numerically Integrate Alpha-Cut Bounds

Description

Integrates numerically a transformed or weighted lower or upper alpha-cut bound of a fuzzy number.

Usage

```
## S4 method for signature 'FuzzyNumber,character,numeric,numeric'
integrateAlpha(object, which=c("lower", "upper"),
  from=0, to=1, weight=NULL, transform=NULL, ...)

## S4 method for signature 'DiscontinuousFuzzyNumber,character,numeric,numeric'
integrateAlpha(object, which=c("lower", "upper"),
  from=0, to=1, weight=NULL, transform=NULL, ...)
```

Arguments

object	a fuzzy number
which	one of "lower", "upper"
from	numeric
to	numeric
weight	a function or NULL
transform	a function or NULL
...	additional arguments passed to <code>integrate</code> or <code>integrate_discont_val</code>

Value

Returns a single numeric value.

See Also

Other `DiscontinuousFuzzyNumber`-method: `DiscontinuousFuzzyNumber-class`; `DiscontinuousFuzzyNumber`; `distance`, `distance`, `DiscontinuousFuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `DiscontinuousFuzzyNumber`, `distance`, `FuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `FuzzyNumber`, `FuzzyNumber-method`; `plot`, `plot`, `DiscontinuousFuzzyNumber`, `missing-method`, `plot`, `FuzzyNumber`, `missing-method`, `plot`, `PiecewiseLinearFuzzyNumber`, `missing-method`, `plot`, `TrapezoidalFuzzyNumber`, `missing-method`

Other `FuzzyNumber`-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `*`, `PiecewiseLinearFuzzyNumber`, `*`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `*`, `TrapezoidalFuzzyNumber`, `numeric-method`, `*`, `numeric`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `+`, `PiecewiseLinearFuzzyNumber`, `+`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `+`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `+`, `numeric`, `FuzzyNumber-method`, `-`, `FuzzyNumber`, `ANY-method`, `-`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `-`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `-`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `-`, `numeric`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `/`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `/`, `PiecewiseLinearFuzzyNumber`, `numeric-method`, `Arithmetic`; `FuzzyNumber-class`; `FuzzyNumber`; `alphaInterval`, `alphaInterval`, `FuzzyNumber-method`, `alphaInterval`, `PiecewiseLinearFuzzyNumber-method`, `alphaInterval`, `PowerFuzzyNumber-method`, `alphaInterval`, `TrapezoidalFuzzyNumber-method`; `alphacut`, `alphacut`, `FuzzyNumber`, `numeric-method`; `ambiguity`, `ambiguity`, `FuzzyNumber-method`; `as.FuzzyNumber`, `as.FuzzyNumber`, `FuzzyNumber-method`, `as.FuzzyNumber`, `numeric-method`; `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `FuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.PiecewiseLinearFuzzyNumber`, `numeric-method`; `as.PowerFuzzyNumber`, `as.PowerFuzzyNumber`, `FuzzyNumber-method`, `as.PowerFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `as.PowerFuzzyNumber`, `PowerFuzzyNumber-method`, `as.PowerFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.PowerFuzzyNumber`, `numeric-method`; `as.TrapezoidalFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `FuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `PiecewiseLinearFuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `PowerFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber-method`, `as.TrapezoidalFuzzyNumber`, `numeric-method`; `as.character`, `as.character`, `FuzzyNumber-method`, `as.character`, `PiecewiseLinearFuzzyNumber-method`, `as.character`, `PowerFuzzyNumber-method`, `as.character`, `TrapezoidalFuzzyNumber-method`; `core`, `core`, `FuzzyNumber-method`; `distance`, `distance`, `DiscontinuousFuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `DiscontinuousFuzzyNumber`, `FuzzyNumber-method`, `distance`, `FuzzyNumber`, `DiscontinuousFuzzyNumber-method`, `distance`, `FuzzyNumber`, `FuzzyNumber-method`; `evaluate`, `evaluate`, `FuzzyNumber`, `numeric-method`; `expectedInterval`, `expectedInterval`, `FuzzyNumber-method`, `expectedInterval`, `PiecewiseLinearFuzzyNumber-method`

expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; piecewiseLinearApproximation, piecewiseLinearApproximation; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method; show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

integrate_discont_val *Integrate a Function with at Most Finite Number of Discontinuities*
EXPERIMENTAL

Description

The function uses multiple calls to [integrate](#).

Usage

```
integrate_discont_val(f, from, to, discontinuities = numeric(0), ...)
```

Arguments

f	an R function taking a numeric vector of length 1 as its first argument and returning a numeric vector of length 1
from	the lower limit of integration
to	the upper limit of integration
discontinuities	nondecreasingly sorted numeric vector which indicates the points at which f is discontinuous
...	further arguments to be passed to the integrate function.

Value

Returns the estimate of the integral.

piecewiseLinearApproximation

Piecewise Linear Approximation of a Fuzzy Number

Description

This method finds a piecewise linear approximation $P(A)$ of a given fuzzy number A by using the algorithm specified by the method parameter.

Usage

```
## S4 method for signature 'FuzzyNumber'
piecewiseLinearApproximation(object,
  method=c("NearestEuclidean", "SupportCorePreserving",
    "Naive", "ApproximateNearestEuclidean [DEPRECATED]"),
  knot.n=1, knot.alpha=seq(0, 1, length.out=knot.n+2)[-c(1,knot.n+2)],
  ..., verbose=FALSE)
```

Arguments

object	a fuzzy number
method	character; one of: "NearestEuclidean" (default), "SupportCorePreserving", or "Naive"
knot.n	desired number of knots (if missing, then calculated from given knot.alpha)
knot.alpha	alpha-cuts at which knots will be positioned (defaults to equally distributed knots)
verbose	logical; should some technical details on the computations being performed be printed? [only "NearestEuclidean"]
...	further arguments passed to integrateAlpha [only "NearestEuclidean" and "SupportCorePreserving"]

Details

‘method’ may be one of:

1. NearestEuclidean: see (Coroianu, Gagolewski, Grzegorzewski, 2013 and 2014a); uses numerical integration, see [integrateAlpha](#). Slow for large knot.n.
2. SupportCorePreserving: This method was proposed in (Coroianu et al., 2014b) and is currently only available for knot.n==1. It is the L2-nearest piecewise linear approximation with constraints $\text{core}(A) == \text{core}(P(A))$ and $\text{supp}(A) == \text{supp}(P(A))$; uses numerical integration.
3. Naive: We have $\text{core}(A) == \text{core}(P(A))$ and $\text{supp}(A) == \text{supp}(P(A))$ and the knots are taken directly from the specified alpha cuts (linear interpolation).

Value

Returns a [PiecewiseLinearFuzzyNumber](#) object.

References

Coroianu L., Gagolewski M., Grzegorzewski P. (2013), Nearest Piecewise Linear Approximation of Fuzzy Numbers, *Fuzzy Sets and Systems* 233, pp. 26-51.

Coroianu L., Gagolewski M., Grzegorzewski P. (2014a), Nearest Piecewise Linear Approximation of Fuzzy Numbers - General Case, submitted for publication.

Coroianu L., Gagolewski M., Grzegorzewski P., Adabitar Firozja M., Houleri T. (2014b), Piecewise Linear Approximation of Fuzzy Numbers Preserving the Support and Core, submitted for publication.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as. FuzzyNumber, as. FuzzyNumber, FuzzyNumber-method, as. FuzzyNumber, numeric-method; as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, numeric-method; as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-method, as. PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as. PowerFuzzyNumber, PowerFuzzyNumber-method, as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PowerFuzzyNumber, numeric-method; as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-method, as. TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as. TrapezoidalFuzzyNumber, numeric-method; as. character, as. character, FuzzyNumber-method, as. character, PiecewiseLinearFuzzyNumber-method, as. character, PowerFuzzyNumber-method, as. character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other approximation: trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method

Examples

```
(A <- FuzzyNumber(-1, 0, 1, 3,
  lower=function(x) sqrt(x),upper=function(x) 1-sqrt(x)))
(PA <- piecewiseLinearApproximation(A, "NearestEuclidean",
  knot.n=1, knot.alpha=0.2))
```

PiecewiseLinearFuzzyNumber

Creates a Piecewise Linear Fuzzy Number

Description

For convenience, objects of class `PiecewiseLinearFuzzyNumber` may be created with this function.

Usage

```
PiecewiseLinearFuzzyNumber(a1, a2, a3, a4, knot.n = 0,
  knot.alpha = numeric(0), knot.left = numeric(0),
  knot.right = numeric(0))
```

Arguments

<code>a1</code>	a number specifying left bound of the support
<code>a2</code>	a number specifying left bound of the core
<code>a3</code>	a number specifying right bound of the core
<code>a4</code>	a number specifying right bound of the support
<code>knot.n</code>	the number of knots
<code>knot.alpha</code>	<code>knot.n</code> alpha-cut values at knots
<code>knot.left</code>	<code>knot.n</code> knots on the left side; a nondecreasingly sorted vector with elements in <code>[a1,a2]</code>
<code>knot.right</code>	<code>knot.n</code> knots on the right side; a nondecreasingly sorted vector with elements in <code>[a3,a4]</code>

Details

If `a1`, `a2`, `a3`, and `a4` are missing, then `knot.left` and `knot.right` may be of length `knot.n+2`.

If `knot.n` is not given, then it is guessed from `length(knot.left)`. If `knot.alpha` is missing, then the knots will be equally distributed on the interval `[0,1]`.

Value

An object of class `PiecewiseLinearFuzzyNumber`.

See Also

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, Arithmetic; PiecewiseLinearFuzzyNumber-class; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method, as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; fapply, fapply, PiecewiseLinearFuzzyNumber, function-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber

PiecewiseLinearFuzzyNumber-class

S4 Class Representing a Piecewise Linear Fuzzy Number

Description

A piecewise linear fuzzy number (PLFN) has side functions and alpha-cut bounds that linearly interpolate a given set of points (at fixed alpha-cuts).

Details

If `knot.n` is equal to 0 or all left and right knots lie on common lines, then a Piecewise Linear Fuzzy Number reduces to a [TrapezoidalFuzzyNumber](#). Note that, however, the [TrapezoidalFuzzyNumber](#) does not inherit from [PiecewiseLinearFuzzyNumber](#) for efficiency reasons. To convert the former to the latter, call `as.PiecewiseLinearFuzzyNumber`.

Slots

`a1`, `a2`, `a3`, `a4`, `lower`, `upper`, `left`, `right`: Inherited from the [FuzzyNumber](#) class.
`knot.n`: number of knots, a single integer value, 0 for a trapezoidal fuzzy number

`knot.alpha`: alpha-cuts, increasingly sorted vector of length `knot.n` with elements in $[0,1]$
`knot.left`: nondecreasingly sorted vector of length `knot.n`; defines left alpha-cut bounds at knots
`knot.right`: nondecreasingly sorted vector of length `knot.n`; defines right alpha-cut bounds at knots

Extends

Class [FuzzyNumber](#), directly.

See Also

[PiecewiseLinearFuzzyNumber](#) for a convenient constructor, [as.PiecewiseLinearFuzzyNumber](#) for conversion of objects to this class, and [piecewiseLinearApproximation](#) for approximation routines.

Other `PiecewiseLinearFuzzyNumber`-method: `*`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `*`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`-method, `*`, `PiecewiseLinearFuzzyNumber`, `numeric`, `*`, `TrapezoidalFuzzyNumber`, `numeric`-method, `*`, `numeric`, `FuzzyNumber`-method, `+`, `PiecewiseLinearFuzzyNumber`, `F`, `+`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`-method, `+`, `PiecewiseLinearFuzzyNumber`, `numeric`, `+`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `+`, `numeric`, `FuzzyNumber`-method, `-`, `FuzzyNumber`, `ANY`-method, `-`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `-`, `PiecewiseLinearFuzzyNumber`, `numeric`-method, `-`, `TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `-`, `numeric`, `FuzzyNumber`-method, `/`, `PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `/`, `PiecewiseLinearFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `numeric`-method, `Arithmetic`; `PiecewiseLinearFuzzyNumber`; `alphaInterval`, `alphaInterval`, `FuzzyNumber`-method, `alphaInterval`, `PiecewiseLinearFuzzyNumber`-method, `alphaInterval`, `PowerFuzzyNumber`-method, `alphaInterval`, `TrapezoidalFuzzyNumber`-method; `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `FuzzyNumber`-method, `as.PiecewiseLinearFuzzyNumber`, `as.PiecewiseLinearFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `as.PiecewiseLinearFuzzyNumber`, `numeric`-method, `as.PowerFuzzyNumber`, `as.PowerFuzzyNumber`, `FuzzyNumber`-method, `as.PowerFuzzyNumber`, `PiecewiseLinearFuzzyNumber`, `as.PowerFuzzyNumber`, `PowerFuzzyNumber`-method, `as.PowerFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `as.PowerFuzzyNumber`, `numeric`-method; `as.TrapezoidalFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `FuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `PiecewiseLinearFuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `PowerFuzzyNumber`, `as.TrapezoidalFuzzyNumber`, `TrapezoidalFuzzyNumber`-method, `as.TrapezoidalFuzzyNumber`, `numeric`-method; `as.character`, `as.character`, `FuzzyNumber`-method, `as.character`, `PiecewiseLinearFuzzyNumber`-method, `as.character`, `PowerFuzzyNumber`-method, `as.character`, `TrapezoidalFuzzyNumber`-method; `expectedInterval`, `expectedInterval`, `FuzzyNumber`-method, `expectedInterval`, `PiecewiseLinearFuzzyNumber`-method, `expectedInterval`, `PowerFuzzyNumber`-method, `expectedInterval`, `TrapezoidalFuzzyNumber`-method; `fapply`, `fapply`, `PiecewiseLinearFuzzyNumber`, `function`-method; `plot`, `plot`, `DiscontinuousFuzzyNumber`, `missing`, `plot`, `FuzzyNumber`, `missing`-method, `plot`, `PiecewiseLinearFuzzyNumber`, `missing`-method, `plot`, `TrapezoidalFuzzyNumber`

Examples

```
showClass("PiecewiseLinearFuzzyNumber")
showMethods(classes="PiecewiseLinearFuzzyNumber")
```

plot *Plot a Fuzzy Number*

Description

The function aims to provide a similar look-and-feel to the built-in `plot.default` and `curve` function.

Usage

```
## S4 method for signature 'FuzzyNumber,missing'
plot(x, y, from=NULL, to=NULL, n=101, at.alpha=NULL,
draw.membership.function=TRUE, draw.alphacuts=!draw.membership.function,
xlab=NULL, ylab=NULL, xlim=NULL, ylim=NULL,
type="l", col=1, lty=1, pch=1, lwd=1,
shadowdensity=15, shadowangle=45, shadowcol=col, shadowborder=NULL,
add=FALSE, ...)

## S4 method for signature 'TrapezoidalFuzzyNumber,missing'
plot(x, y, from=NULL, to=NULL,
draw.membership.function=TRUE, draw.alphacuts=!draw.membership.function,
xlab=NULL, ylab=NULL, xlim=NULL, ylim=NULL,
type="l", col=1, lty=1, pch=1, lwd=1, add=FALSE, ...)

## S4 method for signature 'PiecewiseLinearFuzzyNumber,missing'
plot(x, y, from=NULL, to=NULL,
draw.membership.function=TRUE, draw.alphacuts=!draw.membership.function,
xlab=NULL, ylab=NULL, xlim=NULL, ylim=NULL,
type="l", col=1, lty=1, pch=1, lwd=1, add=FALSE, ...)

## S4 method for signature 'DiscontinuousFuzzyNumber,missing'
plot(x, y, from=NULL, to=NULL,
n=101, draw.membership.function=TRUE, draw.alphacuts=!draw.membership.function,
xlab=NULL, ylab=NULL, xlim=NULL, ylim=NULL,
type="l", col=1, lty=1, pch=1, lwd=1,
add=FALSE, ...)
```

Arguments

x	a fuzzy number
y	not used
from	numeric;
to	numeric;
n	numeric; number of points to probe
at.alpha	numeric vector; give exact alpha-cuts at which linear interpolation should be done

<code>draw.membership.function</code>	logical; you want membership function (TRUE) or alpha-cuts plot (FALSE)?
<code>draw.alphacuts</code>	logical; defaults <code>!draw.membership.function</code>
<code>xlab</code>	character; x-axis label
<code>ylab</code>	character; y-axis label
<code>xlim</code>	numeric;
<code>ylim</code>	numeric;
<code>type</code>	character; defaults "l"; plot type, e.g. "~l" for lines, "p" for points, or "b" for both
<code>col</code>	see plot.default
<code>lty</code>	see plot.default
<code>pch</code>	see plot.default
<code>lwd</code>	see plot.default
<code>shadowdensity</code>	numeric; for shadowed sets;
<code>shadowangle</code>	numeric; for shadowed sets;
<code>shadowcol</code>	color specification, see plot.default ; for shadowed sets;
<code>shadowborder</code>	numeric; for shadowed sets;
<code>add</code>	logical; add another FuzzyNumber to existing plot?
<code>...</code>	further arguments passed to plot.default

Details

Note that if `from > a1` then it is set to `a1`.

Value

Returns nothing really interesting.

See Also

Other `DiscontinuousFuzzyNumber`-method: [DiscontinuousFuzzyNumber-class](#); [DiscontinuousFuzzyNumber](#); [distance](#), [distance](#), [DiscontinuousFuzzyNumber](#), [DiscontinuousFuzzyNumber-method](#), [distance](#), [DiscontinuousFuzzyNumber](#), [distance](#), [FuzzyNumber](#), [DiscontinuousFuzzyNumber-method](#), [distance](#), [FuzzyNumber](#), [FuzzyNumber-method](#); [integrateAlpha](#), [integrateAlpha](#), [DiscontinuousFuzzyNumber](#), [character](#), [numeric](#), [numeric-method](#), [integrateAlpha](#), [FuzzyNumber](#), [character](#), [numeric](#), [numeric-method](#)

Other `FuzzyNumber`-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [Arithmetic](#); [FuzzyNumber-class](#); [FuzzyNumber](#);

alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method;
 as. FuzzyNumber, as. FuzzyNumber, FuzzyNumber-method, as. FuzzyNumber, numeric-method;
 as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as. PiecewiseLinearFuzzyNumber,
 as. PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, numeric-m
 as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-method, as. PowerFuzzyNumber, PiecewiseLinearFuzzy
 as. PowerFuzzyNumber, PowerFuzzyNumber-method, as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as. PowerFuzzyNumber, numeric-method; as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-m
 as. TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. TrapezoidalFuzzyNumber, PowerFuzzyNum
 as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as. TrapezoidalFuzzyNumber, numeric-method;
 as. character, as. character, FuzzyNumber-method, as. character, PiecewiseLinearFuzzyNumber-method,
 as. character, PowerFuzzyNumber-method, as. character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-me
 distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-m
 distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNum
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; show, show, FuzzyNumber-method; supp,
 supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method;
 value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method;
 width, width, FuzzyNumber-method

Other PiecewiseLinearFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,
 *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric
 *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, Fu
 +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
 +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
 -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNum
 -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
 -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzy
 /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; PiecewiseLinearFuzzyNumber-class;
 PiecewiseLinearFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLin
 alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
 as. PiecewiseLinearFuzzyNumber, as. PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as. PiecewiseLinearFuz
 as. PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as. PiecewiseLinearFuzzyNumber, numeric-m
 as. PowerFuzzyNumber, as. PowerFuzzyNumber, FuzzyNumber-method, as. PowerFuzzyNumber, PiecewiseLinearFuzzy
 as. PowerFuzzyNumber, PowerFuzzyNumber-method, as. PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as. PowerFuzzyNumber, numeric-method; as. TrapezoidalFuzzyNumber, as. TrapezoidalFuzzyNumber, FuzzyNumber-m
 as. TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as. TrapezoidalFuzzyNumber, PowerFuzzyNum
 as. TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as. TrapezoidalFuzzyNumber, numeric-method;
 as. character, as. character, FuzzyNumber-method, as. character, PiecewiseLinearFuzzyNumber-method,
 as. character, PowerFuzzyNumber-method, as. character, TrapezoidalFuzzyNumber-method;
 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
 expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
 fapply, fapply, PiecewiseLinearFuzzyNumber, function-method

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method,

```

*, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric
*, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, F
+, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric
+, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method,
-, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber
-, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,
-, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber
/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber-class;
TrapezoidalFuzzyNumber; TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method,
alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method,
alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber
as.PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber
as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method
as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method,
as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method;
as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber
as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method
as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method,
expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method,
expectedInterval, TrapezoidalFuzzyNumber-method

```

Examples

```

plot(FuzzyNumber(0,1,2,3), col="gray")
plot(FuzzyNumber(0,1,2,3, left=function(x) x^2, right=function(x) 1-x^3), add=TRUE)
plot(FuzzyNumber(0,1,2,3, lower=function(x) x, upper=function(x) 1-x), add=TRUE, col=2)

```

PowerFuzzyNumber	<i>Creates a Fuzzy Number with Sides Given by Power Functions</i>
------------------	---

Description

For convenience, objects of class `PowerFuzzyNumber` may be created with this function.

Usage

```
PowerFuzzyNumber(a1, a2, a3, a4, p.left = 1, p.right = 1)
```

Arguments

a1	a number specifying left bound of the support
a2	a number specifying left bound of the core
a3	a number specifying right bound of the core
a4	a number specifying right bound of the support
p.left	a positive number specifying the exponent for the left side
p.right	a positive number specifying the exponent for the right side

Value

Object of class [PowerFuzzyNumber](#)

See Also

Other PowerFuzzyNumber-method: [PowerFuzzyNumber-class](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber-method](#), [alphaInterval](#), [PiecewiseLinearFuzzyNumber-method](#), [alphaInterval](#), [PowerFuzzyNumber-method](#), [alphaInterval](#), [TrapezoidalFuzzyNumber-method](#); [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [PowerFuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [numeric-method](#); [as.TrapezoidalFuzzyNumber](#), [as.TrapezoidalFuzzyNumber](#), [FuzzyNumber-method](#), [as.TrapezoidalFuzzyNumber](#), [Pi](#), [as.TrapezoidalFuzzyNumber](#), [PowerFuzzyNumber-method](#), [as.TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-](#), [as.TrapezoidalFuzzyNumber](#), [numeric-method](#); [as.character](#), [as.character](#), [FuzzyNumber-method](#), [as.character](#), [PiecewiseLinearFuzzyNumber-method](#), [as.character](#), [PowerFuzzyNumber-method](#), [as.character](#), [TrapezoidalFuzzyNumber-method](#); [expectedInterval](#), [expectedInterval](#), [FuzzyNumber-method](#), [expectedInterval](#), [PiecewiseLinearFuzzyNumber-method](#), [expectedInterval](#), [PowerFuzzyNumber-method](#), [expectedInterval](#), [TrapezoidalFuzzyNumber-method](#)

PowerFuzzyNumber-class

S4 class Representing a Fuzzy Number with Sides Given by Power Functions

Description

Fuzzy numbers which sides are given by power functions are defined using four coefficients $a_1 \leq a_2 \leq a_3 \leq a_4$, and parameters $p.\text{left}, p.\text{right} > 0$, which determine exponents for the side functions.

Details

We have $\text{left}(x) = x^{p.\text{left}}$, and $\text{right}(x) = (1 - x)^{p.\text{right}}$.

This class is a natural generalization of trapezoidal FNs. For other see [PiecewiseLinearFuzzyNumber](#).

Slots

$a_1, a_2, a_3, a_4, \text{lower}, \text{upper}, \text{left}, \text{right}$: Inherited from the [FuzzyNumber](#) class.

$p.\text{left}$: single numeric value; 1.0 for a trapezoidal FN.

$p.\text{right}$: single numeric value; 1.0 for a trapezoidal FN.

Extends

Class [FuzzyNumber](#), directly.

See Also

[PowerFuzzyNumber](#) for a convenient constructor, [as.PowerFuzzyNumber](#) for conversion of objects to this class.

[PowerFuzzyNumber](#) for a convenient constructor

Other [PowerFuzzyNumber](#)-method: [PowerFuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber](#)-method, [alphaInterval](#), [PiecewiseLinearFuzzyNumber](#)-method, [alphaInterval](#), [PowerFuzzyNumber](#)-method, [alphaInterval](#), [TrapezoidalFuzzyNumber](#)-method; [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [PowerFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.PowerFuzzyNumber](#), [numeric](#)-method; [as.TrapezoidalFuzzyNumber](#), [as.TrapezoidalFuzzyNumber](#), [FuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [Pi](#), [as.TrapezoidalFuzzyNumber](#), [PowerFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber](#)-method, [as.TrapezoidalFuzzyNumber](#), [numeric](#)-method; [as.character](#), [as.character](#), [FuzzyNumber](#)-method, [as.character](#), [PiecewiseLinearFuzzyNumber](#)-method, [as.character](#), [PowerFuzzyNumber](#)-method, [as.character](#), [TrapezoidalFuzzyNumber](#)-method; [expectedInterval](#), [expectedInterval](#), [FuzzyNumber](#)-method, [expectedInterval](#), [PiecewiseLinearFuzzyNumber](#)-method, [expectedInterval](#), [PowerFuzzyNumber](#)-method, [expectedInterval](#), [TrapezoidalFuzzyNumber](#)-method

Examples

```
showClass("PowerFuzzyNumber")
showMethods(classes="PowerFuzzyNumber")
```

show

Print Basic Information on a Fuzzy Number

Description

See [as.character](#) for more details.

Usage

```
## S4 method for signature 'FuzzyNumber'
show(object)
```

Arguments

object a fuzzy number

Details

The method [as.character](#) is called on given fuzzy number object with default arguments. The results are printed on stdout.

Value

Does not return anything interesting.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

supp

Calculate the Support of a Fuzzy Number

Description

We have $\text{supp}(A) := [a_1, a_4]$. This gives the values that a fuzzy number possibly may represent.

Usage

```
## S4 method for signature 'FuzzyNumber'
supp(object)
```

Arguments

object a fuzzy number

Value

Returns a numeric vector of length 2.

See Also

Other FuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [Arithmetic](#); [FuzzyNumber-class](#); [FuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber-method](#), [alphaInterval](#), [PiecewiseLinearFuzzyNumber-method](#), [alphaInterval](#), [PowerFuzzyNumber-method](#), [alphaInterval](#), [TrapezoidalFuzzyNumber-method](#); [alphacut](#), [alphacut](#), [FuzzyNumber](#), [numeric-method](#); [ambiguity](#), [ambiguity](#), [FuzzyNumber-method](#); [as.FuzzyNumber](#), [as.FuzzyNumber](#), [FuzzyNumber-method](#), [as.FuzzyNumber](#), [numeric-method](#); [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber](#), [numeric-method](#); [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [as.PowerFuzzyNumber](#), [PowerFuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [numeric-method](#); [as.TrapezoidalFuzzyNumber](#), [as.TrapezoidalFuzzyNumber](#), [FuzzyNumber-method](#); [as.TrapezoidalFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [as.TrapezoidalFuzzyNumber](#), [PowerFuzzyNumber](#), [as.TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [as.TrapezoidalFuzzyNumber](#), [numeric-method](#); [as.character](#), [as.character](#), [FuzzyNumber-method](#), [as.character](#), [PiecewiseLinearFuzzyNumber-method](#), [as.character](#), [PowerFuzzyNumber-method](#), [as.character](#), [TrapezoidalFuzzyNumber-method](#); [core](#), [core](#), [FuzzyNumber-method](#); [distance](#), [distance](#), [DiscontinuousFuzzyNumber](#), [DiscontinuousFuzzyNumber-method](#); [distance](#), [DiscontinuousFuzzyNumber](#), [FuzzyNumber-method](#), [distance](#), [FuzzyNumber](#), [DiscontinuousFuzzyNumber-method](#); [distance](#), [FuzzyNumber](#), [FuzzyNumber-method](#); [evaluate](#), [evaluate](#), [FuzzyNumber](#), [numeric-method](#); [expectedInterval](#), [expectedInterval](#), [FuzzyNumber-method](#), [expectedInterval](#), [PiecewiseLinearFuzzyNumber-method](#); [expectedInterval](#), [PowerFuzzyNumber-method](#), [expectedInterval](#), [TrapezoidalFuzzyNumber-method](#); [expectedValue](#), [expectedValue](#), [FuzzyNumber-method](#); [integrateAlpha](#), [integrateAlpha](#), [DiscontinuousFuzzyNumber](#), [integrateAlpha](#), [FuzzyNumber](#), [character](#), [numeric](#), [numeric-method](#); [piecewiseLinearApproximation](#), [piecewiseLinearApproximation](#), [FuzzyNumber-method](#); [plot](#), [plot](#), [DiscontinuousFuzzyNumber](#), [missing-method](#), [plot](#), [FuzzyNumber](#), [missing-method](#), [plot](#), [PiecewiseLinearFuzzyNumber](#), [missing-method](#), [plot](#), [TrapezoidalFuzzyNumber](#); [show](#), [show](#), [FuzzyNumber-method](#); [trapezoidalApproximation](#), [trapezoidalApproximation](#), [FuzzyNumber-method](#); [value](#), [value](#), [FuzzyNumber-method](#); [weightedExpectedValue](#), [weightedExpectedValue](#), [FuzzyNumber-method](#); [width](#), [width](#), [FuzzyNumber-method](#)

Other `alpha_cuts`: [alphacut](#), [alphacut](#), [FuzzyNumber](#), [numeric-method](#); [core](#), [core](#), [FuzzyNumber-method](#)

trapezoidalApproximation

Trapezoidal Approximation of a Fuzzy Number

Description

This method finds a trapezoidal approximation $T(A)$ of a given fuzzy number A by using the algorithm specified by the method parameter.

Usage

```
## S4 method for signature 'FuzzyNumber'
trapezoidalApproximation(object,
  method=c("NearestEuclidean", "ExpectedIntervalPreserving",
           "SupportCoreRestricted", "Naive"),
  ..., verbose=FALSE)
```

Arguments

object	a fuzzy number
method	character; one of: "NearestEuclidean" (default), "ExpectedIntervalPreserving", "SupportCoreRestricted", "Naive"
verbose	logical; should some technical details on the computations being performed be printed?
...	further arguments passed to integrateAlpha

Details

method may be one of:

1. NearestEuclidean: see (Ban, 2009); uses numerical integration, see [integrateAlpha](#)
2. Naive: We have $\text{core}(A) == \text{core}(T(A))$ and $\text{supp}(A) == \text{supp}(T(A))$
3. ExpectedIntervalPreserving: L2-nearest trapezoidal approximation preserving the expected interval given in (Grzegorzewski, 2010; Ban, 2008; Yeh, 2008) Unfortunately, for highly skewed membership functions this approximation operator may have quite unfavourable behavior. For example, if $\text{Val}(A) < \text{EV}_{1/3}(A)$ or $\text{Val}(A) > \text{EV}_{2/3}(A)$, then it may happen that the core of the output and the core of the original fuzzy number A are disjoint (cf. Grzegorzewski, Pasternak-Winiarska, 2011)
4. SupportCoreRestricted: This method was proposed in (Grzegorzewski, Pasternak-Winiarska, 2011). L2-nearest trapezoidal approximation with constraints $\text{core}(A) \subseteq \text{core}(T(A))$ and $\text{supp}(T(A)) \subseteq \text{supp}(A)$, i.e. for which each point that surely belongs to A also belongs to $T(A)$, and each point that surely does not belong to A also does not belong to $T(A)$.

Value

Returns a [TrapezoidalFuzzyNumber](#) object.

References

- Ban A.I. (2008), Approximation of fuzzy numbers by trapezoidal fuzzy numbers preserving the expected interval, Fuzzy Sets and Systems 159, pp. 1327-1344.
- Ban A.I. (2009), On the nearest parametric approximation of a fuzzy number - Revisited, Fuzzy Sets and Systems 160, pp. 3027-3047.
- Grzegorzewski P. (2010), Algorithms for trapezoidal approximations of fuzzy numbers preserving the expected interval, In: Bouchon-Meunier B. et al (Eds.), Foundations of Reasoning Under Uncertainty, Springer, pp. 85-98.
- Grzegorzewski P, Pasternak-Winiarska K. (2011), Trapezoidal approximations of fuzzy numbers with restrictions on the support and core, Proc. EUSFLAT/LFA 2011, Atlantic Press, pp. 749-756.
- Yeh C.-T. (2008), Trapezoidal and triangular approximations preserving the expected interval, Fuzzy Sets and Systems 159, pp. 1345-1353.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber

show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method
 Other approximation: [piecewiseLinearApproximation](#), [piecewiseLinearApproximation](#), [FuzzyNumber-method](#)

Examples

```
(A <- FuzzyNumber(-1, 0, 1, 40,
  lower=function(x) sqrt(x), upper=function(x) 1-sqrt(x)))
(TA <- trapezoidalApproximation(A,
  "ExpectedIntervalPreserving")) # Note that the cores are disjoint!
expectedInterval(A)
expectedInterval(TA)
```

TrapezoidalFuzzyNumber

Creates a Trapezoidal Fuzzy Number

Description

For convenience, objects of class [TrapezoidalFuzzyNumber](#) may be created with this function.

Usage

```
TrapezoidalFuzzyNumber(a1, a2, a3, a4)
```

Arguments

a1	a number specyfing left bound of the support
a2	a number specyfing left bound of the core
a3	a number specyfing right bound of the core
a4	a number specyfing right bound of the support

Value

Object of class [TrapezoidalFuzzyNumber](#)

See Also

Other TrapezoidalFuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [Arithmetic](#); [TrapezoidalFuzzyNumber-class](#);

TriangularFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

TrapezoidalFuzzyNumber-class

S4 class Representing a Trapezoidal Fuzzy Number

Description

Trapezoidal Fuzzy Numbers have linear side functions and alpha-cut bounds.

Details

Trapezoidal fuzzy numbers are among the simplest FNs. Despite their simplicity, however, they include triangular FNs, “crisp” real intervals, and “crisp” reals. Please note that currently no separate classes for these particular TFNs types are implemented in the package.

Slots

a1, a2, a3, a4, lower, upper, left, right: Inherited from the [FuzzyNumber](#) class.

Extends

Class [FuzzyNumber](#), directly.

See Also

[TrapezoidalFuzzyNumber](#) for a convenient constructor, [as.TrapezoidalFuzzyNumber](#) for conversion of objects to this class, and [trapezoidalApproximation](#) for approximation routines.

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method,

```

-, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber,
/, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; TrapezoidalFuzzyNumber; TriangularFuzzyNumber;
alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method,
alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method;
as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber,
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as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method,
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expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method,
expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method;
plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method,
plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

```

Examples

```

showClass("TrapezoidalFuzzyNumber")
showMethods(classes="TrapezoidalFuzzyNumber")

```

TriangularFuzzyNumber *Creates a Triangular Fuzzy Number*

Description

For convenience, objects of class [TrapezoidalFuzzyNumber](#) may be created with this function.

Usage

```
TriangularFuzzyNumber(a1, amid, a4)
```

Arguments

a1	a number specifying left bound of the support
amid	a number specifying the core
a4	a number specifying right bound of the support

Details

Currently there is no separate class of a Triangular Fuzzy Number.

Value

Object of class [TrapezoidalFuzzyNumber](#)

See Also

Other TrapezoidalFuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, Arithmetic; TrapezoidalFuzzyNumber-class; TrapezoidalFuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, missing-method

value

Calculate the Value of a Fuzzy Number

Description

The calculation of the so-called value is one of possible methods to defuzzify a fuzzy number.

Usage

```
## S4 method for signature 'FuzzyNumber'
value(object, ...)
```

Arguments

object a fuzzy number
... additional arguments passed to [alphaInterval](#)

Details

The value of A (Delgado et al, 1998) is defined as $val(A) := \int_0^1 \alpha (A_L(\alpha) + A_U(\alpha)) d\alpha$.

Value

Returns a single numeric value.

References

Delgado M., Vila M.A., Voxman W. (1998), On a canonical representation of a fuzzy number, *Fuzzy Sets and Systems* 93, pp. 125-135.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber, /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method; as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method; as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method; distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method; distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method; expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other characteristics: ambiguity, ambiguity, FuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method; width, width, FuzzyNumber-method

Other defuzzification: expectedValue, expectedValue, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method

weightedExpectedValue *Calculate the Weighted Expected Value of a Fuzzy Number*

Description

The calculation of the so-called weighted expected value is one of possible methods to defuzzify a fuzzy number.

For $w = 0.5$ we get the ordinary [expectedValue](#).

Usage

```
## S4 method for signature 'FuzzyNumber'
weightedExpectedValue(object, w=0.5, ...)
```

Arguments

object	a fuzzy number
w	a single numeric value in [0,1]
...	additional arguments passed to expectedInterval

Details

The weighted expected value of A is defined as $EV_w(A) := (1 - w)EI_L(A) + wEI_U(A)$, where EI is the [expectedInterval](#).

Value

Returns a single numeric value.

See Also

Other FuzzyNumber-method: [*](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [*](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [*](#), [TrapezoidalFuzzyNumber](#), [numeric-method](#), [*](#), [numeric](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [+](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [+](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [+](#), [numeric](#), [FuzzyNumber-method](#), [-](#), [FuzzyNumber](#), [ANY-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber-method](#), [-](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [-](#), [TrapezoidalFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [-](#), [numeric](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#), [/](#), [PiecewiseLinearFuzzyNumber](#), [numeric-method](#), [Arithmetic](#); [FuzzyNumber-class](#); [FuzzyNumber](#); [alphaInterval](#), [alphaInterval](#), [FuzzyNumber-method](#), [alphaInterval](#), [PiecewiseLinearFuzzyNumber-method](#), [alphaInterval](#), [PowerFuzzyNumber-method](#), [alphaInterval](#), [TrapezoidalFuzzyNumber-method](#); [alphacut](#), [alphacut](#), [FuzzyNumber](#), [numeric-method](#); [ambiguity](#), [ambiguity](#), [FuzzyNumber-method](#); [as.FuzzyNumber](#), [as.FuzzyNumber](#), [FuzzyNumber-method](#), [as.FuzzyNumber](#), [numeric-method](#); [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [FuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber](#), [as.PiecewiseLinearFuzzyNumber](#), [TrapezoidalFuzzyNumber-method](#), [as.PiecewiseLinearFuzzyNumber](#), [numeric-method](#); [as.PowerFuzzyNumber](#), [as.PowerFuzzyNumber](#), [FuzzyNumber-method](#), [as.PowerFuzzyNumber](#), [PiecewiseLinearFuzzyNumber](#).

as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method,
 as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-
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 as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method;
 as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method,
 as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method;
 core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-me
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 expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-me
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 expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNum
 integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation,
 piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method,
 plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzy
 show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation,
 trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; width,
 width, FuzzyNumber-method

Other characteristics: ambiguity, ambiguity, FuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-me
 value, value, FuzzyNumber-method; width, width, FuzzyNumber-method

Other defuzzification: expectedValue, expectedValue, FuzzyNumber-method; value, value, FuzzyNumber-method

 width

Calculate the Width of a Fuzzy Number

Description

The width (Chanas, 2001) is a measure of nonspecificity of a fuzzy number.

Usage

```
## S4 method for signature 'FuzzyNumber'
width(object, ...)
```

Arguments

object	a fuzzy number
...	additional arguments passed to expectedInterval

Details

The width of A is defined as $width(A) := EI_U(A) - EI_L(A)$, where EI is the [expectedInterval](#).

Value

Returns a single numeric value.

References

Chanas S. (2001), On the interval approximation of a fuzzy number, *Fuzzy Sets and Systems* 122, pp. 353-356.

See Also

Other FuzzyNumber-method: *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, *, PiecewiseLinearFuzzyNumber, numeric-method, *, TrapezoidalFuzzyNumber, numeric-method, *, numeric, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, +, PiecewiseLinearFuzzyNumber, numeric-method, +, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, +, numeric, FuzzyNumber-method, -, FuzzyNumber, ANY-method, -, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, -, PiecewiseLinearFuzzyNumber, numeric-method, -, TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, -, numeric, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, FuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, PiecewiseLinearFuzzyNumber-method, /, PiecewiseLinearFuzzyNumber, numeric-method, Arithmetic; FuzzyNumber-class; FuzzyNumber; alphaInterval, alphaInterval, FuzzyNumber-method, alphaInterval, PiecewiseLinearFuzzyNumber-method, alphaInterval, PowerFuzzyNumber-method, alphaInterval, TrapezoidalFuzzyNumber-method; alphacut, alphacut, FuzzyNumber, numeric-method; ambiguity, ambiguity, FuzzyNumber-method; as.FuzzyNumber, as.FuzzyNumber, FuzzyNumber-method, as.FuzzyNumber, numeric-method; as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, FuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, as.PiecewiseLinearFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PiecewiseLinearFuzzyNumber, numeric-method; as.PowerFuzzyNumber, as.PowerFuzzyNumber, FuzzyNumber-method, as.PowerFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.PowerFuzzyNumber, PowerFuzzyNumber-method, as.PowerFuzzyNumber, TrapezoidalFuzzyNumber-method, as.PowerFuzzyNumber, numeric-method; as.TrapezoidalFuzzyNumber, as.TrapezoidalFuzzyNumber, FuzzyNumber-method, as.TrapezoidalFuzzyNumber, PiecewiseLinearFuzzyNumber-method, as.TrapezoidalFuzzyNumber, PowerFuzzyNumber-method, as.TrapezoidalFuzzyNumber, TrapezoidalFuzzyNumber-method, as.TrapezoidalFuzzyNumber, numeric-method; as.character, as.character, FuzzyNumber-method, as.character, PiecewiseLinearFuzzyNumber-method, as.character, PowerFuzzyNumber-method, as.character, TrapezoidalFuzzyNumber-method; core, core, FuzzyNumber-method; distance, distance, DiscontinuousFuzzyNumber, DiscontinuousFuzzyNumber-method, distance, DiscontinuousFuzzyNumber, FuzzyNumber-method, distance, FuzzyNumber, DiscontinuousFuzzyNumber-method, distance, FuzzyNumber, FuzzyNumber-method; evaluate, evaluate, FuzzyNumber, numeric-method; expectedInterval, expectedInterval, FuzzyNumber-method, expectedInterval, PiecewiseLinearFuzzyNumber-method, expectedInterval, PowerFuzzyNumber-method, expectedInterval, TrapezoidalFuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; integrateAlpha, integrateAlpha, DiscontinuousFuzzyNumber-method, integrateAlpha, FuzzyNumber, character, numeric, numeric-method; piecewiseLinearApproximation, piecewiseLinearApproximation, FuzzyNumber-method; plot, plot, DiscontinuousFuzzyNumber, missing-method, plot, FuzzyNumber, missing-method, plot, PiecewiseLinearFuzzyNumber, missing-method, plot, TrapezoidalFuzzyNumber, show, show, FuzzyNumber-method; supp, supp, FuzzyNumber-method; trapezoidalApproximation, trapezoidalApproximation, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method

Other characteristics: ambiguity, ambiguity, FuzzyNumber-method; expectedValue, expectedValue, FuzzyNumber-method; value, value, FuzzyNumber-method; weightedExpectedValue, weightedExpectedValue, FuzzyNumber-method

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