Package ‘ecoval’

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Description Functions for evaluating and visualizing ecological assessment procedures for surface waters containing physical, chemical and biological assessments in the form of value functions.
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R topics documented:

ecoval-package ...................................................... 2
ecoval.dict ............................................................ 5
ecoval.dictionaries.default ....................................... 6
ecoval.plotsymbols ............................................... 6
ecoval.river.create .............................................. 7
ecoval.translate ................................................... 10
msk.create ......................................................... 11
msk.diatoms.2007.create ........................................ 12
msk.fish.2004.create ............................................ 13
msk.hydrol.2011.aggregate ...................................... 15
msk.hydrol.2011.create ......................................... 16
Description

Functions for evaluating and visualizing ecological assessment procedures for surface waters.

Functions to generate branches (modules) of the assessment value function:


msk.create,
msk.morphol.1998.create,
msk.physapp.2007.create,
msk.nutrients.2010.create,
msk.diatoms.2007.create,
msk.invertebrates.2010.create,

Additional modules in the evaluation state:

val.pesticides.create,
val.micropoll.create,
val.heavymetals.create,
val.spear.create,

val.invertebrates.create,

Integrative assessment value function considering modules of the Swiss assessment program and modules at the evaluation stage:

ecoval.river.create.
Node names, attribute names and identifiers for attribute levels (if not numeric) can be translated into different languages. See:

ecoval.dict,
ecoval.translate,
ecoval.dictionaries.default,

Details

Package: ecoval
Type: Package
Version: 1.0
Date: 2014-10-17
License: GPL (>= 2)
Depends: utility

Author(s)

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References


http://www.modul-stufen-konzept.ch

See Also

utility.
Examples

# creation of individual modules:

morphol <- msk.morphol.1998.create()
plot(morphol)

hydrol <- msk.hydrol.2011.create()
plot(hydrol)

physapp <- msk.physapp.2007.create()
plot(physapp)

nutrients <- msk.nutrients.2010.create()
plot(nutrients)

micropoll <- val.micropoll.create()
plot(micropoll)

heavymetals <- val.heavymetals.create()
plot(heavymetals)

spear <- val.spear.create()
plot(spear)

diatoms <- msk.diatoms.2007.create()
plot(diatoms)

invertebrates <- msk.invertebrates.2010.create()
plot(invertebrates)

fish <- msk.fish.2004.create()
plot(fish)

# creation of three versions of assessment programs:

msk <- msk.create(language="EnglishNodes",col="blue")
plot(msk)
plot(msk.with.attrib=FALSE)

ecoval <- ecoval.river.create(language="EnglishNodes",col="red")
plot(ecoval)
plot(ecoval.with.attrib=FALSE)

beetles_richness <- utility.endnode.parfun1d.create(name.node = "richness",
                                                     name.attrib = "gb_richness",
                                                     range = c(0,1),
                                                     name.fun = "utility.fun.exp",
                                                     par = c(2,0,1),
                                                     utility = FALSE)

beetles_concordance <- utility.endnode.parfun1d.create(name.node = "concordance",
                                                      name.attrib = "gb_concordance",
                                                      range = c(0,1),
                                                      name.fun = "utility.fun.exp",
                                                      par = c(2,0,1),
                                                      utility = FALSE)
beetles <- utility.aggregation.create(name.node = "ground beetles",
    nodes = list(beetles.richness, beetles.concordance),
    name.fun = "utility.aggregate.add",
    par = c(0.5, 0.5))

ecoval2 <- ecoval.river.create(phys = list(msk.morphol.1998.create),
    chem = list(msk.nutrients.2010.create,
                val.pesticides.create,
                val.heavymetals.create),
    biol = list(msk.invertebrates.2010.create,
                msk.fish.2004.create,
                beetles),
    language = "EnglishNodes")

plot(ecoval2)
plot(ecoval2, with.attrib = FALSE)

ecoval.dict

---

### Description

Extracts a dictionary column from a matrix or data frame of dictionaries (translated words) with the languages provided by the column names and the words in the original language provided in the first column.

### Usage

`ecoval.dict(language, dictionaries = NA)`

### Arguments

- **language**: A single word specifying the desired language.
- **dictionaries**: Matrix or data frame of dictionaries with the languages provided by the column names and the original words provided in the first column. If dictionary is NA, the default dictionary `ecoval.dictionaries.default` is loaded.

### Value

Vector of translated words labelled by the words in the original language.

### See Also

`ecoval.translate`. 
ecoval.dictionaries.default

Default Dictionaries for Nodes, Attributes and Attribute Levels

Description

Default dictionaries for nodes, attributes and attribute levels.

default.dictionaries

ecoval.plotsymbols

Plot valuations of different sub-objectives as pie charts.

Description

A function to add a plot with valuations of different sub-objectives as a pie chart to an existing plot
e.g. with the river network.

Usage

ecoval.plotsymbols(nodes, x, y, r, u,
                   square = F,
                   labels = NA,
                   col = utility.calc.colors(),
                   pos.legend = NA,
                   cex.nodes = 1)

Arguments

nodes Nodes of a value function, which should be plotted as pie chart.
x Vector with x-coordinates for the pie charts.
y Vector with y-coordinates for the pie charts.
r Radius of the pie chart.
u Dataframe or matrix with values between 0 and 1 corresponding to the valuation
    of the nodes with rows for the different pie charts and columns for each node.
    The column names have to be identical to the nodes.
square Logical value, if true the diagram is plotted as square, if false as pie chart.
labels Labels for the pie charts that are plotted close to the chart.
col Colour-coding that transforms the numerical values of u into a color. Default is
    a plot-function from the utility package "utility.calc.colors()" with the following
    color-classes: 0-0.2 red, 0.2-0.4 orange, 0.4-0.6 yellow, 0.6-0.8 green, 0.8-1
    blue.
pos.legend Vector with x and y-coordinates of the legend.
cex.nodes A numerical value giving the amount by which plotting text of the legend and
    the labels should be magnified relative to the default.
ecoval.river.create

References


http://www.modul-stufen-konzept.ch

See Also

utility, rivernet.

Examples

plot(1, type="n",axes=FALSE,ann=FALSE,xlim=c(0, 10),ylim=c(0, 10))
u1 <- matrix(data=c(0,1,0.5,1,0.3,0.4,0.7),nrow=2,
dimnames=list(c(NA,NA),c("ecomorph","hydrology","nutrients")))
ecoval.plotSymbols(nodes = c("ecomorph","hydrology","nutrients"),
  x = c(1,2),
  y = c(7,8.5),
  r = 0.5,
  u = u1,
  col = utility.calc.colors(),
  pos.legend = c(7,8.5),
  cex.nodes = 1)

u2 <- matrix(data=c(0.1,0.25,0.75,0.6),nrow=1,
dimnames=list(NA,c("fish","algae","invertebrates","macrophytes")))
ecoval.plotSymbols(nodes = c("fish","algae","invertebrates","macrophytes"),
  x = 1.5,
  y = 3,
  r = 0.5,
  u = u2,
  square = TRUE,
  col = utility.calc.colors(),
  pos.legend = c(7,3),
  cex.nodes = 1)
Description

Creates a value function for ecological river assessment based on physical, chemical and biological sub-objectives.

Usage

```r
ecoval.river.create(phys = list(msk.morphol.1998.create, 
  msk.physapp.2007.create), 
  physagg = "utility.aggregate.addmin", 
  physpar = numeric(0), 
  chem = list(msk.nutrients.2010.create, 
    val.micropoll.create, 
    val.heavymetals.create), 
  chemagg = "utility.aggregate.addmin", 
  chempar = numeric(0), 
  biol = list(msk.diatoms.2007.create, 
    val.invertebrates.create, 
    msk.fish.2004.create), 
  biolagg = "utility.aggregate.addmin", 
  biolpar = numeric(0), 
  ecolagg = "utility.aggregate.addmin", 
  ecolpar = numeric(0), 
  language = "English", 
  dictionaries = NA, 
  col = "black")
```

Arguments

- **phys**: List containing either functions to create branches of the value function or already branches of value functions corresponding to physical sub-objectives. These branches (produced by the function or given directly) must be in the form of a value function definition as provided by the package utility.
- **physagg**: Name of the function to be used for aggregating the value function branches specified in the argument phys.
- **physpar**: Vector of parameters (often weights) provided to the aggregation function (provided by the argument physagg).
- **chem**: List containing either functions to create branches of the value function or already branches of value functions corresponding to chemical sub-objectives. These branches (produced by the function or given directly) must be in the form of a value function definition as provided by the package utility.
- **chemagg**: Name of the function to be used for aggregating the value function branches specified in the argument chem.
- **chempar**: Vector of parameters (often weights) provided to the aggregation function (provided by the argument chemagg).
- **biol**: List containing either functions to create branches of the value function or already branches of value functions corresponding to biological sub-objectives.
These branches (produced by the function or given directly) must be in the form of a value function definition as provided by the package utility.

**biolagg**
Name of the function to be used for aggregating the value function branches specified in the argument `biol`.

**biolpar**
Vector of parameters (often weights) provided to the aggregation function (provided by the argument `biolagg`).

**ecolagg**
Name of the function to be used to aggregate the physical, chemical, and biological values.

**ecolpar**
Parameter vector passed to the function specified under `ecolpar`.

**language**
Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.

**dictionaries**
Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary `ecoval.dictionaries.default` is loaded.

**col**
Color of bounding boxes in objectives hierarchy.

**Value**

The function returns the value function as a class utility.

**References**


**See Also**

utility.
ecoval.translate  

Translates a Word Given a Dictionary

Description

Translates a word given as the first argument using a dictionary provided as the second argument of the function. The dictionary consists of a character vector of translated words labelled by the words in the original language. If no translation is found, the given word in the original language is returned.

Usage

decoval.translate(word, dictionary)

Arguments

word: A single word to be translated.
dictionary: Vector of translated words labelled by the words in the original language.

Value

The function returns the translated word.

See Also

decoval.dic

Examples

decoval.translate("x", c(x="X", y="Y", z="Z"))
msk.create

Creates a Value Function for Ecological River Assessment

Description

Creates a value function for ecological river assessment based on the Swiss modular concept for stream assessment, level I (Regional survey).

Usage

msk.create(language = "English",
            dictionaries = NA,
            col = "black",
            modify.nutrients = F)

Arguments

language
Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.

dictionaries
Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.

col
Color of bounding boxes in objectives hierarchy.

modify.nutrients
A logical value indicating whether to use a modified version of the value functions for NO2 and NH4 or the original method in the nutrients branch.

Value

The function returns the value function as a class utility.

References


Reichert, P., Borsuk, M., Hostmann, M., Schweizer, S., Sporri, C., Tockner, K. and Truffer, B.,

http://www.modul-stufen-konzept.ch

See Also
utility.

Examples

ecol <- msk.create()
plot(ecol)
ecol.german <- msk.create(language="Deutsch")
plot(ecol.german)

msk.diatoms.2007.create

Creates a Value Function for River Diatoms

Description

Creates a value function for river diatoms based on the Swiss modular concept for stream assessment, level I (Regional survey) from 2007.

Usage

msk.diatoms.2007.create(language = "English",
dictionaries = NA,
col = "black")

Arguments

language Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
dictionaries Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.
col Color of bounding boxes in objectives hierarchy.

Value

The function returns the value function as a class utility.
References


http://www.modul-stufen-konzept.ch


See Also
utility.

Examples

diatoms <- msk.diatoms.2007.create()
plot(diatoms)
diatoms.german <- msk.diatoms.2007.create("Deutsch")
plot(diatoms.german)

msk.fish.2004.create  Creates a Value Function for River Fish

Description

Creates a value function for river fish based on the Swiss modular concept for stream assessment, level I (Regional survey) from 2004.

Usage

msk.fish.2004.create(language = "English",
                      dictionaries = NA,
                      col = "black")
Arguments

- **language**: Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
- **dictionaries**: Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary `ecoval.dictionaries.default` is loaded.
- **col**: Color of bounding boxes in objectives hierarchy.

Value

The function returns the value function as a class utility.

References


http://www.modul-stufen-konzepte.ch

Schager, E., Peter, A. Methoden zur Untersuchung und Beurteilung der Fließgewässer, Fische Stufe F (flächendeckend), Mitteilungen zum Gewässerschutz Nr. 44. Bundesamt fuer Umwelt, Wald und Landschaft, BUWAL, Bern, 2004.

See Also

utility.

Examples

```r
fish <- msk.fish.2004.create()
plot(fish)
fish.german <- msk.fish.2004.create("Deutsch")
plot(fish.german)
```
Aggregation function of the hydrology module of the Swiss modular concept for stream assessment, level I (Regional survey) from 2011.

Description

Aggregates the values of the 9 sub-objectives at the second-highest aggregation level of the hydrology module of the Swiss River Assessment Program MSK (2011).

Usage

```r
msk.hydrol.2011.aggregate(u, par = NA)
```

Arguments

- `u` Numerical vector of length 9 containing the values that quantify the degree of fulfillment of the 9 sub-objectives.
- `par` Argument added for consistency with the other aggregation procedures. No parameters are needed.

Value

The function returns the aggregated value.

References


http://www.modul-stufen-konzept.ch

See Also


Examples

```r
hydrol <- msk.hydrol.2011.create()
plot(hydrol)
hydrol.german <- msk.hydrol.2011.create("Deutsch")
plot(hydrol.german)
```

---

msk.hydrol.2011.create

*Creates a Value Function for River Hydrology*

**Description**

Creates a value function for river hydrology based on the Swiss modular concept for stream assessment, level I (Regional survey) from 2011.

**Usage**

```r
msk.hydrol.2011.create(language = "English",
                        dictionaries = NA,
                        col = "black")
```

**Arguments**

- **language**: Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
- **dictionaries**: Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.
- **col**: Color of bounding boxes in objectives hierarchy.

**Value**

The function returns the value function as a class utility.
msk.invertebrates.2010.create

References


http://www.modul-stufen-konzept.ch


See Also

utility.

Examples

hydrol <- msk.hydrol.2011.create()
plot(hydrol)
hydrol.german <- msk.hydrol.2011.create("Deutsch")
plot(hydrol.german)

msk.invertebrates.2010.create

Creates a Value Function for River Invertebrates

Description

Creates a value function for river invertebrates based on the Swiss modular concept for stream assessment, level I (Regional survey) from 2010.
Usage

```r
msk.invertebrates.2010.create(language = "English",
                           dictionaries = NA,
                           col = "black",
                           modify = FALSE)
```

Arguments

- **language**: Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
- **dictionaries**: Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary `ecoval.dictionaries.default` is loaded.
- **col**: Color of bounding boxes in objectives hierarchy.
- **modify**: Use the biological indicators Makroindex and IBGN in addition to IBCH. Default is False.

Value

The function returns the value function as a class utility.

References


Index Biologique Global Normalise, AFNOR T 90-350

Guide technique de l IBGN, Agences de l Eau, 2eme Editon 2000
msk.morphol.1998.aggregate


See Also

utility.

Examples

```r
invertebrates <- msk.invertebrates.2010.create()
plot(invertebrates)
invertebrates.german <- msk.invertebrates.2010.create("Deutsch")
plot(invertebrates.german)
```

Description

Aggregates the values of the 2 sub-objectives at the highest aggregation level of the ecomorphology module of the Swiss River Assessment Program MSK (1998). If the river is covered, the value for ecomorphology is zero, otherwise it has the value of the uncovered node.

Usage

```r
msk.morphol.1998.aggregate(u,
    par = NA)
```

Arguments

- **u**: Numerical vector of length 2 containing the values that quantify the degree of fulfillment of the 2 sub-objectives.
- **par**: Argument added for consistency with the other aggregation procedures. No parameters are needed.

Value

The function returns the aggregated value.
**References**


http://www.modul-stufen-konzept.ch


**See Also**


**Examples**

```r
morphol <- msk.morphol.1998.create()
plot(morphol)
morphol.german <- msk.morphol.1998.create("Deutsch")
plot(morphol.german)
```

**Description**

Creates a value function for river morphology based on the Swiss modular concept for stream assessment, level I (Regional survey) from 1998.

**Usage**

```r
msk.morphol.1998.create(language = "English",
dictionaries = NA,
col = "black")
```
Arguments

language  Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.

dictionaries  Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecomorphol.dictionaries.default is loaded.

col  Color of bounding boxes in objectives hierarchy.

Value

The function returns the value function as a class utility.

References


http://www.modul-stufen-konzept.ch


See Also

utility.

Examples

```r
morphol <- msk.morphol.1998.create()
plot(morphol)
morphol.german <- msk.morphol.1998.create("Deutsch")
plot(morphol.german)
```
msk.nutrients.2010.create

Creates a Value Function for River Nutrients

Description

Creates a value function for river nutrients based on the Swiss modular concept for stream assessment, level I (Regional survey) from 2010.

Usage

```r
msk.nutrients.2010.create(language = "English",
dictionaries = NA,
col = "black",
modify = F)
```

Arguments

- `language`: Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
- `dictionaries`: Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary `ecoval.dictionaries.default` is loaded.
- `col`: Color of bounding boxes in objectives hierarchy.
- `modify`: A logical value indicating whether to use a modified version of the value functions for NO2 and NH4 or the original method.

Value

The function returns the value function as a class utility.

References


Reichert, P., Borsuk, M., Hostmann, M., Schweizer, S., Sporri, C., Tockner, K. and Truffer, B.,
msk.physapp.2007.create


http://www.modul-stufen-konzept.ch


See Also

utility.

Examples

```r
nutrients <- msk.nutrients.2010.create()
plot(nutrients)
nutrients.german <- msk.nutrients.2010.create("Deutsch")
plot(nutrients.german)
```

msk.physapp.2007.create

*Creates a Value Function for River Physical Appearance*

Description

Creates a value function for river physical appearance based on the Swiss modular concept for stream assessment, level I (Regional survey) from 2007.

Usage

```r
msk.physapp.2007.create(language = "English",
                          dictionaries = NA,
                          col = "black")
```

Arguments

- **language**: Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
- **dictionaries**: Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.
- **col**: Color of bounding boxes in objectives hierarchy.

Value

The function returns the value function as a class utility.
References


http://www.modul-stufen-konzept.ch


See Also
utility.

Examples
physapp <- msk.physapp.2007.create()
plot(physapp)
physapp.german <- msk.physapp.2007.create("Deutsch")
plot(physapp.german)

val.heavymetals.create

Creates a Value Function for River Heavy Metal Concentrations

Description
Creates a value function for heavy metal concentrations in river sediments.

Usage
val.heavymetals.create(language = "English",
dictionaries = NA,
col = "black",
version = "AWEL")
Arguments

language
Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.

dictionaries
Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.

col
Color of bounding boxes in objectives hierarchy.

version
Option to choose between the version "AWEL", which uses an assessment of AWEL (2006) based on quality criteria of LAWA (1998), or the version "IKSR", which uses the assessment of the IKSR (2009).

Value

The function returns the value function as a class utility.

References


IKSR 2009. Bericht Nr. 175, Sedimentmanagementplan Rhein.
val.invertebrates.create

*val.invertebrates.create*

*Creates an Integrative Value Function for River Invertebrates*

**Description**

Creates a value function for river invertebrates integrating macroinvertebrate indices for organic matter pollution and toxicity.

**Usage**

```r
val.invertebrates.create(language = "English",
                          dictionaries = NA,
                          col = "black",
                          modify = TRUE)
```

**Arguments**

- **language**
  Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.

- **dictionaries**
  Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary `ecoval.dictionaries.default` is loaded.

- **col**
  Color of bounding boxes in objectives hierarchy.

- **modify**
  Use the biological indicators Makroindex and IBGN in addition to IBCH. Default is TRUE.

**Value**

The function returns the value function as a class utility.

**Examples**

```r
heavymetals <- val.heavymetals.create()
plot(heavymetals)
heavymetals.german <- val.heavymetals.create("Deutsch")
plot(heavymetals.german)
heavymetals.IKSR <- val.heavymetals.create(version="IKSR")
plot(heavymetals.IKSR,type="nodes")
```
References


http://www.modul-stufen-konzept.ch


Index Biologique Global Normalisé, AFNOR T 90-350


See Also

utility.

Examples

```r
invertebrates <- val.invertebrates.create()
plot(invertebrates)
invertebrates.german <- val.invertebrates.create("Deutsch")
plot(invertebrates.german)
```
val.micropoll.create  Creates a Value Function for River Micropollutants

Description

Creates a value function for river micropollutants with episodic inputs (pesticides, often from diffuse sources) and continuous inputs (mainly from point-sources). Micropollutants with continuous inputs are assessed regarding their toxicity to different organism groups. Micropollutants with episodic inputs are grouped according to their mode of action while exposure patterns are taken into account.

Usage

val.micropoll.create(language = "English",
    dictionaries = NA,
    col = "black")

Arguments

language  Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.

dictionaries  Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.

col  Color of bounding boxes in objectives hierarchy.

Value

The function returns the value function as a class utility.

References


See Also

utility.val.pesticides.create.

Examples

```r
micropoll <- val.micropoll.create()
plot(micropoll)
micropoll.german <- val.micropoll.create("Deutsch")
plot(micropoll.german)
```

val.pesticides.create  Creates a Value Function for River Pesticides

Description

Creates a value function for river pesticides. Substances are grouped according to their mode of action and evaluation according to AWEL 2006 based on Chevre et al. 2006.

Usage

```r
val.pesticides.create(language = "English",
dictionaries = NA,
col = "black")
```
Arguments

language  Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
dictionaries  Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.
col  Color of bounding box.

Value

The function returns the value function as a class utility.

References


See Also

utility.

Examples

pesticides <- val.pesticides.create()
plot(pesticides)
pesticides.german <- val.pesticides.create("Deutsch")
plot(pesticides.german)
val.spear.create

Creates a Value Function for River Spear Index

Description

Creates a value function for the SPEARpesticides index in rivers.

Usage

val.spear.create(language = "English",
dictionaries = NA,
col = "black")

Arguments

language Language to be used to denote nodes, attributes and attribute levels. Must be a column name of the table provided by the second argument.
dictionaries Matrix of dictionaries with the languages provided by the column names and the original words provided as the row names. If dictionary is NA, the default dictionary ecoval.dictionaries.default is loaded.
col Color of bounding boxes in objectives hierarchy.

Value

The function returns the value function as a class utility.

References


See Also

utility.

Examples

```r
spear <- val.spear.create()
plot(spear)
spear.german <- val.spear.create("Deutsch")
plot(spear.german)
```
Index

*Topic package
  ecoval-package, 2

ecoval (ecoval-package), 2
ecoval-package, 2
ecoval.dict, 3, 5, 10
ecoval.dictionaries.default, 3, 6
ecovalplotsymbols, 6
ecoval.river.create, 2, 7
ecoval.translate, 3, 5, 10

msk.create, 2, 11
msk.diatoms.2007.create, 2, 12
msk.fish.2004.create, 2, 13
msk.hydrol.2011.aggregate, 15
msk.hydrol.2011.create, 2, 16, 16
msk.invertebrates.2010.create, 2, 17
msk.morphol.1998.aggregate, 19
msk.morphol.1998.create, 2, 20, 20
msk.nutrients.2010.create, 2, 22
msk.physapp.2007.create, 2, 23

rivernet, 7

utility, 3, 7, 9, 12–14, 16, 17, 19–21, 23, 24, 26, 27, 29, 30, 32

val.heavymetals.create, 2, 24
val.invertebrates.create, 2, 26
val.micropoll.create, 2, 28
val.pesticides.create, 2, 29, 29
val.spear.create, 2, 31