Package 'socialh'

May 14, 2021

Title Rank and Social Hierarchy for Gregarious Animals

Version 0.1.0

Description Tools developed to facilitate the establishment of the rank and social hierarchy
for gregarious animals by the Si method developed by
Kondo & Hurnik (1990)<doi:10.1016/0168-1591(90)90125-W>. It is
also possible to determine the number of agonistic interactions between two
individuals, sociometric and dyadics matrix from dataset obtained through
electronic bins.

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Encoding UTF-8

Imports dplyr, data.table, magrittr, stats, utils

RoxygenNote 7.1.1

Suggests rmarkdown, knitr, testthat (>= 3.0.0)

VignetteBuilder knitr

Config/testthat/edition 3

NeedsCompilation no

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R topics documented:

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dmatrix	*Sij dyadic relationship matrix*

Description

Function to obtain the Sij dyadic dominance relationship from an sociomatrix.

Usage

```
dmatrix(smatrix)
```

Arguments

smatrix   sociomatrix

Details

The dyadic relationship is obtained by the following expression: $Sij = (Xij - Xji) / (|Xij - Xji|)$, where Sij is the social status of the ith animal relative to the jth animal; Xij is the number of times the animal i won the animal j; Xji is the number of times the animal j won the animal i.

Value

Dyadic matrix

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

Kondo, S., & Hurnik, J. F. (1990). Stabilization of social hierarchy in dairy cows. Applied Animal Behaviour Science, 27(4), 287-297.

Examples

```
x <- matrix(c(0,0,1,0,0,1,0,0,2,0,0,0,0,1,0,0,0,1,0,0,2,
              0,0,0,0,1,1,0,0,0,0,0,1,0,0,1,0,0,1,0,0,0,
              1,0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
              nrow=8,byrow=TRUE,)
colnames(x) <- c(1,2,3,4,5,6,8,9)

rownames(x) <- c(1,2,3,4,5,6,8,9)

dyadic <- dmatrix(x)

print(dyadic)
```

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dvalue	*Dominance value*

Description

Function to obtain the dominance value, social rank and hierarchy from Sij dyadic relationship matrix.

Usage

```
dvalue(dmatrix)
```

Arguments

dmatrix   Sij dyadic relationship matrix

Details

The social categories (rank and hierarchy) are define according to dominance value and is obtained by the following expression: SH =(|Distance between highest(+ X) and lowest(- Y) dominance value| + 1) /(2 or 3), where "SH" is the rank or hierarchy. The rank (high and lower) and social category (dominant, intermediate and subordinate)are determined assigned according to dominance value. The choice for divide the group by rank or social category depends of the study objective. Both rank and social category are estimated by the distance between the highest (+ X) and the lowest (- Y) dominance value, plus 1 (corresponds to the dominance value zero), which determines the number of points in the range.

Value

rank and social dominance

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

Coimbra, P. A. D., Machado Filho, L. C. P., & Hötzel, M. J. (2012). Effects of social dominance, water trough location and shade availability on drinking behaviour of cows on pasture. Applied Animal Behaviour Science, 139(3-4), 175-182.

Examples

```
x <- matrix(c(0,-1,1,0,-1,1,0,0,1,0,-1,-1,0,1,0,0,
              -1,1,0,-1,1,-1,0,0,0,1,1,0,-1,0,0,0,
              1,0,-1,1,0,0,1,0,-1,-1,1,0,0,0,0,1,
              0,0,0,0,-1,0,0,0,0,0,0,0,0,-1,0,0),
              nrow=8,byrow=TRUE,)
```

```
colnames(x) <- c(1,2,3,4,5,6,8,9)

rownames(x) <- c(1,2,3,4,5,6,8,9)

dominance <- dvalue(x)

print(dominance)
```

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improved_index   *Improved linearity index*

Description

Function to obtain the linearity index improved by de Vries (1995).

Usage

```
improved_index(dmatrix, smatrix)
```

Arguments

dmatrix	dyatic matrix
smatrix	sociomatrix

Details

The function improved_index is obtained by the following expression: h' = h(6/(n^3-n)*u), where "h'" is the linearity index, "n" is the total of animals, "u" is the unknown or tied relationships.

Value

h' index

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

de Vries, H. (1995). An improved test of linearity in dominance hierarchies containing unknown or tied relationships. Animal Behaviour, 50(5), 1375–1389.

See Also

dmatrix, smatrix

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landau_index   *Landau index*

Description

Function to obtain the linearity index developed by Landau (1951).

Usage

```
landau_index(dmatrix)
```

Arguments

dmatrix   dyadic matrix

Details

The function landau_index is obtained by the following expression: h = (12/n^3-n)* sum(Va - ((n-1)/2))^2, where "h" is the linearity index, "n" is the total of animals, "Va" is the total of times that animal "i" dominated other animals.

Value

h index

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

References

Landau, H. G. (1951). On dominance relations and the structure of animal societies: I. Effect of inherent characteristics. Bulletin of Mathematical Biophysics, 13, 1-19.

See Also

dmatrix

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replacement   *Identification of replacements between two animals*

Description

Function to identify replacements between actor and reactor from electronic bins data.

Usage

```
replacement(x, sec)
```

Arguments

x	dataset with electronic bins information.
sec	interval (in seconds) between two different animals sequentially visited the same bin (feeder or drinker);

Details

replacement is only applied for dataset with columns named as follows: equip_id (bin identification), animal_id (animal identification), IN (date - dd/mm/yyyy - and time - hh:mm:ss - when the animal entry in the bin), OUT (date - dd/mm/yyyy - and time - hh:mm:ss - when the animal left the bin).

Value

Replacement between two animals

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(equip_id = as.numeric("0001"),
                animal_id = c(1,2,6,3,5,4,2,1,3,5,8,1,6,9,4,3,2,1,5,1))

x$IN <- c("01/08/2017 00:03:42","01/08/2017 00:05:26","01/08/2017 00:07:04","01/08/2017 00:08:15",
      "01/08/2017 00:10:35","01/08/2017 00:15:07","01/08/2017 00:18:13","01/08/2017 00:21:48",
      "01/08/2017 00:23:55","01/08/2017 00:30:14","01/08/2017 00:35:00","01/08/2017 00:38:11",
      "01/08/2017 00:39:05","01/08/2017 00:40:20","01/08/2017 00:42:08","01/08/2017 00:46:00",
      "01/08/2017 00:48:12","01/08/2017 00:49:40","01/08/2017 00:50:57","01/08/2017 00:52:36")

x$OUT <-c("01/08/2017 00:05:24","01/08/2017 00:06:56","01/08/2017 00:08:12","01/08/2017 00:10:32",
      "01/08/2017 00:15:04","01/08/2017 00:18:10","01/08/2017 00:21:41","01/08/2017 00:23:53",
      "01/08/2017 00:30:10","01/08/2017 00:34:56","01/08/2017 00:37:32","01/08/2017 00:39:03",
      "01/08/2017 00:40:10","01/08/2017 00:41:51","01/08/2017 00:45:56","01/08/2017 00:48:10",
      "01/08/2017 00:49:36","01/08/2017 00:50:33","01/08/2017 00:52:32","01/08/2017 00:55:34")
```

```
replace <- replacement(x,14)

print(replace)
```

---

smatrix   *Sociomatrix*

Description

Function to obtain the square matrix contained dyadic frequency of dominance-related behaviors (actor and reactor).

Usage

```
smatrix(x)
```

Arguments

x   Replacement or agonistic interaction data table.

Details

The fuction smatrix is only applied for data set with columns named as follows: actor and reactor. The function form a square matrix, in which the number of "n" actors is also the number of "n" reactors.

Value

Sociomatrix

Author(s)

Julia P. S. Valente, Matheus Deniz, Karolini T. de Sousa.

Examples

```
x <- data.frame(actor = c(6,3,5,4,2,1,3,5,8,6,9,3,2,1,1),
                reactor = c(2,6,3,5,4,2,1,3,5,1,6,4,3,2,5))

sociomatrix <- smatrix(x)

print(sociomatrix)
```

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