Package ‘sudokuAlt’

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Description Tools for making, retrieving, displaying and solving sudoku games.
    This package is an alternative to the earlier sudoku-solver package, 'sudoku'.
    The present package uses a slightly different algorithm, has a
    simpler coding and presents a few more sugar tools, such as plot and print
    methods. Solved sudoku games are of some interest in Experimental Design
    as examples of Latin Square designs with additional balance constraints.
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as.sudoku

Generic Sudoku Game Constructor

Description

Construct a Sudoku Game Object

Usage

as.sudoku(x, ...)

Arguments

x

an n^2 x n^2 matrix object to represent the game

... Other additional arguments (currently ignored)

Details

Coerce an object to one that can be used as a sudoku game. IMPORTANT: games are represented as n^2xn^2 character matrices, using 1-9 for n=2 or 3, and LETTERS[1:(n^2)] for n = 4 or 5.

Value

An object of class 'sudoku'

Author(s)

Bill Venables

Examples

M <- as.sudoku(matrix("", 16, 16))
sM <- solve(M)
plot(sM)
Description

Construct a Sudoku Game Object

Usage

## S3 method for class 'matrix'
as.sudoku(x, ...)

Arguments

x An n^2 x n^2 matrix
...
other arguments (currently ignored)

Details

Coerce a matrix to an object that can be used as a sudoku game

Value

An object of class 'sudoku'

Author(s)

Bill Venables

Description

Identity function for sudoku objects

Usage

## S3 method for class 'sudoku'
as.sudoku(x, ...)

Arguments

x A sudoku object
...
other arguments (ignored)
Value

the input sudoku object

Author(s)

Bill Venables

daysAgo

Format a Past Date

Description

Format a Date Relative to the Current Date

Usage

daysAgo(n = 0, warn = TRUE)

Arguments

n A positive integer for how many days ago
warn Issue a warning if n <= 0 or n > 30

Details

Internal function used by fetchUKGame().

Value

A character string of the form "dd/mm/yy"

Author(s)

Bill Venables

Examples

daysAgo() ## today
daysAgo(7) ## a week ago
Design Game

Sudoku Design

Description

Take a sudoku game and represent the information as a data frame giving the row, column, square and symbol for each entry. This is a useful form if the (complete) game is to be used as an experimental design.

Usage

designGame(g, ...)

## Default S3 method:
designGame(g, ...)

## S3 method for class 'sudoku'
designGame(g, ...)

Arguments

- `g` a sudoku game, presumably solved
- `...` currently ignored

Value

a data frame with four columns, Row, Col, Square and Symbol

Examples

```r
set.seed(2019)
d <- seedGame(4) %>% solve() %>%
    regulariseGame(target = "b") %>%
    designGame()
head(d), tail(d)
```

Empty Game

Construct an empty game

Description

Construct a Vacant Game Structure

Usage

emptyGame(n = 3)
Arguments

\( n \)  
an integer value between 2 and 5 inclusive.

Details

Returns a vacant game structure to allow special patterns to be constructed, as shown in the example.

Value

An empty sudoku game structure

Author(s)

Bill Venables

Examples

\[
g <- \text{emptyGame}(4) 
diag(g) <- \text{LETTERS}[1:16] 
\text{plot}(g) 
g \%>\% \text{solve} \%>\% \text{plot} \rightarrow \text{sg} \#\# \%>\% \text{imported from magrittr}
\]

---

**fetchAUGame**  
Retrieve a Sudoku from the AU Site

Description

Retrieve a Sudoku Game

Usage

fetchAUGame(day = 0, difficulty = c("tough", "hard", "medium", "easy"))

Arguments

\( \text{day} \)  
non-negative integer, how many days ago? zero for today’s game.

\( \text{difficulty} \)  
character string, how hard would you like it?

Details

Connects to [http://www.sudoku.com.au](http://www.sudoku.com.au) and retrieves the sudoku game from \( \text{day} \) days ago. Based on a function from a related sudoku package, `sudoku::fetchSudokuUK` with minor changes.

Value

The published sudoku game as a sudoku object.
fetchUKGame

Author(s)

Bill Venables

Examples

## Not run:
fetchAUGame() %>% solve %>% plot -> gau         ## The 'tough' game for today
fetchAUGame(3, "easy") %>% solve %>% plot -> eau ## 'easy' game from 3 days ago

## End(Not run)

---

fetchUKGame

Retrieve a Sudoku from the UK Site

Description

Retrieve a Sudoku Game

Usage

fetchUKGame(day = NULL)

Arguments

day positive integer < 30, how many days ago? or NULL for the most recently published game.

Details

Connects to http://www.sudoku.org.uk/DailySudoku.asp and retrieves the sudoku game from day days ago. Based on a function from a related sudoku package, sudoku::fetchSudokuUK with minor changes.

Value

The published sudoku game as a sudoku object.

Author(s)

Bill Venables
Examples

```r
## Not run:
(g0 <- fetchUKGame())  ## The game for today (according to GMT)
(g3 <- fetchUKGame(3))  ## Game from 3 days ago (according to GMT)
if(require(sudoku)) {    ## The original solver
  g0a <- as.sudoku(fetchSudokuUK())
  identical(g0, g0a)    ## Should be TRUE
}
g0 %>% solve %>% plot -> sg0  ## Spoil the game

## End(Not run)
```

---

**makeGame**

*Make a New Sudoku Game*

**Description**

Construct a Random Sudoku Game

**Usage**

```r
makeGame(n = 3, gaps = ceiling(3 * n^4/4), maxit = 25)
```

**Arguments**

- `n` Size of the game, `n^2` x `n^2`
- `gaps` Number of holes to leave for the solution
- `maxit` Number of tries before giving up.

**Details**

Constructs a sudoku game for given `n`, 2 <= `n` <= 5. `n = 5` can be problematical.

**Value**

a sudoku game

**Author(s)**

Bill Venables

**Examples**

```r
set.seed(54321)
makeGame() %>% solve %>% plot -> sg
originalGame(sg)
```
originalGame

Retrieve the Original from a Solved Game

Description

Retrieve the Original from a Solved Game

Usage

originalGame(x)

Arguments

x a sudoku object

Details

Convenience function for accessing an original from a solved game. If the game is unsolved, the object itself is returned.

Value

The original sudoku game corresponding to the solution, or object itself if the game is unsolved

Author(s)

Bill Venables

Examples

set.seed(666)
seedGame() %>% solve %>% plot -> sg ## %>% imported from magrittr
originalGame(sg)

plot.sudoku

Plot a Sudoku Game

Description

Plot a Sudoku Game
print.sudoku

Usage

```r
## S3 method for class 'sudoku'
plot(
x, 
..., 
cex = 1.5 - (n - 3)/2,
colSolution = "grey",
colGame = "fire brick"
)
```

Arguments

- `x` The sudoku game
- `...` additional arguments
- `cex` Character expansion factor
- `colSolution` colour to be used for the solution (if present)
- `colGame` colour to be used for the original game

Details

Present a graphical display of a sudoku game and its solution if the game is solved

Value

The sudoku game `x`, invisibly.

Author(s)

Bill Venables

Examples

```r
set.seed(20191)
makeGame(4, gaps = 0) %>% plot(cex=1) -> sg
```

print.sudoku `Print a Sudoku Object`

Description

Print a Sudoku Object

Usage

```r
## S3 method for class 'sudoku'
print(x, ...)
```
regulariseGame

Arguments

x The sudoku game object
...
extra arguments (ignored)

Details

Prints a sudoku object in an easily recognisable form.

Value

the object, invisibly

Author(s)

Bill Venables

Description

Put a solved sudoku game into a canonical form

Usage

regulariseGame(g, ...)

## S3 method for class 'sudoku'
regulariseGame(g, target = c("block", "col", "row"), ...)

## Default S3 method:
regulariseGame(g, ...)

Arguments

g a solved sudoku game
...
additional arguments to methods (currently not used)
target character; which section do you want to be in sorted order?

Details

If a solved sudoku game is to be used as an experimental design it is sometimes useful to re-arrange
the symbols so that either the first row, first column or top left block symbols are in sorted order.
This function accomplishes this task.
Value

a regularised solved sudoku game

Examples

```r
set.seed(1234)
g <- makeGame() %>%
solve() %>%
regulariseGame(target = "b") %>%
plot()
plot(originalGame(g))
```

Description

Generate a random sudoku game starting point

Usage

```r
seedGame(n = 3)
```

Arguments

- `n` Size of the game, \( n^2 \times n^2 \)

Details

Generates a game with one instance of each symbol in random positions.

Value

A sparse unsolved sudoku game

Author(s)

Bill Venables

Examples

```r
set.seed(2345)
g <- seedGame(3)
sg <- solve(g) ## a completed random game
plot(sg)
```
Description

Solve a Sudoku Puzzle

Usage

```r
## S3 method for class 'sudoku'
solve(a, ...)
```

Arguments

- `a` A sudoku game object to be solved
- `...` Extra arguments (currently ignored)

Details

An alternative front end to `solveGame` as a method for the base generic function `solve`.

Value

A solved game, or NULL if no solution exists.

Author(s)

Bill Venables

Examples

```r
set.seed(1234)
makeGame(3, gaps = 59) |> solve |> plot -> sg
originalGame(sg)

g <- emptyGame(4) # construct a patterned game
diag(g) <- LETTERS[1:16]
g |> solve |> plot -> sg
sg
```
solveGame  

Solve a Sudoku Game

Description
Solve a Sudoku Game

Usage
solveGame(game)

Arguments
  game  The game to be solved

Details
Given a sudoku game to be solved, find the solution. IMPORTANT: games are represented as \(n^2 \times n^2\) character matrices, using 1-9 for \(n=2\) or 3, and LETTERS[1:((n^2))] for \(n = 4\) or 5.

Value
A solved sudoku game object if one found, or NULL if no solution exists. The original game is attached as an attribute if the game is solved.

Author(s)
Bill Venables

Examples
set.seed(1234)
makeGame(3, gaps = 60) %>% solve %>% plot -> sg
(g <- originalGame(sg))

g <- emptyGame(4)  # construct a patterned game
diag(g) <- LETTERS[1:16]
sg <- solve(g)
plot(sg)
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