

Package ‘rcube’

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Type Package

Title Simulations and Visualizations of Rubik's Cube (with Mods)

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Description

Provides simplified methods for managing classic Rubik's cubes and many other modifications of it (such as NxNxN size cubes, void cubes and 8-coloured cubes - so called octa cubes). Includes functions of handling special syntax for managing such cubes; and different approach to plotting 3D cubes without using external libraries (for example 'OpenGL').

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 createCube

Creating cube size NxNxN

Description

Creates a cube object with empty moves and color scheme information

Usage

```
createCube(N = 3, mode = "normal", scheme = c("orange", "yellow", "blue",
  "white", "green", "red"))
```

Arguments

N	integer - size of cube. Default value is 3, and maximum is 20. More than maximum (20) is possible, however parser will ignore moving layers with number greater than 10 - you will not be able to get full variety of those cubes.
mode	string "normal" (default) or "octa" or "void". There are also available learning modes. Use keywords: "cross", "first layer", "first two layers", "corners", "edges" to obtain your mode. For example "cross,centers", "corners" or "edges and centers". Default color scheme is the same as defined in parameter with added gray color.
scheme	string vector - colour scheme for plotting cube. Name of colours should be given in specified order: front, top, right, bottom, left, back. In learning mode there is possibility to define 12 colors (standard 6 colors and 6 which are default gray). Default value is c("orange","yellow","blue","white","green","red")

Value

Cube class object

Examples

```
# Create 3x3x3 cube with original color scheme:
cube <- createCube()
# Create 14x14x14 cube with original color scheme:
cube <- createCube(N = 14)
# Create 3x3x3 cube with "japanese" color scheme:
cube <- createCube(scheme = c("green","white","red","blue","orange","yellow"))
# Create 3x3x3 learning cubes:
c <- createCube(mode = "cross and centers")
c2 <- createCube(mode = "first layer and centers")
c3 <- createCube(mode = "first two layers")
# Create cube with coloured corners and edges:
c <- createCube(N = 4, mode = "corners and edges")
```

is.solved	<i>Testing if cube is solved</i>
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Description

Function returns TRUE if cube is solved (each side contains exactly one colour) and FALSE otherwise.

Usage

```
is.solved(cube)
```

Arguments

cube - cube object to be tested

Value

TRUE/FALSE

Examples

```
## Create new cube:
cube <- createCube(3)
## And it is solved:
is.solved(cube) # TRUE
## Now, test how many times repeating LFRB moves will bring back initial state:
cube <- twistCube(cube, 'LFRB')
i <- 1
while(!is.solved(cube))
{
  cube <- twistCube(cube, 'LFRB')
  i <- i + 1
}
print(i) # 315
## Check one more time if this is a solution:
is.solved(twistCube(cube, 'LFRB', 315)) # TRUE
## Check if really 314 moves and 316 moves don't give solution:
is.solved(twistCube(cube, 'LFRB', 314)) || is.solved(twistCube(cube, 'LFRB', 316)) # FALSE
```

`plot.cube`*Plotting cube*

Description

Plots cube in 2D

Usage

```
## S3 method for class 'cube'  
plot(x, ...)
```

Arguments

`x` - cube object
`...` - not used

Value

plot

Examples

```
cube <- createCube()  
plot(cube)
```

`plot3dCube`*Plotting cube in 3D*

Description

Plotting cube in 3D

Usage

```
plot3dCube(cube, sides = "both", rotate = "0")
```

Arguments

`cube` - cube object
`sides` - string parameter determining which side of cube should be plotted, correct values are: top, bottom, and both (default).
`rotate` - string defaulting initial rotating of cube. Correct are strings containing characters: o, O, p, P. Default is 'O'

Value

plot

Examples

```
cube <- createCube()
plot3dCube(cube) # generates plot of solved cube
cube <- twistCube(cube, "(LLFFRRBB) x3")
plot3dCube(cube) # plotted 'chess' pattern
```

positions

Example dataset

Description

A dataset containing famous cubes positions. The variables are as follows:

Usage

```
data(positions)
```

Format

A data frame with popular positions of cubes

Details

- n: size of cube
- name: pattern name
- moves: moves to make

print.cube

Printing cube

Description

Prints cube in console

Usage

```
## S3 method for class 'cube'
print(x, ...)
```

Arguments

x - cube object
... - not used

Value

plain text

Examples

```
cube <- createCube()  
print(cube)
```

scramble

Scrambling cube

Description

Scrambling cube

Usage

```
scramble(cube, times = 0)
```

Arguments

cube - cube object to scramble
times - how many random moves should be done on cube. Default is 0 which means N*10 moves where N is the size of the cube.

Value

cube

Examples

```
cube <- createCube()  
set.seed(1)  
cube <- scramble(cube)  
bigcube <- createCube(N = 15)  
set.seed(1)  
bigcube <- scramble(bigcube)
```

translate	<i>Translating notation</i>
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Description

Translating notation

Usage

```
translate(moves, from = "singmaster")
```

Arguments

moves	- cube object
from	- Singmaster

Value

moves

Examples

```
cube <- createCube()
cube <- twistCube(cube, moves = translate("U R2 F B R B2 R U2 L B2 R U' D' R2 F R' L B2 U2 F2 "))
# Superflip pattern, https://en.wikipedia.org/wiki/Superflip
plot3dCube(cube)
```

twistCube	<i>Twist cube</i>
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Description

Twist the cube by given string of moves and number of times.

Usage

```
twistCube(cube, moves = "", times = 1)
```

Arguments

cube	- cube object
moves	- string parameter Syntax: The main QTM clockwise movements are the same as in the Singmasters notation: "U", "D", "F", "B", "R", "L". However moves from HTM such as U2 is not move of upper layer by 180 degrees (it will be explained further). Counter clockwise moves are denoted by lowercase letters: "u", "d", "f", "b", "r", "l". Rotations of the cube are denoted by "O" (rotate cube horizontally, "o" means rotation horizontally in different direction); and "P" (rotate cube vertically, "p" means rotation vertically in different direction). Repetitions of the moves: there are several ways to repeat given sequence of moves. The simplest way is to copy commands. The most effective way to do this is using parameter times. However, in some cases it is useful to repeat only parts of sequence of moves - then we could use bracketing terms and operator times "x".
times	- integer (default is 1). Number of repetitions of moves.

Value

cube - cube object

Examples

```
# Create classic Rubik's cube:
c <- createCube()
# Check moves LL FF RR BB
c <- twistCube(c,"LLFFRRBB")
# Check if LFRB repeated 316 times is cycle:
c <- twistCube(c,"(LFRB)x316")
is.solved(c)
# TRUE
# Twisted chicken feet pattern:
c <- createCube()
c <- twistCube(c,positions[21,"moves"])
plot3dCube(c)
# The same pattern using pipe %>% from magrittr package
require(magrittr)
c <- createCube() %>% twistCube(positions[21,"moves"]) %>% plot3dCube()
# Rubik's Revenge
c <- createCube(N = 4) %>% plot3dCube()
# Rotating only one edge, which is not allowed on a classic cube:
c %>% twistCube(positions[30,"moves"]) %>% plot3dCube()
# Creating Professor's Cube
c <- createCube(N = 5) %>% plot3dCube()
# Rotating and moving edges:
c %>% twistCube("(u3RUrFrFRU3)x12") %>% plot3dCube()
# Moving and rotating edges part 2:
c <- createCube(5) %>% twistCube("((R1:2)x2 BBUU (L1:2)x2 UU rr2
UU RR2 UUFF RR2 FF 112 BB (R1:2)x2 )x2 dd") %>% plot3dCube()
# Hearts pattern on a cube sized 13x13x13:
c <- createCube(13) %>% twistCube("OP U2
```



```
14:5 R4:5 u2 L4:5 r4:5 U3
13:6 R3:6 u3 L3:6 r3:6 U4
12:4 R2:4 l6:8 u4 L2:4 r2:4 L6:8 U5
12:3 R2:3 l7 u5 L2:3 r2:3 L7 U6
12:3 R2:3 u6 L2:3 r2:3 U7
12:4 R2:4 u7 L2:4 r2:4 U8
13:5 R3:5 u8 L3:5 r3:5 U9
14:6 R4:6 u9 L4:6 r4:6 d4 l5:9 D4
L5:9 d3 l6:8 D3
L6:8 d2 l7 D2 L7") %>% plot3dCube()
# Creating octa cube
c <- createCube(N = 4, mode = "octa") %>% plot3dCube()
# Rotating centers which is not visible on a classic cube (URL algorithm):
c %>% twistCube("(URL uurl)x2") %>% plot3dCube()
# Creating void cube 8x8x8
c <- createCube(N = 8,mode = "void") %>% plot3dCube()
```

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