

the k-mapper package 1.1.0

Karnaugh map

/ˈkɑːnɔː/

noun

a diagram consisting of a rectangular array of squares each representing a different combination of the variables in a Boolean function

introduction

k-mapper is a Typst package for adding customizable Karnaugh maps of 2 by 2, 2 by 4, and 4 by 4 grid sizes to your Typst projects.

This Manual has been typeset in Typst, using the k-mapper package, and is intended for the 1.1.0 version of k-mapper. See the source code on the Github repository for the project [here](#).

See the changelog for the package [here](#).

using karnaugh()

The main function of this package is the `karnaugh()` function, which allows you to create and customize all sizes of Karnaugh maps.

gray code position

The position of implicants in k-mapper are declared via *Gray code position*. This is similar to Karnaugh map packages in LaTeX.

The Gray code position of a cell in a Karnaugh map can be determined by looking at the Gray code labels of the Karnaugh map: the Gray code position is the decimal equivalent of the binary number formed from the number(s) on the left and the number(s) on the top.

The empty maps below show each cell's Gray code position. Note that the Gray code position for a cell differs depending on the Karnaugh map's grid size.

	0	1							
			00	0	1		00	0	1
			01	2	3		01	4	5
			11	6	7		11	12	13
			10	4	5		10	8	9
								10	10
0	0	1							
1	2	3							

For example, the shaded cell above's Gray code position (14) can be determined by concatenating the binary numbers to its left on the y-axis (11) and above it on the x-axis (10), giving 1110 which equals 14 in decimal.

function arguments

name	default	description	example values
grid-size int	required	The size of the Karnaugh map's grid. This value can be only 4 (2 by 2), 8 (2 by 4), or 16 (4 by 4). Any other values will throw an error.	4 8 16
x-label content	\$\$	The label (usually a variable name) to go on the top (x-axis) of the Karnaugh map.	\$A\$ [foo]
y-label content	\$\$	The label (usually a variable name) to go on the left (y-axis) of the Karnaugh map.	\$B\$ [bar]
minterms (int) none	none	The array of Gray code positions ¹ where at that position is a minterm (0). Mutually exclusive with maxterms and manual-terms.	(3, 4, 6) (1,)
maxterms (int) none	none	The array of Gray code positions ¹ where at that position is a maxterm (1). Mutually exclusive with minterms and manual-terms.	(0, 1, 2, 3, 5, 11, 12) (7,)
manual-terms (content) none	none	The array of content in each cell in order of Gray-code position ¹ . The length of this array <i>must</i> equal the grid-size. Mutually exclusive with minterms and maxterms.	// Grid-size 4 (0, "X", 1, 1)
implicants ((int, int),)	()	An array where each element is an array of two ints, where each int is a Gray code position ¹ corner of a <i>rectangular</i> implicant.	((0, 3), (1, 1)) ((0, 2),)

name	default	description	example values
horizontal-implicants ((int, int),)	()	An array where each element is an array of two ints, where each int is a Gray code position ¹ corner of a <i>horizontal split</i> implicant — that is, one which wraps around the vertical edges of the Karnaugh map.	// Grid-size 16 ((0, 6), (8, 10))
vertical-implicants ((int, int),)	()	An array where each element is an array of two ints, where each int is a Gray code position ¹ corner of a <i>vertical split</i> implicant — that is, one which wraps around the horizontal edges of the Karnaugh map.	// Grid-size 8 ((0, 4),) // Grid-size 16 ((0, 9), (2, 10))
corner-implicants bool	false	A bool which indicates whether the Karnaugh map contains a <i>corner split</i> implicant — that is, one which wraps around both vertical and horizontal edges of the Karnaugh map.	true
cell-size length	20pt	The size of an individual cell in the Karnaugh map.	1cm
stroke-width length	0.5pt	The stroke width of the Karnaugh map grid.	0.2pt
colors (color)	array of: red green blue cyan magenta yellow	An array of RGBA colors to be used in displaying implicants. The first implicant uses the first color in the array, the second implicant the second color, etc. If there are more implicants than there are colors, each subsequent implicant will use the least recently used color (i.e. it wraps around). By default, all colors in colors have alpha values of 100.	// Grayscale K-map (rgb(200, 200, 200, 100),)

name	default	description	example values
implicant-inset length	2pt	The inset of implicants within each cell.	3pt
edge-implicant-overflow length	5pt	How much <i>split implicants</i> (horizontal, vertical, corner) overflow the bounds of the grid.	2mm
implicant-radius length	5pt	The corner radius of implicants.	3mm
implicant-stroke-transparentize ratio	#-100%	The ratio to transparentize the stroke color of implicants by. If set to 0%, the stroke color of implicants are the same as the fill color, darkened by the factor set in <code>implicant-stroke-darken</code> (60% by default). Negative values mean the stroke color becomes more opaque.	-50%
implicant-stroke-darken ratio	60%	The ratio to darken the stroke color of implicants by.	100%
implicant-stroke-width length	0.5pt	The stroke width of implicants.	1pt

examples

	0	1
0	0	1
1	1	1

```

// Grayscale Karnaugh map
#karnaugh(
  4,
  minterms: (0, ),
  implicants: ((1, 3), (2, 3)),
  colors: (rgb(100, 100, 100, 100), ) // <-
)

```

¹See p. 1.

		<i>C</i>	
		0	1
<i>AB</i>	00	0	1
	01	0	0
	11	1	1
	10	0	X

```
#karnaugh(
  8,
  x-label: $C$,
  y-label: $A B$,
  manual-terms: (0, 1, 0, 0, 0, "X", 1, 1),
  implicants: ((6, 7), ),
  vertical-implicants: ((1, 5), )
)
```

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	1	0	0	1
	01	0	1	1	0
	11	0	1	1	0
	10	1	0	0	1

```
#karnaugh(
  16,
  x-label: $C D$,
  y-label: $A B$,
  maxterms: (0, 2, 5, 7, 13, 15, 8, 10),
  implicants: ((5, 15), ),
  corner-implicants: true
)
```

	0	1
00	0	1
01	2	3
11	6	7
10	4	5

```
#karnaugh(
  8,
  manual-terms: (0, 1, 2, 3, 4, 5, 6, 7),
  implicants: (
    (0, 0), (1, 1), (2, 2), (3, 3),
    (4, 4), (5, 5), (6, 6), (7, 7)
  )
)
```

		<i>CD</i>			
		00	01	11	10
<i>AB</i>	00	0	1	3	2
	01	4	5	7	6
	11	12	13	15	14
	10	8	9	11	10

```
#karnaugh(
  16,
  x-label: $C D$,
  y-label: $A B$,
  manual-terms: (
    0, 1, 2, 3, 4, 5, 6, 7, 8,
    9, 10, 11, 12, 13, 14, 15
  ),
  implicants: ((5, 7), (5, 13), (15, 15)),
  vertical-implicants: ((1, 11), ),
  horizontal-implicants: ((4, 14), ),
  corner-implicants: true,
)
```

		C	
		0	1
AB	00	0	1
	01	2	3
	11	6	7
	10	4	5

```
// No fill Karnaugh map
#karnaugh(
  8,
  x-label:  $C$ ,
  y-label:  $A B$ ,
  manual-terms: (0, 1, 2, 3, 4, 5, 6, 7),
  implicants: ((0, 3), (2, 7)),
  horizontal-implicants: ((4, 5), ),
  colors: (rgb(255, 255, 255, 0), ),
  implicant-stroke-width: 1pt
)
```