laserbeam.sty

v1.0

A style file for typesetting Laser Beam logic puzzles
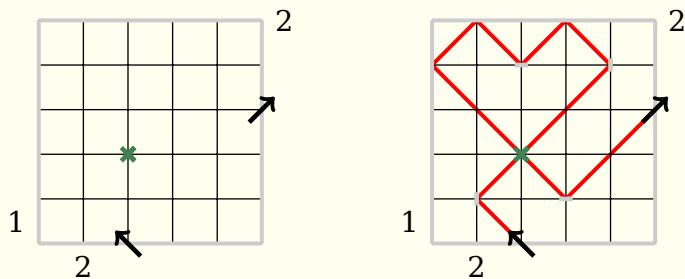
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Contents

1 The puzzle

Draw a laser beam in each grid according to the following guidelines. The beam
has to enter or to leave the grid at the arrows. At each intersection, a mirror,
on which the laser beam must reflect on one side, can be placed horizontally
or vertically. The other side must not be touched by the beam. All locations
where the laser crosses are given. The numbers to the left and above the grid
indicate how many cells are traversed by the beam in the corresponding row
or column. The numbers to the right and below reveal, how many mirrors are
found in the intersection of the corresponding row or column. Here's a little
self-explanatory example:
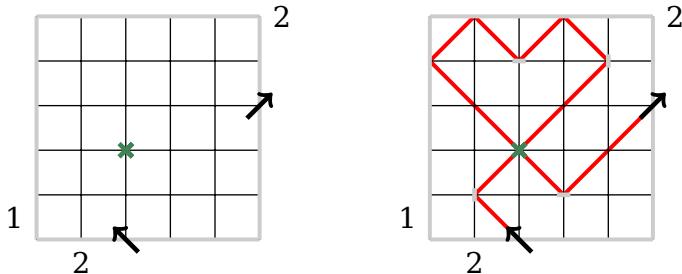

```
1  \begin{center}
2    \begin{laserbeam}
3      \laserV{1}
4      \laserH{{}}
5      \mirrorH{{},2}
6      \mirrorV{{},{},{},{},{},2}
7      \framepuzzle[LP@c@mirror]
8      \placearrow{3}{1}{LeftUp}
9      \placearrow{6}{4}{RightUp}
10     \placecross{3}{3}
11   \end{laserbeam}
12   \hspace{1cm}
13   \begin{laserbeam}
14     \laserV{1}
15     \laserH{{}}
16     \mirrorH{{},2}
17     \mirrorV{{},{},{},{},{},2}
18     \framepuzzle[LP@c@mirror]
19     \placearrow{3}{1}{LeftUp}
20     \placearrow{6}{4}{RightUp}
21     \placecross{3}{3}
22     \placemirror{2}{2}{V}
23     \placemirror{4}{2}{H}
24     \placemirror{5}{5}{V}
```

```
25      \placemirror{3}{5}{H}
26      \begin{puzzlebackground}
27        \laser{\tikzpath{3}{1}{7,9,9,9,7,1,7,1,3,3,3,9,9}}
28      \end{puzzlebackground}
29    \end{laserbeam}
30  \end{center}
```

2 Options

rows [5] defines the number of rows in the grid.

columns [5] specifies the number of columns in the grid

width [6.5cm] sets the width of the minipage, in which the grid is typeset.

scale [1] scales the size of the grid in the minipage.

fontsize [Large] specifies the size of the numbers next to the grid. Here, the usual LaTeX sizes are used. Possible values: tiny, scriptsize, footnotesize, small, normalsize, large, <u>Large</u>, LARGE, huge, Huge

title [] sets the title of a puzzle.

titleindent [0cm] defines the indent of the title.

titlewidth [6.5cm] specifies the width of the box the title is set in.

bgcolor [] sets the background color of the grid.

counterstyle [none] defines the counter style. Predefined styles: none, left, right

cvoffset [-38pt] sets the vertical offset of the counters in the margin.

3 Environments

3.1 laserbeam

\begin{laserbeam}[⟨options⟩]
    · · ·
    \end{laserbeam}

The laserbeam environment is the central core of the style file. With the optional argument of the environment, you can reset the options with local scope. Here, a blank grid is created.

3.2 puzzlebackground

\begin{puzzlebackground}
    · · ·
    \end{puzzlebackground}

The puzzlebackground environment allows you to place elements behind the main layer.

3.3 puzzleforeground

\begin{puzzleforeground}
    · · ·
    \end{puzzleforeground}

The puzzleforeground environment allows you to place elements in front of the main layer.

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4 Commands

4.1 In the grid and around

4.1.1 laserH

\laserH{⟨*csv list*⟩} The command \laserH typesets the numbers above the grid indicating how many cells are traversed by the laser beam. It expects a comma-separated list as an argument.

4.1.2 laserV

\laserV{⟨*csv list*⟩} The command \laserV typesets the numbers left to the grid.

4.1.3 mirrorH

\mirrorH{⟨*csv list*⟩} The command \mirrorH typesets the numbers below the grid indicating how many mirrors are placed in the intersections of this column.

4.1.4 mirrorV

\mirrorV{⟨*csv list*⟩} The command \mirrorV typesets the numbers right to the grid.

4.1.5 placearrow

\placearrow{⟨*column*⟩}{⟨*row*⟩} {⟨*direction*⟩} The command \placearrow is used for the placement of arrows at the grid frame. The reference for coordinates is the bottom left corner of the cell. In the mandatory argument ⟨*direction*⟩, you can use the following indicators: LeftUp, LeftDown, RightUp, RightDown

4.1.6 placecross

\placecross{⟨*column*⟩}{⟨*row*⟩} With the command \placecross you can place a cross in the intersections of the grid.

4.1.7 placemirror

\placemirror{⟨*column*⟩}{⟨*row*⟩} {⟨*direction*⟩} With the command \placemirror you can place mirrors in the intersections of the grid. In the mandatory argument ⟨*direction*⟩, you can use the following indicators: H, V

4.1.8 laser

\laser[⟨*color*⟩]{⟨*tikz path*⟩} The command \laser draws the laser beam given by ⟨*tikz path*⟩ with color [⟨*color*⟩] (default: red). The reference for coordinates is the bottom left corner of the cell.

```
1  \laser[green]{(1,2)--(2,3)--(1,4)}
```

You should consider using this command in the puzzlebackground environment.

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4.1.9 tikzpath

`\tikzpath{⟨column⟩}{⟨row⟩}`
`{⟨csv list⟩}`

With the `\tikzpath` command, you can easily construct a `\tikz` path. You just need to define a starting point ⟨*column*⟩⟨*row*⟩ (bottom left corner) and a ⟨*csv list*⟩ with direction indicators relative to the current position.

7:	up left	8:	up	9:	up right
4:	left	5:	no change	6:	right
1:	down left	2:	down	3:	down right

```
1  \framearea{green}{\tikzpath{2}{2}{8,6,2,4}}
```

This command will frame grid cell (2,2) green.

4.1.10 framepuzzle

`\framepuzzle[⟨color⟩]`

With the `\framepuzzle` command, you can frame the grid (thicker line) with the color specified with the optional argument [⟨*color*⟩] (default: black).

4.2 Presentation

4.2.1 definecounterstyle

`\definecounterstyle{⟨name⟩}`
`{⟨definition⟩}`

The command `\definecounterstyle` allows you to define your own styles. For example, the style `left` is defined as follows:

```
1  \definecounterstyle{left}{
2    \begingroup\reversemarginpar\marginnote{
3    \tikz\node[shape=rectangle,fill=yellow!40,inner sep=7pt,
4               draw,rounded corners=3pt,thick]
5    {\Huge\puzzlecounter};}[\LP@cvoffset]\endgroup}
6  }
```

To typeset the counter into the margin we use the command `\marginnote`. We need to use the command `\reversemarginpar` to set the counter into the left margin. Of course, we must use this command in a group for local scope. Finally we use `\puzzlecounter` in a `\tikz` node with a vertical offset set with the option `cvoffset`.

4.2.2 puzzlecounter

`\puzzlecounter`

The command `\puzzlecounter` provides the counter in textual form to use it for example in `\definecounterstyle`.

4.2.3 titleformat

`\titleformat{⟨format⟩}`

With the command `\titleformat`, you can define the format of the title. By default, the definition is as follows:

```
1  \titleformat{\centering\Large\color{blue}}
```

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4.3   Miscellaneous

4.3.1   `laserbeamsetup`

`\laserbeamsetup{⟨options⟩}`   With the command \laserbeamsetup you can reset the options with global scope.

4.3.2   `setpuzzlecounter`

`\setpuzzlecounter{⟨number⟩}`   With the command \setpuzzlecounter, you can reset the puzzle counter, for example before the solutions.

5   Examples & Solutions

You can download application examples and their solutions from the project page. The puzzles are originally licensed under ⓒ①⑤⓪.