`matrix.skeleton`'s Manual

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1 Introduction

The Ti*k*Z `matrix` library places nodes on a grid. However, this grid is discarded after the nodes have been placed. As a result, certain constructions involving multiple nodes become cumbersome. The following two examples highlight some of the difficulties.

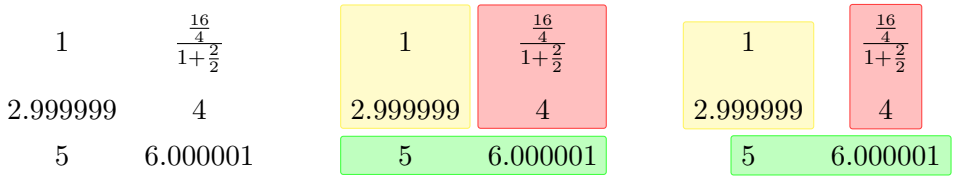
1.1 Alignment Issues with `fit`

The `fit` library is used to highlight a subset of nodes in a matrix. If all the nodes in the matrix have the same dimension, as in Figure 1, `fit` produces the desired output.

(a) Input matrix **(b)** Desired output and result with `fit`

Figure 1. Highlighting in a matrix with nodes of identical dimensions

However, if the nodes have different heights and widths, as illustrated in Figure 2, some alignment issues arise.



(a) Input matrix **(b)** Desired output **(c)** Result with `fit`

Figure 2. Highlighting in a matrix with nodes of different dimensions

These problems can be addressed using `minimum width` and `minimum height`. However, adjusting manually these parameters in every matrix is a waste of time.

The `matrix.skeleton` library provides a clean solution through the use of nodes called `cells`. These `cells` and other skeleton nodes are described in Section 2.

1.2 Working with Rows and Columns

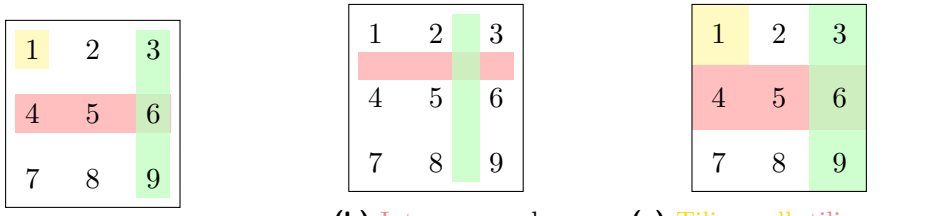
The readability of a matrix can sometimes be improved by adding a background on every other row. This simple task is not easily achievable with `matrix` alone. The style `every odd column` only affects the nodes of the said columns. There is no real column object to work with.

The `matrix.skeleton` library provides Ti*k*Z styles to achieve this goal easily. These styles are described in Section 3

2 Skeleton

2.1 Nodes

`matrix.skeleton` works by positioning a set of nodes to recreate the `matrix` grid. The eight types of such nodes are illustrated in Figure 3.



(a) Cell, row, and column

(b) Inter-row and inter-column

(c) Tiling cell, tiling row, and tiling column

Figure 3. Skeleton nodes

2.2 Using `matrix.skeleton`

The recommended way of using `matrix.skeleton` is through Ti*k*Z. First, load the library with:

```
\usetikzlibrary{matrix.skeleton}
```

Then add an option to your matrix:

```
\matrix (m) [label skeleton] {...};
```

This creates a set of nodes that can be used for styling. For example, the nodes illustrated in Figure 3 are named: `m-cell-1-1`, `m-row-2`, `m-column-3`, `m-inter-row-1`, `m-inter-column-2`, `m-tiling-cell-1`, `m-tiling-row-2`, and `m-tiling-column-3`.

3 Styling

The skeleton nodes are PGF nodes not meant to be styled. Styles should be applied to nodes whose shapes depend on the skeleton ones.

3.1 Macros

Styling in `matrix.skeleton` is done with the `fit` library. The following macro creates a `fit` node with the specified style:

```
\fitandstyle{(m-cell-1-1) (m-cell-2-2)}{draw=red};
```

It takes an optional argument to place the node in a `pgfonlayer` environment:

```
\fitandstyle[background]{(m-cell-1-1) (m-cell-2-2)}{fill=red};
```

3.2 TikZ `matrix` Options

Common styling options are also provided as Ti*k*Z options. These options call `label skeleton` before styling the appropriate nodes. They take the following form:

```
\matrix (m) [style odd rows = {draw=red}] {...};

\matrix (m) [style odd tiling rows = {draw=red}] {...};

\matrix (m) [style grid = {draw}] {...};

\matrix (m) [style tiling grid = {draw}] {...};
```

All of these options have an `on layer` variant taking the following form:

```
\matrix (m) [style odd rows on layer = {background}{fill=red}] {...};
```

4 Examples

The following examples illustrate the styling capabilities offered by `matrix.skeleton`.

4.1 Grid

1	$\frac{\frac{16}{4}}{1+\frac{2}{2}}$	3
3.999999	5	6
7	8.000001	$3+3+3$

```
\begin{tikzpicture}
\matrix (m) [matrix of math nodes, style contour = {draw, very thick},
             style grid = {draw, thin}] {
1        & \frac{\frac{16}{4}}{1 + \frac{2}{2}} & 3         \\
3.999999 & 5                                    & 6         \\
7        & 8.000001                             & 3 + 3 + 3 \\
};
\end{tikzpicture}
```

4.2 Rows

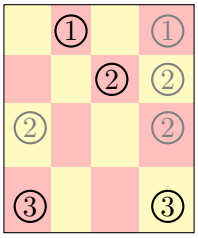
1	$\frac{\frac{16}{4}}{1+\frac{2}{2}}$	3
3.999999	5	6
7	8.000001	$3+3+3$

```
\begin{tikzpicture}
\matrix (m) [matrix of math nodes, row sep = 10pt,
             style odd rows on layer={background}{fill=green!25},
             style even rows on layer={background}{fill=yellow!30}] {
1        & \frac{\frac{16}{4}}{1 + \frac{2}{2}} & 3         \\
3.999999 & 5                                    & 6         \\
7        & 8.000001                             & 3 + 3 + 3 \\
};

\fitandstyle{(m-inter-row-1)}{fill=red!25}
\fitandstyle{(m-inter-row-2)}{fill=red!25}
\end{tikzpicture}
```

4.3 Checker Board

This example is inspired by the following TEX - LATEX Stack Exchange question: How can I set the background color of the rows and columns of a matrix node in Tikz?



```
\begin{tikzpicture}
\matrix (m) [draw, matrix of nodes, row sep=2mm, column sep=1mm,
             nodes={draw, thick, circle, inner sep=1pt}, label skeleton] {
  & 1 & &[2mm]|[gray]|1\\
  & & 2 &|[gray]|2\\
  |[gray]|2 & & &|[gray]|2\\[4mm]
  3 & & & 3\\
};
\foreach \row in {1, ..., 4} {
  \foreach \col in {1, ..., 4} {
    \pgfmathparse{Mod(\row + \col, 2) ? "red!25" : "yellow!30"}
    \colorlet{squarebg}{\pgfmathresult}
    \fitandstyle[background]{(m-tiling-cell-\row-\col)}{fill = squarebg}
  }
}
\end{tikzpicture}
```

5 Internals

`matrix.skeleton` was heavily inspired by Andrew Stacey's `matrixcells` LaTeX package. It has three distinctive features. First, it works with any `anchor`. Second, it provides finer control with respect to `row sep`, `column sep`, and `inner sep`. Third, the skeleton node positioning relies only on TeX and PGF, not on LaTeX or Ti*k*Z.

`matrixcells` properly aligns its `cells` when the node `anchor` is `base`. However, when the alignment is different it runs into problems, as exposed in the following TeX - LaTeX Stack Exchange question: Matrixcells problem with the y-axis only. This shortcoming is the result of some loss of information in `pgfmodulematrix.code.tex`. A dimension used during the placement of nodes is overwritten. Therefore, this information is not available to build the grid. In `matrixcells`, this lost dimension is reconstructed as the average of two other dimensions. This method only gives the right dimension when the nodes are anchored at `base`. To always get proper alignment, the `pgfmodulematrix.code.tex` macro erasing the dimension was rewritten. Following `@percusse`'s recommendation this change is transparent to the user and does not require updating PGF/Ti*k*Z.

`matrixcells` only provides `cells` corresponding the `tiling-cells` in `matrix.skeleton`. This tiling behavior is sometimes desired. However, it can result in unexpected behaviors when: using a non-base `anchor`, using `row sep` or `column sep`, or when working on boundary nodes.