

The `pmat` package to typeset partitioned matrices

Tomás Oliveira e Silva
Universidade de Aveiro
Aveiro, Portugal
email: `tos@inesca.pt`

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This document is a very short description of the `pmat` package, version 0.1. The `pmat` package provides the macros `\pmat` and `\endpmat` to typeset partitioned matrices, and it works under `TEX` and under `LATEX` (any version). Under `LATEX` it is possible to replace `\pmat` and `\endpmat` by `\begin{pmat}` and `\end{pmat}`, respectively.

The `\pmat` macro takes three arguments. The first one is a left delimiter (the thing you put immediately after a `\left` command). The last one is a right delimiter (the thing you put immediately after a `\right` command). As usual, a delimiter may be omitted by using a dot (`.`). The middle argument specifies the dashed vertical lines that are to be placed between columns of the matrix. This argument must contain exactly $n - 1$ characters, where n is the number of columns of the matrix. If a character is a `|` then a dashed vertical line will be placed between the appropriate columns. Otherwise, no dashed line will be placed between those columns (we recommend the use of the character dot (`.`) in these cases). The format of the entries of the partitioned matrix follows the conventions of plain `TEX`, i.e., entries are separated by a `&` (just like in `LATEX`), but lines are separated by a `\cr` (instead of the `\\` used in `LATEX`). All entries are typeset in math mode (in `\textstyle`). For technical reasons, a `\cr` must also be placed at the end of the last line. The placement of horizontal dashed lines is done with the command `\-`, which must be placed immediately after the command `\cr`. For example, the code

```
\[
  \begin{pmat}[{.}]
    a_{11} & a_{12} & b_{11} \cr
    a_{21} & a_{22} & b_{21} \cr\
    c_{11} & c_{12} & d_{11} \cr
  \end{pmat}
\]
```

produces the matrix

$$\left[\begin{array}{cc|c} a_{11} & a_{12} & b_{11} \\ a_{21} & a_{22} & b_{21} \\ \hline c_{11} & c_{12} & d_{11} \end{array} \right]$$

There are two macros that can be used to modify the shape of the crossings between horizontal and vertical dash lines. The first one, `\pmatcross`, makes

horizontal and vertical dash lines to cross. (It is the default.) The other, `\pmatnocross`, makes the lines not to cross. Under L^AT_EX2e, the first one can be made the default (it already is) by passing the option `cross` to the package, and the second one can be made the default by passing the option `nocross` to the package. The difference between the two forms can be examined in the following example (before the second `\begin{pmat}` we have put a `\pmatnocross`)

$$\left[\begin{array}{cc|c} a_{11} & a_{12} & b_{11} \\ a_{21} & a_{22} & b_{21} \\ \hline c_{11} & c_{12} & d_{11} \end{array} \right] \quad \left[\begin{array}{cc|c} a_{11} & a_{12} & b_{11} \\ a_{21} & a_{22} & b_{21} \\ \hline c_{11} & c_{12} & d_{11} \end{array} \right]$$

There are seven internal parameters that control the inner workings of the `pmat` macros. To hide their names they can only be accessed or changed through the macros `\pmatget` and `\pmatset`. The `\pmatget` macro takes one argument, the number of the parameter (from 0 to 6). It “returns” the current value of that parameter. The `\pmatset` macro takes two arguments, the number of the parameter, and its new value. All parameters are dimensions, so do not forget to put a unit of length (such as `mm`) after its numerical value. The seven parameters are the following:

- 0** This parameter controls the length of a dash “unit”. All horizontal and vertical dash lines have a length that is an integer multiple of this parameter. Its default value is `2.88pt`.
- 1** This parameter controls the thickness of the dash lines. Its default value is `0.36pt`.
- 2** This parameter controls the minimum distance between two lines. Its default value is `2pt`.
- 3** This parameter controls the minimum distance between two columns. Its default value is `8pt`.
- 4** This parameter controls the minimum width of each entry of the matrix. Its default value is `0pt`.
- 5** This parameter controls the minimum height of each entry of the matrix. Its default value is `6pt`.
- 6** This parameter controls the minimum depth of each entry of the matrix. Its default value is `1.5pt`.

Due to the way lengths are quantized, to avoid larger than strictly necessary gaps between lines the values of $[5] + ([1] + [2])/2$ and $[6] + ([1] + [2])/2$ should be smaller but close to a multiple of $[0]$. (A number inside square brackets refers to the corresponding parameter.) For example, the code

```
\[
  \pmatset{1}{0.72pt}
  \pmatset{0}{2\pmatget{1}}
  \pmatset{5}{0pt}
  \pmatset{6}{0pt}
  \begin{pmat}{{| |}}
```

```

A_{11} & A_{12} & A_{13} \cr\
A_{21} & A_{22} & A_{23} \cr\
A_{31} & A_{32} & A_{33} \cr
\end{pmat}
\]

```

produces the matrix

$$\left[\begin{array}{ccc|ccc} A_{11} & A_{12} & A_{13} & & & \\ \hline A_{21} & A_{22} & A_{23} & & & \\ \hline A_{31} & A_{32} & A_{33} & & & \end{array} \right]$$

For a uniform look of the document all matrices, partitioned and not partitioned, should be typeset using the `pmat` macros.

Possible future improvements: Instead of quantizing the height and depth of each entry separately, maybe their sum should be quantized. Perhaps the minimum height and depth of each entry should depend upon the current font size.

$$\left[\begin{array}{cc|c} \mathbf{A} & \mathbf{B} & \\ \hline \mathbf{C} & \mathbf{D} & \end{array} \right] = \left[\begin{array}{cc|c} -k_1 & -k_2\sqrt{1-k_1^2} & \sqrt{(1-k_1^2)(1-k_2^2)} \\ \hline \sqrt{1-k_1^2} & -k_1k_2 & k_1\sqrt{1-k_2^2} \\ \hline 0 & \sqrt{1-k_2^2} & k_2 \end{array} \right]$$