

The `jmsdelim` package

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1 Overview

Sizing delimiters using `\left` and `\right` should be outlawed! The results are nearly always unaesthetic, primarily because the correct size of a mathematical delimiter is a typesetting consideration which does *not* emanate from the physical size of the interior.

Correctly sizing delimiters is very difficult, particularly in well-architected documents: a correctly engineered mathematical document will include macros for all operations, and these macros necessarily will include delimiters (such as parentheses). However, the correct size for the delimiter cannot be chosen ahead of time, because it will depend on the arguments; two options are available:

1. Provide optional arguments to each notation macro for choosing delimiter sizes. This is nearly intractable to do in practice.
2. Ignore delimiter sizes.

With `jmsdelim` we offer an alternative: the correct delimiter sizes can be set at the *leaf nodes* of a mathematical expression, and magically bubble upward through the delimiters.

2 Document interface

`\DelimMin` `\DelimMin{⟨intexprmin⟩}`

This sets the minimum delimiter size to `⟨intexprmin⟩` outside the current location; delimiter sizes are represented as natural numbers, with 0 the smallest size.

`\DelimMin` is the work-horse of `jmsdelim`; let us consider an example of what one might do prior to adopting `jmsdelim`. Suppose we have defined a macro `\Psh` for the free co-completion, following the notation of the French school, and we wish to parenthesize an instance of it:

$\mathrm{Hom}_{\mathbf{Cat}}(1, \widehat{\mathbb{C}})$

```
\NewDocumentCommand\Cat{}{\mathbf{Cat}}
\NewDocumentCommand\Psh{m}{\widehat{#1}}
\NewDocumentCommand\Hom{mmm}{
  \operatorname{Hom}_{#1}(#2,#3)
}
\[\mathrm{Hom}\{\mathrm{Cat}\}{1}\{\Psh{\mathbb{C}}\}\ \]
```

One might have tried to get a better result by using `\left` and `\right`:

$$\mathrm{Hom}_{\mathbf{Cat}} \left(1, \widehat{\mathbb{C}} \right)$$

```

\NewDocumentCommand\Cat{}\{\mathbf{Cat}\}
\NewDocumentCommand\Psh{m}\{\widehat{#1}\}
\NewDocumentCommand\HomX{mmm}{
  \operatornamename{Hom}_{#1}\left(#2,#3\right)
}
\NewDocumentCommand\Hom{mmm}{
  \operatornamename{Hom}_{#1}\mleft(#2,#3\mright)
}
\[\ \Hom{\Cat}{1}\{\Psh{\mathbb{C}}\}\ \backslash
\[\ \HomX{\Cat}{1}\{\Psh{\mathbb{C}}\}\ \backslash

```

The above is appallingly worse: the height of the hat does not in any way determine the correct size for the delimiter! The solution using `jmsdelim` is quite simple, however: first, we change `\Hom` to call `\DelimPrn`, and then we use `\DelimMin` within the `\Psh` notation.

$$\mathrm{Hom}_{\mathbf{Cat}}(1, \widehat{\mathbb{C}})$$

```

\NewDocumentCommand\Cat{}{\mathbf{Cat}}
\NewDocumentCommand\Psh{m}{\DelimMin{1}\widehat{#1}}
\NewDocumentCommand\Hom{mmm}{
  \operatorname{Hom}_{#1}\DelimPrn{#2,#3}
}
\[\Hom{\Cat}{1}{\Psh{\mathbb{C}}}\]

```

Behavior under subscripts By default, delimiter sizes are capped under subscripts and superscripts because the alternative is unaesthetic. For instance:

$$\int_{(\sum_i a_i)} \int_{(\sum_i a_i)}$$

```
\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{#1}{#2}%
}
\[
  \int_{\DelimPrn{\Sum{i}{a_i}}}
  \int_{\DelimPrn{\DelimMin{4}{\Sum{i}{a_i}}}}
\]
```

Protected scopes Because the emitted delimiter size under a subscript does *not* determine the actual amount of space used, it is in most cases not correct for this delimiter size to have an effect on its non-subscript context. For this reason, judicious use of the `\DelimProtect` command is recommended in the case of subscripts. Compare the badly typeset example on the left with the nicely typeset example on the right:

$$\left[A_{\sum_i x_i}\right] \quad \left[A_{\sum_i x_i}\right]$$

```

\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{#1}{#2}%
}
\l
  \DelimBrk{A_{\DelimMin{4}\Sum{i}x_i}}
  \DelimBrk{\DelimMin{1}A_{\DelimProtect{\DelimMin{4}\Sum{i}x_i}}}
\l

```

2.1 Basic Delimiter commands

Like `mleftright` [Obe16], `jmsdelim` ensures the correct amount of space on the outside of the delimiters using `\mathopen` and `\mathclose`.

| | |
|-----------------------------|---|
| <code>\DelimSurround</code> | $\left\langle \left\langle \text{left} \right\rangle \right\rangle \left\langle \text{right} \right\rangle \left\langle \text{body} \right\rangle$ <p>Surrounds $\langle \text{body} \rangle$ with appropriately sized $\langle \text{left} \rangle$ and $\langle \text{right} \rangle$ delimiters respectively.</p> |
|-----------------------------|---|

$$\left| \sum_i b_i \right|$$

```

\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{#1}{#2}%
}
\[\DelimSurround{\vert}{\vert}{\Sum{i}{b_i}}\]

```

| | |
|----------------------------|---|
| <code>\DelimBetween</code> | $\left\langle \text{sep} \right\rangle \left\langle \text{lbody} \right\rangle \left\langle \text{rbody} \right\rangle$ <p>Places an appropriately sized $\langle \text{sep} \rangle$ between $\langle \text{lbody} \rangle$ and $\langle \text{rbody} \rangle$.</p> |
|----------------------------|---|

$$a \parallel \sum_i b_i$$

```

\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{#1}{#2}%
}
\[\DelimBetween{\Vert}{a}{\Sum{i}{b_i}}\]

```

| | |
|------------------------------------|---|
| <code>\DelimBetweenSurround</code> | $\left\langle \text{left} \right\rangle \left\langle \text{sep} \right\rangle \left\langle \text{right} \right\rangle \left\langle \text{lbody} \right\rangle \left\langle \text{rbody} \right\rangle$ <p>Places an appropriately sized $\langle \text{sep} \rangle$ between $\langle \text{lbody} \rangle$ and $\langle \text{rbody} \rangle$, surrounding the result by $\langle \text{left} \rangle$ and $\langle \text{right} \rangle$ respectively.</p> |
|------------------------------------|---|

$$\left\{ \sum_i a \cdot b_i \mid a \in A \right\}$$

```

\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{#1}{#2}%
}
\[
  \DelimBetweenSurround{\lbrace}{\vert}{\rbrace}{
    \Sum{i}{a\cdot b_i}
  }{a\in A}
\]

```

\DelimProtect

\DelimProtect{⟨body⟩}

Executes ⟨body⟩ in a sandbox, preventing its state updates from bubbling outward; this is useful in case of subscripts and superscripts. The following command demonstrates incorrect sizing in the presence of a high delimiter size within a subscript:

$$\left(\sum(\sum_i a_i)^F\right)$$

```
\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{#1}{#2}%
}
\[
  \DelimPrn{\Sum{\DelimPrn{\DelimMin{4}\Sum{i}{a_i}}}{F}}
\]
```

Using a combination of `\DelimProtect` and `\DelimMin`, the formatting can be corrected locally.

$$\left(\sum(\sum_i a_i)^F\right)$$

```
\NewDocumentCommand\Sum{mm}{%
  \DelimMin{1}{\textstyle\sum}_{\DelimProtect{#1}}{#2}%
}
\[
  \DelimPrn{
    \DelimMin{2}
    \Sum{\DelimPrn{\DelimMin{4}\Sum{i}{a_i}}}{F}
  }
\]
```

2.2 Derived delimiter commands

\DelimPrn

\DelimPrn{⟨body⟩}

Surrounds ⟨body⟩ in parentheses.

\DelimBrk

\DelimBrk{⟨body⟩}

Surrounds ⟨body⟩ in square brackets.

\DelimBrc

\DelimBrc{⟨body⟩}

Surrounds ⟨body⟩ in curly braces.

\DelimGl

\DelimGl{⟨body⟩}

Surrounds ⟨body⟩ in angle brackets.

\DelimVrt

\DelimVrt{⟨body⟩}

Surrounds ⟨body⟩ in vertical brackets.

\DelimBbrk

\DelimBbrk{⟨body⟩}

Surrounds ⟨body⟩ in Scott brackets (requires `\llbracket`, `\rrbracket` to be defined).

| | |
|-------------------------|---------------------------------------|
| <code>\DelimVvrt</code> | <code>\DelimVvrt{<body>}</code> |
|-------------------------|---------------------------------------|

Surrounds $\langle\text{body}\rangle$ in double vertical bars.

2.3 Configuration and options

| | |
|--------------------------|---|
| <code>\DelimSetup</code> | <code>\DelimSetup{<options>}</code> |
|--------------------------|---|

`jmsdelim` can be customized along a few axes.

| | |
|----------------------------|---|
| <code>size_commands</code> | <p>The option <code>size_commands</code> is a comma-separated list which contains a list of sizing commands for delimiters, from smallest to largest. By default, the standard <code>\big</code>, <code>\Big</code>, <code>\bigg</code>, <code>\Bigg</code> sequence is replaced by custom versions that behave differently in script size. This behavior can be overridden as follows:</p> |
|----------------------------|---|

```

\DelimSetup{
  size_commands = {\relax,\big,\Big,\bigg,\Bigg}
}

```

3 Interface for macro authors

The internals of `jmsdelim` are implemented in `expl3`.

| | |
|--------------------------------|---|
| <code>jmsdelim_scope:nn</code> | <code>jmsdelim_scope:nn {<pre>} {<post>}</code> <p>This is the fundamental control structure for authors of custom delimiting commands; $\langle\text{pre}\rangle$ is a block of code that renders things to temporary boxes, and $\{<\text{post}>\}$ is code that <i>uses</i> these boxes, placing them relative to some delimiters. The function of <code>\jmsdelim_scope:nn</code> is to watch for the delimiter size updates induced by $\langle\text{pre}\rangle$, and set the delimiter size commands correctly before executing $\langle\text{post}\rangle$. Both $\langle\text{pre}\rangle$ and $\langle\text{post}\rangle$ are to be executed in the same block level.</p> |
|--------------------------------|---|

| | |
|-----------------------------------|---|
| <code>jmsdelim_hbox_set:Nn</code> | <code>jmsdelim_hbox_set:Nn {<box>} {<contents>}</code> <p>This command is meant to be used inside the $\langle\text{pre}\rangle$ block of <code>\jmsdelim_scope:nn</code>; it typesets $\langle\text{contents}\rangle$ in the box named by $\langle\text{box}\rangle$, correctly propagating the math style.</p> |
|-----------------------------------|---|

| | |
|---------------------------------|--|
| <code>jmsdelim_size_cmd:</code> | <code>jmsdelim_size_cmd:</code> <p>This command is meant to be used inside the $\langle\text{post}\rangle$ block of <code>\jmsdelim_scope:nn</code> to set the size of a given delimiter; it behaves like <code>\big</code>, etc.</p> |
|---------------------------------|--|

| | |
|------------------------------------|--|
| <code>jmsdelim_surround:nnn</code> | <code>jmsdelim_surround:nnn {<left>} {<right>} {<body>}</code> <p>This routine surrounds $\langle\text{body}\rangle$ with the delimiters $\langle\text{left}\rangle$ and $\langle\text{right}\rangle$ of the appropriate size respectively.</p> |
|------------------------------------|--|

jmsdelim_between:nnn

jmsdelim_between:nnn {<sep>} {<lbody>} {<rbody>}

This routine separates <lbody> and <rbody> with a separator <sep> of the appropriate size.

jmsdelim_between:nnnnn

jmsdelim_between:nnnnn {<left>} {<sep>} {<right>} {<lbody>} {<rbody>}

This routine separates <lbody> and <rbody> with a separator <sep> of the appropriate size, and surrounds the result by <left> and <right> respectively of the same size.

jmsdelim_protect:n

jmsdelim_protect:n {<body>}

Executes <body> in a sandbox, preventing its state updates from bubbling upward.

4 jmsdelim implementation

```
1 <*package>
2 \RequirePackage{expl3}
3 \RequirePackage{l3keys2e}
4 \RequirePackage{xparse}
5 \RequirePackage{ifluatex}
6 \RequirePackage{scalerel}
7 \ProvidesExplPackage {jmsdelim} {2022/03/11} {0.2.0}
8 {Compositional delimiter sizing}
9 <@@=jmsdelim>
```

We first declare the options for the jmsdelim module, together with their default values.

```
10 \keys_define:nn { jmsdelim } {
11   size~commands .clist_set:N = \l__jmsdelim_size_cmds,
12 }
13 \keys_set:nn { jmsdelim } {
14   size~commands = {relax,jmsdelim_big:n,jmsdelim_Big:n,jmsdelim_bigg:n,jmsdelim_Bigg:n},
15 }
16
17 \cs_new:Npn \jmsdelim_big:n #1 {
18   {\mathchoice{\big #1} {\big #1}{\big #1}{#1}}
19 }
20
21 \cs_new:Npn \jmsdelim_Big:n #1 {
22   {\mathchoice{\Big #1} {\Big #1}{\big #1}{#1}}
23 }
24
25 \cs_new:Npn \jmsdelim_bigg:n #1 {
26   {\mathchoice{\bigg #1} {\bigg #1}{\big #1}{#1}}
27 }
28
29 \cs_new:Npn \jmsdelim_Bigg:n #1 {
30   {\mathchoice{\Bigg #1} {\Bigg #1}{\big #1}{#1}}
31 }
```

Then, we set up the internal state that will be used by jmsdelim.

```
32 \int_new:N \g__jmsdelim_size
```

```

33 \int_new:N \g__jmsdelim_size_up
34 \int_gset:Nn \g__jmsdelim_size {0}
35 \int_gset:Nn \g__jmsdelim_size_up {0}

```

4.1 Internals

`__jmsdelim_clist_item:Nn` A version of `\clist_item:Nn` that takes the last item when the index is out of bounds.

```

36 \cs_new:Npn \__jmsdelim_clist_item:Nn #1 #2 {
37   \clist_item:Nn #1 {
38     \int_min:nn { #2 } {\clist_count:N #1}
39   }
40 }

```

(End definition for __jmsdelim_clist_item:Nn.)

`__jmsdelim_setup_sizes:`

```

41 \cs_new:Npn \__jmsdelim_setup_sizes: {
42   \int_gset:Nn \g__jmsdelim_size {
43     \int_max:nn \g__jmsdelim_size \g__jmsdelim_size_up
44   }
45
46   \cs_set_eq:Nc \jmsdelim_size_cmd: {
47     \__jmsdelim_clist_item:Nn \l__jmsdelim_size_cmds {
48       \g__jmsdelim_size + 1
49     }
50   }
51 }

```

(End definition for __jmsdelim_setup_sizes:.)

4.1.1 Preservation of math styles

It is fairly complicated and inefficient to preserve math styles across boxes. There is an appropriate way to do so in Lua^AT_EX, which we use conditionally if available; otherwise, we make use of `\ThisStyle` and `\SavedStyle` from `scalerel` [Seg16], which are more inefficient. In fact, it becomes impossible to use `jmsdelim` in PDF^AT_EX when the nesting is sufficiently deep, whereas there is no corresponding blowup in Lua^AT_EX. The `\ignoremathstyle` and `\discernmathstyle` macros from `scalerel` can be used to turn off the inefficient preservation of math styles locally, such as in the case where no subscripts are used.

`__jmsdelim luatex_save_mathstyle:N`

```

52 \cs_new:Npn \__jmsdelim_luatex_save_mathstyle:N #1 {
53   \ifcase \mathstyle
54     \cs_set_eq:NN #1 \displaystyle
55   \or
56     \cs_set_eq:NN #1 \crampeddisplaystyle
57   \or
58     \cs_set_eq:NN #1 \textstyle
59   \or

```

```

60   \cs_set_eq:NN #1 \crampedtextstyle
61   \or
62   \cs_set_eq:NN #1 \scriptstyle
63   \or
64   \cs_set_eq:NN #1 \crampedscriptstyle
65   \or
66   \cs_set_eq:NN #1 \scriptscriptstyle
67   \or
68   \cs_set_eq:NN #1 \crampedscriptscriptstyle
69   \fi
70 }

```

(End definition for __jmsdelim luatex_save_mathstyle:N.)

__jmsdelim_restore_mathstyle:n

```

71 \cs_new:Npn \__jmsdelim_restore_mathstyle: {
72   \SavedStyle
73 }

```

(End definition for __jmsdelim_restore_mathstyle:n.)

__jmsdelim_save_mathstyle:n

```

74 \cs_new:Npn \__jmsdelim_save_mathstyle:n #1 {
75   \ifluatex
76     \__jmsdelim luatex_save_mathstyle:N \__jmsdelim_restore_mathstyle:
77     #1
78   \else
79     \ThisStyle{#1}
80   \fi
81 }

```

(End definition for __jmsdelim_save_mathstyle:n.)

4.2 Public interface for macro authors

jmsdelim_scope:nn

```

82 \cs_new:Npn \jmsdelim_scope:nn #1 #2 {
83   \group_begin:
84     \int_set:Nn \l_tmpa_int \g__jmsdelim_size_up
85     \int_gset:Nn \g__jmsdelim_size_up 0
86     \int_gset:Nn \g__jmsdelim_size 0
87     \group_begin:
88       \__jmsdelim_save_mathstyle:n {
89         #1
90         \__jmsdelim_setup_sizes:
91         #2
92       }
93     \group_end:
94     \int_gset:Nn \g__jmsdelim_size_up {\int_max:nn \g__jmsdelim_size_up \l_tmpa_int}
95   \group_end:
96 }

```


(End definition for jmsdelim_scope:nn. This function is documented on page 5.)

jmsdelim_hbox_set:Nn

```

97 \cs_new:Npn \jmsdelim_hbox_set:Nn #1 #2 {
98   \mode_if_math:TF
99     { \hbox_set:Nn #1 {\m@th\__jmsdelim_restore_mathstyle: #2$} }
100     { \hbox_set:Nn #1 { #2 } }
101 }

```

(End definition for jmsdelim_hbox_set:Nn. This function is documented on page 5.)

jmsdelim_surround:nnn

```

102 \cs_new:Npn \jmsdelim_surround:nnn #1 #2 #3 {
103   \jmsdelim_scope:nn {
104     \jmsdelim_hbox_set:Nn \l_tmpa_box {#3}
105   }{
106     \mathopen\jmsdelim_size_cmd: {#1}
107     \box_use:N \l_tmpa_box
108     \mathclose\jmsdelim_size_cmd: {#2}
109   }
110 }

```

(End definition for jmsdelim_surround:nnn. This function is documented on page 5.)

jmsdelim_protect:n

```

111 \cs_new:Npn \jmsdelim_protect:n #1 {
112   \group_begin:
113     \int_set:Nn \l_tmpa_int \g__jmsdelim_size_up
114     \int_set:Nn \l_tmpb_int \g__jmsdelim_size
115     \group_begin: #1 \group_end:
116     \int_gset:Nn \g__jmsdelim_size_up \l_tmpa_int
117     \int_gset:Nn \g__jmsdelim_size \l_tmpb_int
118   \group_end:
119 }

```

(End definition for jmsdelim_protect:n. This function is documented on page 6.)

jmsdelim_between:nnn

```

120 \cs_new:Npn \jmsdelim_between:nnn #1 #2 #3 {
121   \jmsdelim_scope:nn {
122     \jmsdelim_hbox_set:Nn \l_tmpa_box {#2}
123     \jmsdelim_hbox_set:Nn \l_tmpb_box {#3}
124   }{
125     \box_use:N \l_tmpa_box
126     \mathrel{\jmsdelim_size_cmd: {#1}}
127     \box_use:N \l_tmpb_box
128   }
129 }

```

(End definition for jmsdelim_between:nnn. This function is documented on page 6.)

jmsdelim_between:nnnnn

```
130 \cs_new:Npn \jmsdelim_between:nnnnn #1 #2 #3 #4 #5 {
131   \jmsdelim_scope:nn {
132     \jmsdelim_hbox_set:Nn \l_tmpa_box {#4}
133     \jmsdelim_hbox_set:Nn \l_tmpb_box {#5}
134   }{
135     \mathopen\jmsdelim_size_cmd: {#1}
136     \box_use:N \l_tmpa_box
137     \mathrel{\jmsdelim_size_cmd: {#2}}
138     \box_use:N \l_tmpb_box
139     \mathclose\jmsdelim_size_cmd: {#3}
140   }
141 }
```

(End definition for jmsdelim_between:nnnnn. This function is documented on page 6.)

4.3 Document interace

DelimMin

```
142 \NewDocumentCommand\DelimMin{m}{
143   \int_gset:Nn \g__jmsdelim_size_up {\int_max:nn \g__jmsdelim_size_up {#1}}
144 }
```

(End definition for DelimMin. This function is documented on page 1.)

DelimSurround

```
145 \NewDocumentCommand\DelimSurround{mmm}{
146   \jmsdelim_surround:nnn {#1} {#2} {#3}
147 }
```

(End definition for DelimSurround. This function is documented on page 3.)

DelimBetween

```
148 \NewDocumentCommand\DelimBetween{mmm}{
149   \jmsdelim_between:nnn {#1} {#2} {#3}
150 }
```

(End definition for DelimBetween. This function is documented on page 3.)

DelimBetweenSurround

```
151 \NewDocumentCommand\DelimBetweenSurround{mmmm}{
152   \jmsdelim_between:nnnnn {#1} {#2} {#3} {#4} {#5}
153 }
```

(End definition for DelimBetweenSurround. This function is documented on page 3.)

DelimProtect

```

154 \NewDocumentCommand\DelimProtect{m}{
155   \jmsdelim_protect:n {#1}
156 }

```

(End definition for DelimProtect. This function is documented on page 4.)

DelimPrn

```

157 \NewDocumentCommand\DelimPrn{m}{
158   \jmsdelim_surround:nnn {( )} {#1}
159 }

```

(End definition for DelimPrn. This function is documented on page 4.)

DelimBrk

```

160 \NewDocumentCommand\DelimBrk{m}{
161   \jmsdelim_surround:nnn {[ ]} {#1}
162 }

```

(End definition for DelimBrk. This function is documented on page 4.)

DelimBrc

```

163 \NewDocumentCommand\DelimBrc{m}{
164   \jmsdelim_surround:nnn {\lbrace} {\rbrace} {#1}
165 }

```

(End definition for DelimBrc. This function is documented on page 4.)

DelimBbrk

```

166 \NewDocumentCommand\DelimBbrk{m}{
167   \jmsdelim_surround:nnn {\llbracket} {\rrbracket} {#1}
168 }

```

(End definition for DelimBbrk. This function is documented on page 4.)

DelimGl

```

169 \NewDocumentCommand\DelimGl{m}{
170   \jmsdelim_surround:nnn {\langle} {\rangle} {#1}
171 }

```

(End definition for DelimGl. This function is documented on page 4.)

DelimVrt

```

172 \NewDocumentCommand\DelimVrt{m}{
173   \jmsdelim_surround:nnn {\lvert} {\rvert} {#1}
174 }

```

(End definition for DelimVrt. This function is documented on page 4.)

DelimVvrt

```

175 \NewDocumentCommand\DelimVvrt{m}{
176   \jmsdelim_surround:nnn {\lVert} {\rVert} {#1}
177 }

```

(End definition for DelimVvrt. This function is documented on page 5.)

```

178 \ProcessKeysPackageOptions {jmsdelim}

```

References

- [Obe16] Heiko Oberdick. *The mlefttright package*. May 16, 2016. URL: <https://ctan.org/pkg/mlefttright> (cit. on p. 2).
- [Seg16] Steven B. Segletes. *scalerel – Constrained scaling and stretching of objects*. Dec. 29, 2016. URL: <https://ctan.org/pkg/scalerel> (cit. on p. 7).

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