

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.

1.1 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:

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

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

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

$\text{Hom}_{\text{Cat}}(1, \widehat{\mathbb{C}})$	<pre>\NewDocumentCommand\Cat{}\{\mathbf{Cat}\} \NewDocumentCommand\Psh{m}\{\widehat{#1}\} \NewDocumentCommand\HomX{mmm}{ \operatorname{Hom}_{#1}\left(#2,#3\right) }</pre>
$\text{Hom}_{\text{Cat}}(1, \widehat{\mathbb{C}})$	<pre>\NewDocumentCommand\Hom{mmm}{ \operatorname{Hom}_{#1}\mleft(#2,#3\mright) } \[\Hom{\Cat}{1}\{\Psh{\mathbb{C}}\}\ \] \[\HomX{\Cat}{1}\{\Psh{\mathbb{C}}\}\ \]</pre>

The above is hugely 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.

$\text{Hom}_{\text{Cat}}(1, \widehat{\mathbb{C}})$	<pre>\NewDocumentCommand\Cat{}\{\mathbf{Cat}\} \NewDocumentCommand\Psh{m}\{\DelimMin{1}\widehat{#1}\} \NewDocumentCommand\Hom{mmm}{ \operatorname{Hom}_{#1}\DelimPrn{#2,#3} } \[\Hom{\Cat}{1}\{\Psh{\mathbb{C}}\}\ \]</pre>
--	---

`\DelimBump` `\DelimBump`

This increases the minimum delimiter size by one outside the current location. This can be used to achieve a readable notation for cuts in sequent calculus as in Munch-Maccagnoni [Mun13; Mun17], for instance:

$\langle t \parallel \tilde{\mu}x. \langle \mu\alpha. \langle u \parallel e \rangle \parallel e' \rangle \rangle$	<pre>\NewDocumentCommand\Cut{mm}{% \DelimBump% \DelimBetweenSurround{\langle}{\Vert}{\rangle}{#1}{#2}% } \NewDocumentCommand\Mu{mm}\mu #1.#2 \NewDocumentCommand\MuTilde{mm}\tilde{\mu} #1.#2 \[\ \Cut{t}{ \MuTilde{x}{ \Cut{\Mu{\alpha}}{\Cut{u}{e}}{e'} } } \]</pre>
---	--

1.2 Basic Delimiter commands

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

`\DelimSurround` `\DelimSurround{<left>}{<right>}{<body>}`

Surrounds `<body>` with appropriately sized `<left>` and `<right>` delimiters respectively.

<hr/> <hr/>	<code>\DelimBetween</code>	<code>\DelimSurround{⟨sep⟩}{⟨lbody⟩}{⟨rbody⟩}</code>
		Places an appropriately sized <code>⟨sep⟩</code> between <code>⟨lbody⟩</code> and <code>⟨rbody⟩</code> .

<hr/> <hr/>	<code>\DelimBetweenSurround</code>	<code>\DelimSurround{⟨left⟩}{⟨sep⟩}{⟨right⟩}{⟨lbody⟩}{⟨rbody⟩}</code>
		Places an appropriately sized <code>⟨sep⟩</code> between <code>⟨lbody⟩</code> and <code>⟨rbody⟩</code> , surrounding the result by <code>⟨left⟩</code> and <code>⟨right⟩</code> respectively.

1.3 Derived delimiter commands

<hr/> <hr/>	<code>\DelimPrn</code>	<code>\DelimPrn{⟨body⟩}</code>
		Surrounds <code>⟨body⟩</code> in parentheses.

<hr/> <hr/>	<code>\DelimBrk</code>	<code>\DelimBrk{⟨body⟩}</code>
		Surrounds <code>⟨body⟩</code> in square brackets.

<hr/> <hr/>	<code>\DelimBrc</code>	<code>\DelimBrc{⟨body⟩}</code>
		Surrounds <code>⟨body⟩</code> in curly braces.

<hr/> <hr/>	<code>\DelimGl</code>	<code>\DelimGl{⟨body⟩}</code>
		Surrounds <code>⟨body⟩</code> in angle brackets.

<hr/> <hr/>	<code>\DelimBbrk</code>	<code>\DelimBbrk{⟨body⟩}</code>
		Surrounds <code>⟨body⟩</code> in Scott brackets (requires <code>\llbracket</code> , <code>\rrbracket</code> to be defined).

1.4 Configuration and options

<hr/> <hr/>	<code>\jmsdelimsetup</code>	<code>\jmsdelimsetup{⟨options⟩}</code>
		<code>jmsdelim</code> can be customized along a few axes.

<hr/> <hr/>	<code>size_commands</code>	The option <code>size_commands</code> is a comma-separated list which contains a list of sizing commands for delimiters, from smallest to largest.
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1.5 Interface for macro authors

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

<u>jmsdelim_scope:nn</u>	jmsdelim_scope:nn {⟨pre⟩} {⟨post⟩}	This is the fundamental control structure for authors of custom delimiting commands; ⟨pre⟩ is a block of code that renders things to temporary boxes, and {⟨post⟩} is code that <i>uses</i> these boxes, placing them relative to some delimiters. The function of \jmsdelim_scope:nn is to watch for the delimiter size and bumping state updates induced by ⟨pre⟩, and set the delimiter size commands correctly before executing ⟨post⟩. Both ⟨pre⟩ and ⟨post⟩ are to be executed in the same block level.
<u>jmsdelim_size_cmd:</u>	jmsdelim_size_cmd:	This command is meant to be used inside the ⟨post⟩ block of \jmsdelim_scope:nn to set the size of a given delimiter; it behaves like \big, etc.
<u>jmsdelim_surround:nnn</u>	jmsdelim_surround:nnn {⟨left⟩} {⟨right⟩} {⟨body⟩}	This routine surrounds ⟨body⟩ with the delimiters ⟨left⟩ and ⟨right⟩ of the appropriate size respectively.
<u>jmsdelim_between:nnn</u>	jmsdelim_between:nnn {⟨sep⟩} {⟨lbody⟩} {⟨rbody⟩}	This routine separates ⟨lbody⟩ and ⟨rbody⟩ with a separator ⟨sep⟩ of the appropriate size.
<u>jmsdelim_between:nnnnn</u>	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.

2 Extended example from perfectcut

The following states the idempotency of an adjunction:

$$\left\langle t \parallel \tilde{\mu}x.\langle \mu\alpha.\langle u \parallel e \rangle \parallel e' \rangle \right\rangle = \left\langle \mu\alpha.\langle t \parallel \tilde{\mu}x.\langle u \parallel e \rangle \rangle \parallel e' \right\rangle$$

The following states the commutativity of a strong monad:

$$\left\langle t \parallel \tilde{\mu}x.\langle u \parallel \tilde{\mu}y.\langle v \parallel e \rangle \rangle \right\rangle = \left\langle u \parallel \tilde{\mu}y.\langle t \parallel \tilde{\mu}x.\langle v \parallel e \rangle \rangle \right\rangle$$

Using \underline to mark redexes:

$$\begin{aligned}
& \delta(V, x.y, x.y) \\
&= \mu\star.\langle V \parallel [\tilde{\mu}x.\langle \underline{y \parallel \star} \rangle \mid \tilde{\mu}x.\langle \underline{y \parallel \star} \rangle] \rangle \\
&= \mu\star.\langle V \parallel [\tilde{\mu}x.\langle \iota_1(x) \parallel \tilde{\mu}z.\langle \underline{y \parallel \star} \rangle \rangle \mid \tilde{\mu}x.\langle \iota_2(x) \parallel \tilde{\mu}z.\langle \underline{y \parallel \star} \rangle \rangle] \rangle \\
&= \mu\star.\langle V \parallel \tilde{\mu}z.\langle \underline{y \parallel \star} \rangle \rangle \\
&= \mu\star.\langle \underline{y \parallel \star} \rangle \\
&= y
\end{aligned}$$

```

\ignoremathstyle
\NewDocumentCommand\Cut{mm}{%
  \DelimBump\DelimBetweenSurround{\langle}{\Vert}{\rangle}{#1}{#2}%
}
\NewDocumentCommand\mt{}{\tilde\mu}
\NewDocumentCommand\Case{mm}{%
  \DelimBetweenSurround{[]}{\vert}{[]}{#1}{#2}%
}
The following states the idempotency of an adjunction:
\[
\Cut{t}{\mt x.\Cut{\mu\alpha.\Cut{u}{e}}{e'}}=\Cut{\mu\alpha.\Cut{t}{\mt x.\Cut{u}{e}}}{e'}
\]

The following states the commutativity of a strong monad:
\[
\Cut t{\mt x.\Cut u{\mt y.\Cut ve}}=\Cut u{\mt y.\Cut t{\mt x.\Cut ve}}
\]
Using \cs{underline} to mark redexes:
\begin{align*}
& \& \delta(V,x.y,x.y)\backslash\backslash \\
& \& = \mu\{\star\}. \\
& \quad \Cut{V}{\begin{cases} \mt x.\underline{\Cut y\{\star\}} \\ \mt x.\underline{\Cut y\{\star\}} \end{cases}} \\
& \quad \backslash\backslash \\
& \& = \mu\{\star\}. \\
& \quad \Cut{V}{\begin{cases} \underline{\begin{cases} \mt x.\Cut{\iota_1}(x)}{\mt z.\Cut{y}\{\star\}} \\ \mt x.\Cut{\iota_2}(x)}{\mt z.\Cut{y}\{\star\}} \end{cases}} \\ \end{cases}} \\
& \quad \backslash\backslash \\
& \& = \mu\{\star\}.\Cut{V}{\underline{\mt z.}\Cut{y}\{\star\}}\backslash\backslash \\
& \& = \mu\{\star\}.\Cut{y}\{\star\}\backslash\backslash \\
& \& = y
\end{align*}

```

3 jmsdelim implementation

```

1 <*package>
2 \RequirePackage{expl3}
3 \RequirePackage{l3keys2e}
4 \RequirePackage{xparse}
5 \RequirePackage{ifluatex}
6 \RequirePackage{scalerel}
7 \ProvidesExplPackage {jmsdelim} {2020/11/02} {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  \NewDocumentCommand\normaldelim{}{}
14  \keys_set:nn { jmsdelim } {
15    size~commands = {relax,big,Big,bigg,Bigg},
16  }

```

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

```

17  \int_new:N \g__jmsdelim_size
18  \int_new:N \g__jmsdelim_size_up
19  \bool_new:N \g__jmsdelim_bump
20  \bool_gset_false:N \g__jmsdelim_bump
21  \int_gset:Nn \g__jmsdelim_size {0}
22  \int_gset:Nn \g__jmsdelim_size_up {0}

```

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

```

23  \cs_new:Npn \__jmsdelim_clist_item:Nn #1 #2 {
24    \clist_item:Nn #1 {
25      \int_min:nn { #2 } {\clist_count:N #1}
26    }
27  }

```

(End definition for `__jmsdelim_clist_item:Nn`.)

3.1 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 `LuaATEX`, which we use conditionally if available; otherwise, we make use of `\ThisStyle` and `\SavedStyle` from `scalerel`, which are more inefficient. In fact, it becomes impossible to use `jmsdelim` in `PDFATEX` when the nesting is sufficiently deep, whereas there is no corresponding blowup in `LuaATEX`. 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`

```

28  \cs_new:Npn \__jmsdelim_luatex_save_mathstyle:N #1 {
29    \ifcase \mathstyle
30      \cs_set_eq:NN #1 \displaystyle
31    \or
32      \cs_set_eq:NN #1 \crampeddisplaystyle
33    \or
34      \cs_set_eq:NN #1 \textstyle
35    \or
36      \cs_set_eq:NN #1 \crampedtextstyle
37    \or

```

```

38     \cs_set_eq:NN #1 \scriptstyle
39   \or
40     \cs_set_eq:NN #1 \crampedscriptstyle
41   \or
42     \cs_set_eq:NN #1 \scriptscriptstyle
43   \or
44     \cs_set_eq:NN #1 \crampedscriptscriptstyle
45   \fi
46 }

```

(End definition for __jmsdelim luatex_save_mathstyle:N.)

__jmsdelim_restore_mathstyle:n

```

47 \cs_new:Npn \__jmsdelim_restore_mathstyle: {
48   \SavedStyle
49 }

```

(End definition for __jmsdelim_restore_mathstyle:n.)

__jmsdelim_save_mathstyle:n

```

50 \cs_new:Npn \__jmsdelim_save_mathstyle:n #1 {
51   \ifluatex
52     \__jmsdelim luatex_save_mathstyle:N \__jmsdelim_restore_mathstyle:
53     #1
54   \else
55     \ThisStyle{#1}
56   \fi
57 }

```

(End definition for __jmsdelim_save_mathstyle:n.)

__jmsdelim_hbox_set:Nn Can only be called in a __jmsdelim_save_mathstyle:n scope; sets the contents of an hbox in the saved math (or text) style.

```

58 \cs_new:Npn \__jmsdelim_hbox_set:Nn #1 #2 {
59   \mode_if_math:TF
60     { \hbox_set:Nn #1 { $\__jmsdelim_restore_mathstyle: #2$ } }
61     { \hbox_set:Nn #1 { #2 } }
62 }

```

(End definition for __jmsdelim_hbox_set:Nn.)

3.2 Internals

__jmsdelim_setup_sizes:

```

63 \cs_new:Npn \__jmsdelim_setup_sizes: {
64   \int_gset:Nn \g__jmsdelim_size {
65     \int_max:nn \g__jmsdelim_size \g__jmsdelim_size_up
66     + \bool_if:NTF \g__jmsdelim_bump {1} {0}
67   }

```

```

68
69 \cs_set_eq:Nc \jmsdelim_size_cmd: {
70   \__jmsdelim_clist_item:Nn \l__jmsdelim_size_cmds {
71     \g__jmsdelim_size + 1
72   }
73 }
74 }

```

(End definition for __jmsdelim_setup_sizes:.)

3.3 Public interface for macro authors

jmsdelim_scope:nn

```

75 \cs_new:Npn \jmsdelim_scope:nn #1 #2 {
76   \group_begin:
77   \int_set:Nn \l_tmpa_int \g__jmsdelim_size_up
78   \int_gset:Nn \g__jmsdelim_size_up 0
79   \bool_set:Nn \l_tmpa_bool \g__jmsdelim_bump
80   \bool_gset_false:N \g__jmsdelim_bump
81   \int_gset:Nn \g__jmsdelim_size 0
82   \group_begin:
83     \__jmsdelim_save_mathstyle:n {
84       #1
85       \__jmsdelim_setup_sizes:
86       #2
87     }
88   \group_end:
89   \int_gset:Nn \g__jmsdelim_size_up \l_tmpa_int
90   \bool_gset:Nn \g__jmsdelim_bump \l_tmpa_bool
91   \group_end:
92 }

```

(End definition for jmsdelim_scope:nn. This function is documented on page 4.)

jmsdelim_surround:nnn

```

93 \cs_new:Npn \jmsdelim_surround:nnn #1 #2 #3 {
94   \jmsdelim_scope:nn {
95     \__jmsdelim_hbox_set:Nn \l_tmpa_box {#3}
96   }{
97     \mathopen\jmsdelim_size_cmd: {#1}
98     \box_use:N \l_tmpa_box
99     \mathclose\jmsdelim_size_cmd: {#2}
100   }
101 }

```

(End definition for jmsdelim_surround:nnn. This function is documented on page 4.)

jmsdelim_between:nnn

```

102 \cs_new:Npn \jmsdelim_between:nnn #1 #2 #3 {
103   \jmsdelim_scope:nn {

```



```

104   \__jmsdelim_hbox_set:Nn \l_tmpa_box {#2}
105   \__jmsdelim_hbox_set:Nn \l_tmpb_box {#3}
106   }{
107     \box_use:N \l_tmpa_box
108     \mathrel{\jmsdelim_size_cmd: {#1}}
109     \box_use:N \l_tmpb_box
110   }
111 }

```

(End definition for jmsdelim_between:nnn. This function is documented on page 4.)

jmsdelim_between:nnnnn

```

112 \cs_new:Npn \jmsdelim_between:nnnnn #1 #2 #3 #4 #5 {
113   \jmsdelim_scope:nn {
114     \__jmsdelim_hbox_set:Nn \l_tmpa_box {#4}
115     \__jmsdelim_hbox_set:Nn \l_tmpb_box {#5}
116   }{
117     \mathopen\jmsdelim_size_cmd: {#1}
118     \box_use:N \l_tmpa_box
119     \mathrel{\jmsdelim_size_cmd: {#2}}
120     \box_use:N \l_tmpb_box
121     \mathclose\jmsdelim_size_cmd: {#3}
122   }
123 }

```

(End definition for jmsdelim_between:nnnnn. This function is documented on page 4.)

3.4 Document interace

DelimMin

```

124 \NewDocumentCommand\DelimMin{m}{
125   \int_gset:Nn \g__jmsdelim_size_up {#1}
126 }

```

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

DelimBump

```

127 \NewDocumentCommand\DelimBump{}{
128   \bool_gset_true:N \g__jmsdelim_bump
129 }

```

(End definition for DelimBump. This function is documented on page 2.)

DelimSurround

```

130 \NewDocumentCommand\DelimSurround{mmm}{
131   \jmsdelim_surround:nnn {#1} {#2} {#3}
132 }

```

(End definition for DelimSurround. This function is documented on page 2.)

DelimBetween

```
133 \NewDocumentCommand\DelimBetween{mmm}{  
134   \jmsdelim_between:nnn {#1} {#2} {#3}  
135 }
```

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

DelimBetweenSurround

```
136 \NewDocumentCommand\DelimBetweenSurround{mmmm}{  
137   \jmsdelim_between:nnnn {#1} {#2} {#3} {#4} {#5}  
138 }
```

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

DelimPrn

```
139 \NewDocumentCommand\DelimPrn{m}{  
140   \jmsdelim_surround:nnn {({} {)}} {#1}  
141 }
```

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

DelimBrk

```
142 \NewDocumentCommand\DelimBrk{m}{  
143   \jmsdelim_surround:nnn {[} {]} {#1}  
144 }
```

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

DelimBrc

```
145 \NewDocumentCommand\DelimBrc{m}{  
146   \jmsdelim_surround:nnn {\lbrace} {\rbrace} {#1}  
147 }
```

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

DelimBbrk

```
148 \NewDocumentCommand\DelimBbrk{m}{  
149   \jmsdelim_surround:nnn {\llbracket} {\rrbracket} {#1}  
150 }
```

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

DelimGl

```
151 \NewDocumentCommand\DelimGl{m}{  
152   \jmsdelim_surround:nnn {\langle} {\rangle} {#1}  
153 }
```

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

```
154 \ProcessKeysPackageOptions {jmsdelim}
```

References

- [Mun13] Guillaume Munch-Maccagnoni. “Syntax and Models of a non-Associative Composition of Programs and Proofs”. PhD thesis. Univ. Paris Diderot, 2013 (cit. on p. 2).
- [Mun17] Guillaume Munch-Maccagnoni. `perfectcut` – *Nested delimiters that consistently grow regardless of the contents*. Sept. 3, 2017. URL: <https://ctan.org/pkg/perfectcut> (cit. on p. 2).
- [Obe16] Heiko Oberdick. *The mlefttright package*. May 16, 2016. URL: <https://ctan.org/pkg/mlefttright> (cit. on p. 2).