

The `jmsdelim` package

Jonathan Sterling

September 14, 2019

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)
}
\[\Hom{\Cat}{1}{\Psh{\mathbb{C}}}\]
```

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

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

$\text{Hom}_{\mathbf{Cat}}(1, \widehat{\mathbb{C}})$	<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:

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

2.1 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`.

<hr/> <hr/>	<code>\DelimSurround{⟨left⟩}{⟨right⟩}{⟨body⟩}</code>
	Surrounds $\langle\text{body}\rangle$ with appropriately sized $\langle\text{left}\rangle$ and $\langle\text{right}\rangle$ delimiters respectively.

$$|\sum_i b_i|$$

```

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

```

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

$$a \parallel \sum_i b_i$$

```

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

```

<hr/> <hr/>	<code>\DelimBetweenSurround{⟨left⟩}{⟨sep⟩}{⟨right⟩}{⟨lbody⟩}{⟨rbody⟩}</code>
	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.

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

```

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

```

2.2 Derived delimiter commands

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

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

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

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

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

2.3 Configuration and options

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

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

3 Interface for macro authors

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

<hr/> <hr/>	<code>jmsdelim_scope:nn {<pre>} {<post>}</code>
	This is the fundamental control structure for authors of custom delimiting commands; <code><pre></code> is a block of code that renders things to temporary boxes, and <code>{<post>}</code> 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 and bumping state updates induced by <code><pre></code> , and set the delimiter size commands correctly before executing <code><post></code> . Both <code><pre></code> and <code><post></code> are to be executed in the same block level.

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

<hr/> <hr/>	<code>jmsdelim_size_cmd:</code>
	This command is meant to be used inside the <code><post></code> block of <code>\jmsdelim_scope:nn</code> to set the size of a given delimiter; it behaves like <code>\big</code> , etc.

<hr/> <hr/>	<code>jmsdelim_surround:nnn {<left>} {<right>} {<body>}</code>
	This routine surrounds <code><body></code> with the delimiters <code><left></code> and <code><right></code> of the appropriate size respectively.

<hr/> <hr/>	<code>jmsdelim_between:nnn {<sep>} {<lbody>} {<rbody>}</code>
	This routine separates <code><lbody></code> and <code><rbody></code> with a separator <code><sep></code> of the appropriate size.

<hr/> <hr/>	<code>jmsdelim_between:nnnn {<left>} {<sep>} {<right>} {<lbody>} {<rbody>}</code>
	This routine separates <code><lbody></code> and <code><rbody></code> with a separator <code><sep></code> of the appropriate size, and surrounds the result by <code><left></code> and <code><right></code> respectively of the same size.

4 Extended example from perfectcut

The following states the idempotency of an adjunction:

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

The following states the commutativity of a strong monad:

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

Using `\underline` to mark redexes:

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

```
\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:

```
\[
\Cut t{\mt x.\Cut u{\mt y.\Cut v{e}}}=\Cut u{\mt y.\Cut t{\mt x.\Cut v{e}}}
\]
```

Using `\cs{underline}` to mark redexes:

```
\begin{align*}
& \delta(V,x.y,x.y) \\
&= \mu\{\star\}. \\
& \quad \Cut{V}{ \\
& \quad \quad \Case{ \\
& \quad \quad \quad \mt x.\underline{\Cut y{\star}} \\
& \quad \quad \quad } \\
& \quad \quad \quad \mt x.\underline{\Cut y{\star}} \\
& \quad \quad \quad } \\
& \quad \quad } \\
&= \mu\{\star\}. \\
& \quad \Cut{V}{ \\
& \quad \quad \underline{ \\

```

```

\Case{
  \mt x.\Cut{\iota_{1}}(x)}{\mt z.\Cut{y}{\star}}
}{
  \mt x.\Cut{\iota_{2}}(x)}{\mt z.\Cut{y}{\star}}
}
}
}\
& = \mu{\star}.\Cut{V}{\underline{\mt z.}\Cut{y}{\star}}\
& = \mu{\star}.\Cut{y}{\star}\
& =y
\end{align*}

```

5 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 \keys_set:nn { jmsdelim } {
14   size~commands = {relax,big,Big,bigg,Bigg},
15 }

```

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

```

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

```

5.1 Internals

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

```

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

```

(End definition for `__jmsdelim_clist_item:Nn`.)

__jmsdelim_setup_sizes:

```

27 \cs_new:Npn \__jmsdelim_setup_sizes: {
28   \int_gset:Nn \g__jmsdelim_size {
29     \int_max:nn \g__jmsdelim_size \g__jmsdelim_size_up
30     + \bool_if:NTF \g__jmsdelim_bump {1} {0}
31   }
32
33   \cs_set_eq:Nc \jmsdelim_size_cmd: {
34     \__jmsdelim_clist_item:Nn \l__jmsdelim_size_cmds {
35       \g__jmsdelim_size + 1
36     }
37   }
38 }

```

(End definition for __jmsdelim_setup_sizes:.)

5.1.1 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

```

39 \cs_new:Npn \__jmsdelim_luatex_save_mathstyle:N #1 {
40   \ifcase \mathstyle
41     \cs_set_eq:NN #1 \displaystyle
42   \or
43     \cs_set_eq:NN #1 \crampeddisplaystyle
44   \or
45     \cs_set_eq:NN #1 \textstyle
46   \or
47     \cs_set_eq:NN #1 \crampedtextstyle
48   \or
49     \cs_set_eq:NN #1 \scriptstyle
50   \or
51     \cs_set_eq:NN #1 \crampedscriptstyle
52   \or
53     \cs_set_eq:NN #1 \scriptscriptstyle
54   \or
55     \cs_set_eq:NN #1 \crampedscriptscriptstyle
56   \fi
57 }

```

(End definition for __jmsdelim_luatex_save_mathstyle:N.)

__jmsdelim_restore_mathstyle:n

```
58 \cs_new:Npn \__jmsdelim_restore_mathstyle: {  
59   \SavedStyle  
60 }
```

(End definition for __jmsdelim_restore_mathstyle:n.)

__jmsdelim_save_mathstyle:n

```
61 \cs_new:Npn \__jmsdelim_save_mathstyle:n #1 {  
62   \ifluatex  
63     \__jmsdelim luatex_save_mathstyle:N \__jmsdelim_restore_mathstyle:  
64     #1  
65   \else  
66     \ThisStyle{#1}  
67   \fi  
68 }
```

(End definition for __jmsdelim_save_mathstyle:n.)

5.2 Public interface for macro authors

jmsdelim_scope:nn

```
69 \cs_new:Npn \jmsdelim_scope:nn #1 #2 {  
70   \group_begin:  
71     \int_set:Nn \l_tmpa_int \g__jmsdelim_size_up  
72     \int_gset:Nn \g__jmsdelim_size_up 0  
73     \bool_set:Nn \l_tmpa_bool \g__jmsdelim_bump  
74     \bool_gset_false:N \g__jmsdelim_bump  
75     \int_gset:Nn \g__jmsdelim_size 0  
76     \group_begin:  
77       \__jmsdelim_save_mathstyle:n {  
78         #1  
79         \__jmsdelim_setup_sizes:  
80         #2  
81       }  
82     \group_end:  
83     \int_gset:Nn \g__jmsdelim_size_up {\int_max:nn \g__jmsdelim_size_up \l_tmpa_int}  
84     \bool_gset:Nn \g__jmsdelim_bump \l_tmpa_bool  
85   \group_end:  
86 }
```

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

jmsdelim_hbox_set:Nn

```
87 \cs_new:Npn \jmsdelim_hbox_set:Nn #1 #2 {  
88   \mode_if_math:TF  
89     { \hbox_set:Nn #1 {\$ \__jmsdelim_restore_mathstyle: #2$} }  
90     { \hbox_set:Nn #1 { #2 } }  
91 }
```


(End definition for `jmsdelim_hbox_set:Nn`. This function is documented on page 4.)

`jmsdelim_surround:nnn`

```

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

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

`jmsdelim_between:nnn`

```

101 \cs_new:Npn \jmsdelim_between:nnn #1 #2 #3 {
102   \jmsdelim_scope:nn {
103     \jmsdelim_hbox_set:Nn \l_tmpa_box {#2}
104     \jmsdelim_hbox_set:Nn \l_tmpb_box {#3}
105   }{
106     \box_use:N \l_tmpa_box
107     \mathrel{\jmsdelim_size_cmd: {#1}}
108     \box_use:N \l_tmpb_box
109   }
110 }
```

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

`jmsdelim_between:nnnnn`

```

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

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

5.3 Document interace

`DelimMin`

```

123 \NewDocumentCommand\DelimMin{m}{
```

```

124 \int_gset:Nn \g__jmsdelim_size_up {#1}
125 }

```

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

DelimBump

```

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

```

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

DelimSurround

```

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

```

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

DelimBetween

```

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

```

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

DelimBetweenSurround

```

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

```

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

DelimPrn

```

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

```

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

DelimBrk

```

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

```

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

DelimBrc

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

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

DelimBbrk

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

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

DelimGl

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

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

```
153 \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 mleftright package*. May 16, 2016. URL: <https://ctan.org/pkg/mleftright> (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).