

The letterswitharrows package

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This package does provides math-mode commands for setting left and right arrows over mathematical symbols, so that the arrows dynamically scale with the symbols. Here is a sample:

$$\vec{s} \leq \vec{t} \in \vec{U_r} \quad |\overrightarrow{AB}| = |\overleftarrow{AB}| \quad A \overleftrightarrow{\hspace{.1em}} B$$

Somehow embellishments don't work in the documentation!? While it is possible to set arrows over longer strings of symbols, the focus lies on single characters.

Only PDF output is supported. Output to PS is implemented, but rarely tested. For a wider range of formats there is pgf-based output.

1 Usage

The package provides the general-purpose `\arrowoverset` command, as well as some sets of predefined shorthand commands.

1.1 Presets

The presets are selected by passing them as options to the `presets` package option. For instance, to define the `abc` and the `vec-cev` sets of commands you would load the package like so:

```
\usepackage[presets={abc,vec-cev}]{letterswitharrows}
```

By default, the `abc`, `ABC` and `cAcBcC` presets are loaded.

`abc` Passing `abc` to the `presets` option allows you to use the `\v<char>` and `\<char>v` commands for all the lower-case letters `a` through `z` except for `v`.

`\v<char>`
`\<char>v`
`\vleft`
`\vright`

For the letter `v` the commands `\vleft` and `\vright` are provided.

$$\vec{a}, \vec{b}, \vec{c}, \vec{d}, \vec{m}, F_{\vec{t}}$$

```
\[ \va, \vb, \vc, \dv, \mv, F_{\tv} \]
```

`ABC` Passing `ABC` to the `presets` option allows you to use the `\v<CHAR>` and `\<CHAR>v` commands for all the upper-case letters `A` through `Z`.

`\v<CHAR>`
`\<CHAR>v`

$\overrightarrow{A}, \overrightarrow{B}, \overrightarrow{C}, \overrightarrow{D}, \overrightarrow{E}, F_{\overline{G}}$

`\[\vA, \vB, \vC, \Dv, \Ev, F_{\Gv} \]`

`cAcBcC`

Passing `cAcBcC` to the `presets` option allows you to use the `\vc<CHAR>` and `\c<CHAR>v` commands for all the upper-case letters A through Z to set arrows over `\mathcal`-letters.

`\vc<CHAR>`
`\c<CHAR>v`

$\overrightarrow{A}, \overrightarrow{B}, \overrightarrow{C}, \overrightarrow{D}, \overrightarrow{E}, F_{\overline{G}}$

`\[\vcA, \vcB, \vcC, \cDv, \cEv, F_{\cGv} \]`

`vec-cev`

Passing `vec-cev` to the `presets` option (re)defines the `\vec` and `\cev` commands.

`\vec`
`\cev`

Unlike the other commands these do not automatically consume subsequent subscripts or ' tokens.

$\overrightarrow{x} := \overleftarrow{AB} \quad \langle \overrightarrow{w}, \overrightarrow{v} \rangle = 42$

`\[\vec{\mathbf{x}} := \cev{AB} \quad \langle \vw, \vright \rangle = 42 \]`

1.2 The `\arrowoverset` command

`\arrowoverset`
`\arrowoverset*`

`\arrowoverset` [*xoffset*] [*xscale*] [*yoffset*] {*math*}

`\arrowoverset*` [*xoffset*] [*xscale*] [*yoffset*] {*math*}

This command sets a right (or left if `\arrowoverset*` is used) arrow over *math*. The base length of the arrow is the width of the *math* multiplied by *xscale*, which must be specified as a fraction *num*/*denom*. The arrow is offset by *xoffset* to the right, which must be a math skip expression, and by *yoffset* to the top, which must be a skip expression.

This command consumes subsequent subscripts or up to two primes '. The former does not affect the length of the arrow.

1.3 Other package options

pgf If you specify the `pgf` option, every arrow is drawn as a `pgfpicture`. This requires the `pgf` package, and slow in its current implementation.

T_EXhackers note: You can set up custom arrow drawing code by redefining `_jmt_lwa_arrow_draw:nnn`. The command is expected to draw an arrow with its head at the current position. Its length should be #1 and it should be drawn at a font size of #2pt. If #3 is - if the arrow should point rightwards and empty otherwise.

tweaks

Specifying the `tweaks` option applies per-letter scaling adjustments to some of the single-letter shorthands. This is enabled by default. These are specific to Latin Modern Math and subject to be changed on a whim. If you wish a more stable behaviour specify `tweaks=false`

2 Implementation

```

1 \NeedsTeXFormat{LaTeX2e}
2 \RequirePackage{expl3}
3 \ProvidesExplPackage {letterswitharrows} {2019-11-21} {} {Draw arrows over math letters.}
4 \RequirePackage{xparse,l3keys2e,mathtools}
5 % TODO: I just use mathtools for mathrlap; replace.
6
7 <@@=jmt_lwa>
8 \msg_new:nnn {letterswitharrows} {pdf-only} {Only~pdf-output~is~supported.}
9 \AtBeginDocument{
10   \sys_if_output_pdf:F {
11     \msg_warning:nn {letterswitharrows} {pdf-only}
12   }
13 }

```

The drawing code.

```

\__jmt_lwa_arrow_draw_special:nnn
\__jmt_lwa_arrow_draw_pgfs:nnn
\__jmt_lwa_arrow_left:nn
\__jmt_lwa_arrow_right:nn
14 \cs_new:Nn \__jmt_lwa_arrow_draw_special:nnn % length, font size, sign
15 {
16   \sys_if_output_pdf:TF {
17     \tex_special:D {pdf:~
18       q~
19       1~J~1~j~
20       1~0~0~\dim_to_decimal:n{#3#2pt/10}~0~0~cm~
21       .3~w~
22       q~
23       \dim_to_decimal:n{#3#2pt/10}~0~0~1~0~0~cm~
24       1~0~0~1~1~0~cm~
25       0~1~m~
26       .25~0~1~0~1~0~cm~
27       1~0~.25~0~0~1~cm~
28       S~
29       Q~
30       0~0~m~
31       -1~0~0~1~0~0~cm~
32       \dim_to_decimal:n{#3#1}~0~1~S~
33       Q
34     }
35   } {
36     \tex_special:D {"~
37       1~setlinecap~1~setlinejoin~
38       1~0~0~\dim_to_decimal:n{#3#2pt/10}~0~0~6~array~astore~concat~
39       .3~setlinewidth~
40       gsave~
41       \dim_to_decimal:n{#3#2pt/10}~0~0~1~0~0~6~array~astore~concat~
42       1~0~0~1~1~0~6~array~astore~concat~
43       0~1~moveto~
44       .25~0~1~0~1~0~curveto~
45       1~0~.25~0~0~1~curveto~
46       stroke~
47       grestore~
48       0~0~moveto~
49       -1~0~0~1~0~0~6~array~astore~concat~

```

```

50      \dim_to_decimal:n{#3#1}~0~lineto~stroke
51    }
52  }
53 }
54
55 % TODO
56 % \tl_new:N \g__jmt_lwa_pgf_arrow_style_tl
57 % \tl_set:Nn \g__jmt_lwa_pgf_arrow_style_tl
58 %   {Computer~Modern~Rightarrow[width=#2pt*2/10,length=#2pt/10,sharp]}
59
60 \cs_new:Nn \__jmt_lwa_arrow_draw_pgf:nnn {
61   \begin{pgfpicture}
62     \pgfsetlinewidth{#2pt/30}
63     \pgfsetarrowsstart
64     {Computer~Modern~Rightarrow[width=#2pt*2/10,length=#2pt/10,sharp]}
65     % \pgfsetarrowsstart{\tl_use:N \g__jmt_lwa_pgf_arrow_style_tl}
66     \pgfpathmoveto{\pgfpointorigin}
67     \pgfpathlineto{\pgfpoint{-#3#1}{0cm}}
68     \pgfusepath{stroke}
69     \pgfresetboundingbox
70   \end{pgfpicture}
71 }
72
73 \cs_new_eq:NN \__jmt_lwa_arrow_draw:nnn \use_none:nnn
74
75 \cs_new:Nn \__jmt_lwa_arrow_right:nn {
76   \skip_horizontal:n {#1}
77   % \rule[\dimexpr -#2pt/6\relax]{#1}{\dimexpr #2pt/3\relax}
78   \__jmt_lwa_arrow_draw:nnn {#1} {#2} {}
79 }
80
81 \cs_new:Nn \__jmt_lwa_arrow_left:nn {
82   \__jmt_lwa_arrow_draw:nnn {#1} {#2} {-}
83   \skip_horizontal:n {#1}
84   % \rule[\dimexpr -#2pt/6\relax]{#1}{\dimexpr #2pt/3\relax}
85 }

```

(End definition for __jmt_lwa_arrow_draw_special:nnn and others.)

The core functions.

__jmt_lwa_arrow_overset_style:Nnnnnn

__jmt_lwa_arrow_overset:nnnnn

```

86 \cs_new:Npn \__jmt_lwa_arrow_overset_style:Nnnnnn #1#2#3#4#5#6#7 {
87   \hbox_set:Nn \l_tmpa_box {$\m@th#1#3$}
88   \dim_set:Nn \l_tmpa_dim {#2 pt/10}
89   \vbox:n {
90     \tex_lineskiplimit:D = \maxdimen
91     \tex_baselineskip:D = 0pt
92     \tex_lineskip:D = \dim_eval:n {\l_tmpa_dim * 3/2 + #7}
93     \tex_halign:D { ## \tex_cr:D
94       \skip_horizontal:n {\l_tmpa_dim / 2}
95     $
96     \m@th
97     #1
98     \tex_mskip:D \muskip_eval:n {#5}
99     \use:c {#4} {\dim_eval:n{\box_wd:N \l_tmpa_box * #6}} {#2}

```

```

100      $
101      \tex_cr:D
102      \box_use_drop:N \l_tmpa_box
103      \tex_cr:D
104    }
105  }
106 }
107
108 \cs_new:Nn \__jmt_lwa_arrow_overset:nnnnn { % content, direction, xoffset, scale, yoffset
109   \mathchoice {
110     \__jmt_lwa_arrow_overset_style:Nnnnnn
111     \displaystyle {\tf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
112   } {
113     \__jmt_lwa_arrow_overset_style:Nnnnnn
114     \textstyle {\tf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
115   } {
116     \__jmt_lwa_arrow_overset_style:Nnnnnn
117     \scriptstyle {\sf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
118   } {
119     \__jmt_lwa_arrow_overset_style:Nnnnnn
120     \scriptscriptstyle {\ssf@size} {#1} {\__jmt_lwa_arrow_#2:nn} {#3} {#4} {#5}
121   }
122 }

```

(End definition for __jmt_lwa_arrow_overset_style:Nnnnnn and __jmt_lwa_arrow_overset:nnnnn.)

__jmt_lwa_arrow_overset:w

\arrowoverset

```

123 \cs_new_protected:Npn \__jmt_lwa_arrow_overset:w {
124   \c_group_begin_token
125   \__jmt_lwa_arrow_overset_aux:w
126 }
127
128 % This exp_args is necessary because _ generates the wrong token in expl3 syntax
129 \exp_args:NNx \NewDocumentCommand \__jmt_lwa_arrow_overset_aux:w
130   {s O{0mu} O{1} O{0ex} m t' e{\char_generate:nn {95}{8}} t'} {
131   \__jmt_lwa_arrow_overset:nnnnn
132   {
133     #5
134     \c_math_superscript_token {
135       \scriptscriptstyle\IfBooleanT{#6}{\prime}\IfBooleanT{#8}{\prime}
136     } % TODO: Better positioning etc?
137     \exp_args:Nf\IfValueT{\use:n#7} {
138       \c_math_subscript_token {
139         \mathrlap{#7}
140       }
141     }
142   }
143   {\IfBooleanTF{#1}{left}{right}}
144   {#2} {#3} {#4}
145
146   \exp_args:Nf\IfValueTF{\use:n#7}{
147     % TODO: Better way to do this? This is all kinds of wrong.
148     \hphantom{\!\c_math_subscript_token{#7}}
149   } {}
150   \c_group_end_token

```

```

151 }
152 \cs_set_eq:NN \arrowoverset \__jmt_lwa_arrow_overset:w

```

Replacements for hyperref bookmarks.

```

153 \AtBeginDocument{
154   \@ifpackageloaded{hyperref}{
155     \pdfstringdefDisableCommands{
156       % Why does this only work with Expandable?
157       \DeclareExpandableDocumentCommand \__jmt_lwa_arrow_overset:w {s o o o m} {
158         \ifpdfstringunicode
159           {#5 \IfBooleanTF{#1}{\unichar{"20D6}}{\unichar{"20D7}}}
160         {#5}
161       }
162     }
163   }{}
164 }

```

(End definition for __jmt_lwa_arrow_overset:w and \arrowoverset. This function is documented on page 2.)

Package option handling.

```

\g__jmt_lwa_tweak_shortcuts_bool
\g__jmt_lwa_selected_presets_prop
\__jmt_lwa_arrow_draw:nnn
165 \bool_new:N \g__jmt_lwa_tweak_shortcuts_bool
166 \prop_new:N \g__jmt_lwa_selected_presets_prop
167 \keys_define:nn {letterswitharrows} {
168   mode .choice:,
169   mode / special .code:n = {
170     \cs_set_eq:NN \__jmt_lwa_arrow_draw:nnn \__jmt_lwa_arrow_draw_special:nnn
171   },
172   mode / pgf .code:n = {
173     \RequirePackage{pgf}
174     \ExplSyntaxOff\usepgflibrary{arrows.meta}\ExplSyntaxOn
175     \cs_set_eq:NN \__jmt_lwa_arrow_draw:nnn \__jmt_lwa_arrow_draw_pgf:nnn
176   },
177   mode .initial:n = {special},
178   pgf .meta:n = {mode = pgf},
179   presets .multichoices:nn = {abc, ABC, cAcBcC, vec-cev} {
180     \int_compare:nNnTF \l_keys_choice_int = 1 {
181       \prop_gclear:N \g__jmt_lwa_selected_presets_prop
182     } {}
183     \prop_gput:NvN \g__jmt_lwa_selected_presets_prop \l_keys_choice_tl {}
184   },
185   presets .initial:n = {abc, ABC, cAcBcC},
186   tweaks .bool_set:N = \g__jmt_lwa_tweak_shortcuts_bool,
187   tweaks .initial:n = {true},
188 }
189 \ProcessKeysPackageOptions{letterswitharrows}

```

(End definition for \g__jmt_lwa_tweak_shortcuts_bool, \g__jmt_lwa_selected_presets_prop, and __jmt_lwa_arrow_draw:nnn.)

```

\<char>
\<char>v
\left
\right
190 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {abc} {
191   \int_step_inline:nnn {1} {26} {
192     \int_compare:nNnTF {#1} = {22} {

```

```

193     \cs_new:cpx {vright} {
194       \exp_not:N\__jmt_lwa_arrow_overset:w{v}
195     }
196     \cs_new:cpx {vleft} {
197       \exp_not:N\__jmt_lwa_arrow_overset:w*{v}
198     }
199   } {
200     \cs_new:cpx {v\int_to_alph:n{#1}} {
201       \exp_not:N\__jmt_lwa_arrow_overset:w{\int_to_alph:n{#1}}
202     }
203     \cs_new:cpx {\int_to_alph:n{#1}v} {
204       \exp_not:N\__jmt_lwa_arrow_overset:w*{\int_to_alph:n{#1}}
205     }
206   }
207 }
208 } {}

```

(End definition for `\v<char>` and others. These functions are documented on page 1.)

`\v<CHAR>`

`\<CHAR>v`

```

209 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {ABC} {
210   \int_step_inline:nnn {1} {26} {
211     \cs_new:cpx {v\int_to_Alph:n{#1}} {
212       \exp_not:N\__jmt_lwa_arrow_overset:w{\int_to_Alph:n{#1}}
213     }
214     \cs_new:cpx {\int_to_Alph:n{#1}v} {
215       \exp_not:N\__jmt_lwa_arrow_overset:w*{\int_to_Alph:n{#1}}
216     }
217   }
218 } {}

```

(End definition for `\v<CHAR>` and `\<CHAR>v`. These functions are documented on page 2.)

`\vc<CHAR>`

`\c<CHAR>v`

```

219 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {cAcBcC} {
220   \int_step_inline:nnn {1} {26} {
221     \cs_new:cpx {vc\int_to_Alph:n{#1}} {
222       \exp_not:N\__jmt_lwa_arrow_overset:w{\exp_not:N\mathcal{\int_to_Alph:n{#1}}}
223     }
224     \cs_new:cpx {c\int_to_Alph:n{#1}v} {
225       \exp_not:N\__jmt_lwa_arrow_overset:w*{\exp_not:N\mathcal{\int_to_Alph:n{#1}}}
226     }
227   }
228 } {}

```

(End definition for `\vc<CHAR>` and `\c<CHAR>v`. These functions are documented on page 2.)

`\vec`

`\cev`

```

229 \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {vec-cev} {
230   \RenewDocumentCommand \vec {m} {
231     \__jmt_lwa_arrow_overset:w {#1} \scan_stop:
232   }
233   \DeclareDocumentCommand \cev {m} {
234     \__jmt_lwa_arrow_overset:w* {#1} \scan_stop:
235   }
236 } {}

```

(End definition for `\vec` and `\cev`. These functions are documented on page 2.)

Some personal-preference tweaks.

```

237 \bool_if:NTF \g__jmt_lwa_tweak_shortcuts_bool {
238   \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {ABC} {
239     \cs_set:cpn {vS} {
240       \__jmt_lwa_arrow_overset:w[2mu][8/10]{S}
241     }
242   } {}
243   \prop_if_in:NnTF \g__jmt_lwa_selected_presets_prop {abc} {
244     \cs_new:cpn {vell} {
245       \__jmt_lwa_arrow_overset:w{\ell}
246     }
247     \cs_new:cpn {ellv} {
248       \__jmt_lwa_arrow_overset:w{\ell}
249     }
250   } {}
251 } {}

```

Change History

2019/11/21

General: Require expl3 before

`\ProvidesExplPackage.` 3