The mhsetup package*

Morten Høgholm (maintained by Lars Madsen)

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Abstract

The mhsetup package provides tools for a LaTeX programming environment similar to the one described in expl3 on CTAN although not as extensive. It is a required part of both the mathtools and empheq packages.

The description below was made before the extensive changes made to the expl3 code available from the LaTeX Project website.

1 The new internal syntax

The LaTeX3 package ldcsetup defines the command `\InternalSyntaxOn` which makes `_` and `:` letters and then automatically restores the category codes at the end of the package. This usually works fine but when you try to load amstext you will experience that TeX goes into an infinite loop. Packages containing code like `\@for\@tempa:=\@tempb\do{...}` will not work correctly either, thus we provide an alternative version here with the pair of commands `\MHInternalSyntaxOn` and `\MHInternalSyntaxOff`. They are to be used only as a pair, because `\MHInternalSyntaxOn` defines `\MHInternalSyntaxOff` so that it restores the category codes correctly.

`\MHInternalSyntaxOn`
`\MHInternalSyntaxOff`

2 Handling optional arguments

The standard behavior of scanning for optional arguments in LaTeX allows any number of spaces preceding the optional argument and that is not always good in math. For that reason amsmath makes sure that commands like `\\` disallows spaces before the optional argument but at the same time it fails to provide "safe" environments. What would you expect from the following input?

```
\[
  \begin{gathered}
    [v] = 100 \\
    [t] = 200
  \end{gathered}
```

---

*This package has version number v1.3, last revised on 2017/03/31.

```
\]
```

LaTeX will see the [v] as an optional argument of gathered and use it. In this case the test inside gathered checks if it's a t or b and if it's neither it'll choose \vcenter internally. So you get no warning, only missing output. Another example, this time from the empheq package used with its overload option: If preceding spaces are allowed, the input

```
\begin{gather}
  [a] = [b]
\end{gather}
```

results in the rather strange error message

```
! Package keyval Error: a undefined.
```

When using \newcommand etc. for defining commands and environments with optional arguments, the peek ahead is done by \kernel@ifnextchar (since LaTeX release 2003/12/01, else \@ifnextchar) and it is *hardwired at definition time* by \@xargdef. With the commands \MHPrecedingSpacesOff and \MHPrecedingSpacesOn mhsetup provides an interface to define commands and environments where the optional argument cannot have preceding spaces. You simply wrap them around the definitions:

\MHPrecedingSpacesOff
\MHPrecedingSpacesOn

```
\MHPrecedingSpacesOff
\newenvironment*{test}[1][default]{Start, arg: (#1)}{Ending.}
\MHPrecedingSpacesOn
\begin{test}
  [text]
\end{test}
\begin{test}[text]
\end{test}
```

Start, arg: (default) [text] Ending. Start, arg: (text) Ending.

It is of somewhat limited use in commands (control words in TeX terminology), because TeX discards the spaces. The exception is *control symbols* where TeX obeys following spaces but there are rather few of them available. All is not lost however. In the aligned environment from amsmath (shown below) a command is used as argument grabber.

```
\newenvironment{aligned}{%
  \let\@testopt\alignsafe@testopt
  \aligned@a
}{%
  \crcr\egroup
  \restorecolumn@
```

```
    \egroup
}
\newcommand{\aligned@a}[1][c]{\start@aligned{#1}\m@ne}
```

By applying our trick on the grabber function, we get a space obeying version:

```
\MHPrecedingSpacesOff
\renewcommand*\aligned@a[1][c]{\start@aligned{#1}\m@ne}
\MHPrecedingSpacesOn
```

This way a nested `aligned` environment is still safe from empty first cells.

3   First bits of a new programming environment

```
1 ⟨*package⟩
2 \ProvidesPackage{mhsetup}%
3    [2017/03/31 v1.3 programming setup (MH)]
```

3.1   The new internal syntax

`\MHInternalSyntaxOn`
`\MHInternalSyntaxOff`

Almost copy of `\InternalSyntaxOn`.

```
4 \def\MHInternalSyntaxOn{
5    \edef\MHInternalSyntaxOff{%
6    \catcode'\noexpand\~=\the\catcode'\~\relax
7    \catcode'\noexpand\ =\the\catcode'\ \relax
8    \catcode'\noexpand\^^I=\the\catcode'\^^I\relax
9    \catcode'\noexpand\@=\the\catcode'\@\relax
10   \catcode'\noexpand\:=\the\catcode'\:\relax
11   \catcode'\noexpand\_=\the\catcode'\_\relax
12   \endlinechar=\the\endlinechar\relax
13   }%
14   \catcode'\~=10\relax
15   \catcode'\ =9\relax
16   \catcode'\^^I=9\relax
17   \makeatletter
18   \catcode'\_=11\relax
19   \catcode'\:=11\relax
20   \endlinechar=' %
21   \relax
22 }
23 \MHInternalSyntaxOn
24 \AtEndOfPackage{\MHInternalSyntaxOff}
```

3.2   Programming tools

The whole idea is to provide programming tools that are convenient but not yet widely available. I hope this'll be obsolete soon!

Firstly we setup a few helper functions.

\MH_let:NwN   An alias for `\let`.

```
25 \let\MH_let:NwN \let
```

\MH_let:cN   This one takes a `\csname`-`\endcsname` name and `\lets` it to a single macro. We'll use this to setup our conditionals.

```
26 \def\MH_let:cN #1#2{
27   \expandafter\MH_let:NwN \csname#1\endcsname#2}
```

\MH_let:cc   This one has takes a `\csname`-`\endcsname` name and `\lets` it to a another `\csname`-`\endcsname` name. To be used in constructions with weird characters like `*` or alike in them and can take a `\global` prefix if wanted (we want that later on).

```
28 \def\MH_let:cc #1#2{
29   \expandafter\MH_let:NwN\csname#1\expandafter\endcsname
30   \csname#2\endcsname}
```

\MH_new_boolean:n
\MH_set_boolean_F:n
\MH_set_boolean_T:n
\MH_if_boolean:nTF
\MH_if_boolean:nT
\MH_if_boolean:nF

Sets up conditionals. For instance

$$\text{\texttt{\textbackslash MH\_new\_boolean:n }}\{\langle name \rangle\}$$

defines the boolean $\langle name \rangle$ but also the conditional `\MH_if_boolean_`$\langle name \rangle$`:` to be used in the ordinary

```
\MH_if_boolean_⟨name⟩:
  ⟨true code⟩
\MH_else:
  ⟨false code⟩
\MH_fi:
```

There is also a more "LATEX-like" interface available by using the commands

$$\text{\texttt{\textbackslash MH\_if\_boolean:nT}}\{\langle name \rangle\}\{\langle arg \rangle\}$$

which will execute the argument if the current value of the boolean is 'true' while

$$\text{\texttt{\textbackslash MH\_if\_boolean:nF}}\{\langle name \rangle\}\{\langle arg \rangle\}$$

is the equivalent with 'false'. Finally we have

$$\text{\texttt{\textbackslash MH\_if\_boolean:nTF}}\{\langle name \rangle\}\{\langle true\ code \rangle\}\{\langle false\ code \rangle\}.$$

This is the interface I have used in this package.

Initially `\MH_if_boolean_`$\langle name \rangle$`:` is 'false'. This can be changed by saying

TEX:	`\MH_boolean_`$\langle name \rangle$`_true:` *or*
LATEX:	`\MH_set_boolean_T:n`$\{\langle name \rangle\}$

and changed back again by

TEX:	`\MH_boolean_`$\langle name \rangle$`_false:` *or*
LATEX:	`\MH_set_boolean_F:n`$\{\langle name \rangle\}$

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And yes, we're also using alternative names for `\else` and `\fi` now. That way a simple search and replace will be all that is needed for this package to be a certified LaTeX3 package (well, maybe a little more is needed, but not much).

```
31 \def\MH_new_boolean:n #1{
32   \expandafter\@ifdefinable\csname MH_if_boolean_#1:\endcsname{
33     \@namedef{MH_boolean_#1_true:}
34       {\MH_let:cN{MH_if_boolean_#1:}\iftrue}
35     \@namedef{MH_boolean_#1_false:}
36       {\MH_let:cN{MH_if_boolean_#1:}\iffalse}
37     \@nameuse{MH_boolean_#1_false:}%
38   }
39 }
40 \def\MH_set_boolean_F:n #1{ \@nameuse{MH_boolean_#1_false:} }
41 \def\MH_set_boolean_T:n #1{ \@nameuse{MH_boolean_#1_true:} }
42 \def\MH_if_boolean:nTF #1{
43   \@nameuse{MH_if_boolean_#1:}
44     \expandafter\@firstoftwo
45   \MH_else:
46     \expandafter\@secondoftwo
47   \MH_fi:
48 }
49 \def\MH_if_boolean:nT #1{
50   \@nameuse{MH_if_boolean_#1:}
51     \expandafter\@firstofone
52   \MH_else:
53     \expandafter\@gobble
54   \MH_fi:
55 }
56 \def\MH_if_boolean:nF #1{
57   \@nameuse{MH_if_boolean_#1:}
58     \expandafter\@gobble
59   \MH_else:
60     \expandafter\@firstofone
61   \MH_fi:
62 }
```

`\MH_if:w`
`\MH_if_meaning:NN`
`\MH_else:`
`\MH_fi:`
`\MH_if_num:w`
`\MH_if_dim:w`
`\MH_if_case:w`
`\MH_or:`

Copies of TeX primitives.

```
63 \@ifundefined{MH_if:w}{\MH_let:NwN \MH_if:w =\if}{}
64 \@ifundefined{MH_if_meaning:NN}{\MH_let:NwN \MH_if_meaning:NN =\ifx}{}
65 \@ifundefined{MH_else:}{\MH_let:NwN \MH_else:=\else}{}
66 \@ifundefined{MH_fi:}{\MH_let:NwN \MH_fi:=\fi}{}
67 \AtBeginDocument{
68   \@ifundefined{MH_if_num:w}{\MH_let:NwN \MH_if_num:w =\ifnum}{}
69   \@ifundefined{MH_if_dim:w}{\MH_let:NwN \MH_if_dim:w =\ifdim}{}
70   \@ifundefined{MH_if_case:w}{\MH_let:NwN \MH_if_case:w =\ifcase}{}
71 }
72 \@ifundefined{MH_or:}{\MH_let:NwN \MH_or:=\or}{}
```

`\MH_cs_to_str:N` Strip off the backslash of a macro name.

5

```
73 \def\MH_cs_to_str:N {\expandafter\@gobble\string}
```

\MH_protected:
\MH_setlength:dn
\MH_addtolength:dn

We might as well make use of some of the extended features from ε-TeX. We use \dimexpr for some simple calculations as it saves a lot of the scanning that goes on inside calc. The \protected primitive comes in handy when we want to declare a robust command, that cannot be 'robustified' with \DeclareRobustCommand. If we don't have ε-TeX we'll just let our private macros be aliases for the less effective alternatives.

```
74 \@ifundefined{eTeXversion}
75   {
76     \MH_let:NwN \MH_protected:\relax
77     \def\MH_setlength:dn{\setlength}
78     \def\MH_addtolength:dn{\addtolength}
79   }
80   {
81     \MH_let:NwN \MH_protected:\protected
82     \def\MH_setlength:dn #1#2{#1=\dimexpr#2\relax\relax}
83     \def\MH_addtolength:dn #1#2{\advance#1 \dimexpr#2\relax\relax}
84   }
```

\MH_keyval_alias_with_addon:nnnn
\MH_keyval_alias:nnn

A way to make aliases with keyval. This will come in handy later.

```
85 \def\MH_keyval_alias_with_addon:nnnn #1#2#3#4{
86   \@namedef{KV@#1@#2}{\@nameuse{KV@#1@#3}#4}
87   \@namedef{KV@#1@#2@default}{\@nameuse{KV@#1@#3@default}#4}}
88 \def\MH_keyval_alias:nnn #1#2#3{
89   \MH_keyval_alias_with_addon:nnnn {#1}{#2}{#3}{}}
```

\MH_use_choice_i:nnnn
\MH_use_choice_ii:nnnn
\MH_use_choice_iii:nnnn
\MH_use_choice_iv:nnnn

I need to be able to pick up individual arguments in a list of four (similar to \@secondoftwo).

```
90 \def\MH_use_choice_i:nnnn #1#2#3#4{#1}
91 \def\MH_use_choice_ii:nnnn #1#2#3#4{#2}
92 \def\MH_use_choice_iii:nnnn #1#2#3#4{#3}
93 \def\MH_use_choice_iv:nnnn #1#2#3#4{#4}
```

\MH_nospace_ifnextchar:Nnn
\MH_nospace_nextchar:
\MH_nospace_testopt:nn
\MH_nospace_protected_testopt:n

Scanning for the next character but disallow spaces.

```
94 \long\def\MH_nospace_ifnextchar:Nnn #1#2#3{
95   \MH_let:NwN\reserved@d=~#1
96   \def\reserved@a{#2}
97   \def\reserved@b{#3}
98   \futurelet\@let@token\MH_nospace_nextchar:
99 }
100 \def\MH_nospace_nextchar:{
101   \MH_if_meaning:NN \@let@token\reserved@d
102     \MH_let:NwN \reserved@b\reserved@a
103   \MH_fi:
104   \reserved@b
105 }
106 \long\def\MH_nospace_testopt:nn #1#2{
107   \MH_nospace_ifnextchar:Nnn[
```

```
108      {#1}
109      {#1[{#2}]}
110 }
111 \def\MH_nospace_protected_testopt:n #1{
112   \MH_if_meaning:NN \protect\@typeset@protect
113     \expandafter\MH_nospace_testopt:nn
114   \MH_else:
115     \@x@protect#1
116   \MH_fi:
117 }
```

\kernel@ifnextchar   The code for the space sensitive peek ahead.
\MH_kernel_xargdef:nwwn
\MH_nospace_xargdef:nwwn
\MHPrecedingSpacesOff
\MHPrecedingSpacesOn

```
118 \@ifundefined{kernel@ifnextchar}
119   {\MH_let:NwN \kernel@ifnextchar \@ifnextchar}
120   {}
121 \MH_let:NwN \MH_kernel_xargdef:nwwn \@xargdef
122 \long\def\MH_nospace_xargdef:nwwn #1[#2][#3]#4{
123   \@ifdefinable#1{
124     \expandafter\def\expandafter#1\expandafter{
125       \expandafter
126       \MH_nospace_protected_testopt:n
127       \expandafter
128       #1
129       \csname\string#1\endcsname
130       {#3}}
131     \expandafter\@yargdef
132       \csname\string#1\endcsname
133        \tw@
134        {#2}
135        {#4}}}
136 \providecommand*\MHPrecedingSpacesOff{
137   \MH_let:NwN \@xargdef \MH_nospace_xargdef:nwwn
138 }
139 \providecommand*\MHPrecedingSpacesOn{
140   \MH_let:NwN \@xargdef \MH_kernel_xargdef:nwwn
141 }
```

\MH_group_align_safe_begin:
\MH_group_align_safe_end:

```
142 \def \MH_group_align_safe_begin: {\iffalse{\fi\ifnum0=`}\fi}
143 \def \MH_group_align_safe_end:   {\ifnum0=`{}\fi}

144 ⟨/package⟩
```