Using the \texttt{mhequ} package

Martin Hairer

Version 1.72, 9 November 2022

This package provides two environments: \texttt{equ} for single-line equations and \texttt{equs} for multi-line equations. They behave similarly to the built-in \texttt{equation} and \texttt{amsmath}'s \texttt{align} environments and can essentially be used as drop-in replacements. The main difference is that equation numbers are handled differently: equations are numbered if and only if they have a \texttt{\label}, so there is no need for starred versions. This also applies to individual lines in a multiline equation. Also, the \texttt{equs} environment supports blocks of equation with more

Since \texttt{mhequ} redefines the \texttt{\tag} and \texttt{\intertext} commands, it should always be loaded after the \texttt{amsmath} package. However, these two commands should still behave correctly inside the \texttt{amsmath} environments. The rest of this document demonstrates the usage of the \texttt{mhequ} package, it is easiest to just read the source code of this document to see how it works. See also the description given at the start of the file \texttt{mhequ.sty}.

Here is a simple labelled equation:

\begin{equation}
  e^{i\pi} + 1 = 0 .
\end{equation}  \hfill (1)

Removing or adding the label does not require a change of environment:

\begin{equation}
  e^{i\pi} + 1 = 0 .
\end{equation}

However, if the option \texttt{numberall} is set, then every single equation is numbered. A simple list of equations can be displayed either with one number per equation

\begin{align}
  f(x) &= \sin(x) + 1 , \hfill (2) \\
  h(x) &= f(x) + g(x) - 3 , \hfill (3) \\
  f(x) &= \sin(x) + 1 , \hfill (4) \\
  h(x) &= f(x) + g(x) - 3 , \hfill (5)
\end{align}

or with one number for the whole list

\begin{equation}
  f(x) = \sin(x) + 1 , \\
  h(x) = f(x) + g(x) - 3 . \hfill (6)
\end{equation}

Of course, it can also have no number at all:

\begin{align*}
  f(x) &= \sin(x) + 1 , \\
  h(x) &= f(x) + g(x) - 3 .
\end{align*}

The command \texttt{\minilab\{label\_name\}} allows us to create a counter for the lines in a block of equations.

\begin{equation}
  f(x) = \sin(x) + 1 , \hfill (7a)
\end{equation}
\[ g(x) = \cos(x) - x^2 + 4 , \quad (7b) \]
\[ h(x) = f(x) + g(x) - 3 . \quad (7c) \]

One can refer to the whole block (7) or to one line, like (7a) for example. It is possible to use any tag one likes with the \texttt{\textbackslash tag\{displayed\_tag\}} command

\[ x = y , \quad (\star) \]

which in this case was used as \texttt{\textbackslash tag\{$\star$\}}. Such an equation can be referred to as usual: \texttt{(\star)}. Of course, \texttt{mhequ} can be used in conjunction with the usual \texttt{equation} environment, but \texttt{mhequ} is great, so why would you want to do this?

\[ x = y + z \quad (8) \]

Typesetting several columns of equations is quite easy and doesn’t require 10 different environments with awkward names:

\[
\begin{align*}
  x &= y + z & a &= b + c & x &= v & (9) \\
  x &= y + z & a &= b + c & x &= u + 1 & (9') \\
  a &= b & \text{(multicol)} & x &= y \\
  x &= y + z & a^2 &= (b - c)^3 + y \\
\end{align*}
\]

and also (this is some \texttt{\textbackslash intertext})

\[ x = y + z \quad a = (b + c)^2 - 5 \quad \ell = m \quad (10) \]

We can even extend the block (7) much later using the \texttt{\textbackslash minilab\{label\_name\}} command:

\[
\begin{align*}
  x &= y + z & x &= y + z & f(x) &= b & (7d) \\
  x &= y + z & x &= y + z & g(x) &= b & (7e) \\
  \sin^2 x + \cos^2 x &= 1 & (7f) \\
\end{align*}
\]

It is possible to change the type of subnumbering and to use the \texttt{\textbackslash text} command without having to load \texttt{amstext}:

\[ I_1 = \int_a^b g(x) \, dx , \quad \text{(First equation)} \quad (11A) \]
\[ I_2 = \int_a^b g(x^2 - 1) \, dx . \quad \text{(Second equation)} \quad (11B) \]