Numbering individual lines of equation array's

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This package defines the subeqnarray and subeqnarray* environments, which behave like the equivalent eqnarray and eqnarray* environments, except that the individual lines are numbered like 1a, 1b, 1c, etc.

To refer to these numbers an extra label command \slabel has been defined.

Many of this code was taken from latex.tex and modified for this purpose.

1 Initial Code

\c@subequation We need to allocate a new counter for the subequation environment. It is reset by the equation counter.

```
1 ⟨*package⟩
2 \newcounter{subequation}[equation]
```

\thesubequation The representation of the counter subequation includes the equation counter.

```
3 \def\thesubequation{\theequation\alph{subequation}}
```

2 Option Handling

The standard LaTeX options leqno and fleqn are recognised by this package.

```
4 %
5 %    When \Lopt{leqno} is used the equation numbers should appear on
6 %    the left side of the equation. The numbers are generated by
7 %    |\@subeqnnum| which needs a different definition to acheive this
8 %    effect.
9 %    \begin{macrocode}
10 \DeclareOption{leqno}{%
11   \def\@subeqnnum{\hbox to .01\p@{}\rlap{\reset@font\rmfamily
12         \hskip -\displaywidth(\thesubequation)}}}
```

The default definition of \@subeqnnum.

```
13 \DeclareOption{reqno}{%
14   \def\@subeqnnum{{\reset@font\rmfamily (\thesubequation)}}}
```

When the option fleqn is used, the equations have to be printed flush left, with an indent of \mathindent; the equations are seperated from the surrounding

text by `\topsep` (plus `\partopsep` if necessary) and the width of the display is `\linewidth`.

```
\DeclareOption{fleqn}{%
  \def\subeqn@start{%
    \tabskip\mathindent
    \abovedisplayskip\topsep
    \ifvmode\advance\abovedisplayskip\partopsep\fi
    \belowdisplayskip\abovedisplayskip
    \belowdisplayshortskip\abovedisplayskip
    \abovedisplayshortskip\abovedisplayskip
    $$\everycr{}\halign to \linewidth}}% $$
```

The default will be to have displayed equations to the width of `\displaywidth`.

```
\DeclareOption{deqn}{%
  \def\subeqn@start{%
    \tabskip\@centering
    $$\everycr{}\halign to \displaywidth}}% $$
```

We don't support any other options

```
\DeclareOption*{\OptionNotUsed}
```

3 Executing Options

Make sure the `\@eqnnum` is defined by specifying `reqno` as a default option. Specifying `deqn` as a default option defines `\subeqn@start`.

```
\ExecuteOptions{reqno,deqn}
```

Now see if the user specified any options.

```
\ProcessOptions
```

4 The main code

`\slabel` A new label command to refer to subequations. It works like the `\label` command and was taken from `latex.ltx`.

`\slabel{FOO}` writes the following on file `\@auxout`:
`\newlabel{FOO}{{eval(\@currentlabel)}{eval(\thepage)}}`

```
\newcommand\slabel[1]{%
  \@bsphack
  \if@filesw
    {\let\thepage\relax
     \def\protect{\noexpand\noexpand\noexpand}%
     \edef\@tempa{\write\@auxout{\string
        \newlabel{#1}{{\thesubequation}{\thepage}}}}%
     \expandafter}\@tempa
     \if@nobreak \ifvmode\nobreak\fi\fi
  \fi\@esphack}
```

`subeqnarray` (*env.*) The `subeqnarray` environment steps the equation counter, sets the subequation counter equal to 1 and behaves much like the `eqnarray` environment. Note the `\@currentlabel` is defined to use the equation counter. This is done so that an entire array an be referred to using the value of the equation counter. Hence the need for the `\slabel` command.

```
\newenvironment{subeqnarray}%
   {\stepcounter{equation}%
    \def\@currentlabel{\p@equation\theequation}%
    \global\c@subequation\@ne
    \global\@eqnswtrue\m@th
    \global\@eqcnt\z@\let\\\@subeqncr
    \subeqn@start
     \bgroup\hskip\@centering
      $\displaystyle\tabskip\z@skip{##}$\@eqnsel
      &\global\@eqcnt\@ne \hskip \tw@\arraycolsep \hfil${##}$\hfil
      &\global\@eqcnt\tw@ \hskip \tw@\arraycolsep
         $\displaystyle{##}$\hfil \tabskip\@centering
      &\global\@eqcnt\thr@@
         \hbox to\z@\bgroup\hss##\egroup\tabskip\z@skip\cr}
   {\@@subeqncr\egroup $$\global\@ignoretrue}
```

`\@subeqncr` These macros handle the user command `\\`; they are adapted from the ones used or the `eqnarray` environment.

First the presence of a `*` detected and the right penalty selected.

```
\def\@subeqncr{{\ifnum0=‘}\fi\@ifstar{\global\@eqpen\@M
    \@ysubeqncr}{\global\@eqpen\interdisplaylinepenalty \@ysubeqncr}}
```

`@ysubeqncr` This macro is called by `\@subeqncr` and checks if the user requested any extra vertical space. It calls `\@xsubeqncr` with the wanted amount of space as its argument.

```
\def\@ysubeqncr{\@ifnextchar [{\@xsubeqncr}{\@xsubeqncr[\z@skip]}}
```

`\@xsubeqncr` This macro calls `\@@subeqncr` to put in extra `&`'s if needed, generating an error if the number of columns is too large. Then the penalty selected earlier and the white space requested are inserted.

```
\def\@xsubeqncr[#1]{\ifnum0=‘{\fi}\@@subeqncr
   \noalign{\penalty\@eqpen\vskip\jot\vskip #1\relax}}
```

`\@@subeqncr` Check the number of columns, and insert extra `&` if needed. If there appear to be more than 3 columns an error is signalled.

```
\def\@@subeqncr{\let\@tempa\relax
    \ifcase\@eqcnt \def\@tempa{& & &}\or \def\@tempa{& &}
      \or \def\@tempa{&}\else
       \let\@tempa\@empty
       \@latexerr{Too many columns in subeqnarray environment}\@ehc\fi
     \@tempa \if@eqnsw\@subeqnnum\refstepcounter{subequation}\fi
     \global\@eqnswtrue\global\@eqcnt\z@\cr}
```

`subeqnarray*` (*env.*) This environment is basically the same as the `eqnarray` environment, but it is provided just or completeness.

```
\newenvironment{subeqnarray*}%
  {\def\@subeqncr{\nonumber\@ssubeqncr}\subeqnarray}
  {\global\advance\c@equation\m@ne\nonumber\endsubeqnarray}
```

`\@ssubeqncr` This is used in the `esubqnarray*` environment.

```
\let\@ssubeqncr\@subeqncr
⟨/package⟩
```

5 An example of the use of this package

When you run the following document through LaTeX you will see the differene between the `subeqnarray` and `eqnarray` environments.

```
⟨*sample⟩
\documentclass[fleqn]{article}
\usepackage{subeqnarray}
\begin{document}
\title{Sample subeqnarray}
\author{Johannes L. Braams}
\date{\today}
\maketitle

This document shows an example of the use of the \emph{subeqnarray}
environment. Here is one:
\begin{subeqnarray}
\label{eqw}
\slabel{eq0}
 x & = & a \times b \\
\slabel{eq1}
 & = & z + t\\
\slabel{eq2}
 & = & z + t
\end{subeqnarray}
The first equation is number~\ref{eq0}, the last is~\ref{eq2}. The
equation as a whole can be referred to as equation~\ref{eqw}.

To show that equation numbers behave normally, here's an
\emph{eqnarray} environment.
\begin{eqnarray}
\label{eq10}
 x & = & a \times b \\
\label{eq11}
 & = & z + t\\
\label{eq12}
 & = & z + t
\end{eqnarray}

These are equations~\ref{eq10},~\ref{eq11} and~\ref{eq12}.
\end{document}
⟨/sample⟩
```

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Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.

Change History

1.1
General: Fixed bug in subeqnarray* environment 1
2.0
General: Added support for the fleqn option 1
Added support for the leqno option 1
2.1
General: Upgrade for LaTeX2e 1

v2.1b
General: Changed licensing remarks to use LPPL 1