

Subnumbering of equations*

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1 Introduction

Sometimes it is necessary to be able to refer to subexpressions of an equation. In order to do that these subexpressions should be numbered. In standard L^AT_EX there is no provision for this. To solve this problem Stephen Gildea once wrote `subeqn.sty` for L^AT_EX 2.09; Donald Arsenau rewrote the macros and Johannes Braams made them available for L^AT_EX 2_ε.

Note that this package is *not* compatible with the package `subeqnarray`, written by Johannes Braams.

This package can be used together with the L^AT_EX options `leqno` and `fleqn`.

2 Available environments

- `subequations` Inside the `subequations` environment L^AT_EX's equation environments such as `equation` and `eqnarray` are numbered as subexpressions. At the same time the number of the (main) equation is kept the same.
- `subeqnarray` `\begin{subeqnarray}` works like `\begin{subequations}\begin{eqnarray}`, but saves typing. A `\label` command given at the very beginning of the first entry defines a `label` for the overall equation number, as if you had typed `\begin{subequations}\label{xxx}\begin{eqnarray}`.

3 Available commands

- `\thesubequation` The command `\thesubequation` controls the labelling of the subexpressions of an equation. You can change the labelling by redefining this command, but the names of the counters may be confusing: The sub-number is given by counter `equation`, while the overall equation number is given by `mainequation`.

There are two ways to reference the overall equation number: through its value, as in `\Roman{mainequation}`, or through `\themainequation`, which gives the text of the normal `\theequation`. Refer to the local sub-number through the value of the `equation` counter, as in `\alph{equation}`. The default numbering is like 13c, given by:

```
\newcommand*{\thesubequation}{\themainequation\alph{equation}}
```

*This file has version number v2.0a, last revised 1999/03/03.

Some alternatives:

A number such as 13.C is achieved by

```
\newcommand*{\thesubequation}{\thema inequation.\Alph{equation}}
```

A number such as 13-iii is achieved by

```
\newcommand*{\thesubequation}{\thema inequation-\roman{equation}}
\newcommand*{\thesubequation}{\thema inequation.\Alph{equation}}
```

When the document class which is used has declared

```
\renewcommand{\@eqnnum}{\theequation}
\renewcommand{\theequation}{(\arabic{equation})}
```

which puts parentheses around *all* equation numbers, including those produced by the `\ref` command, you can use:

```
\newcommand*{\thesubequation}{(\arabic{ma inequation}\alph{equation})}
```

4 The implementation

```
1 (*package)
```

`subequations` Within the `subequations` the equation numbers consist of two parts. The first part is a representation of the current value of the `equation` counter when the environment is entered, ie the number of the equation; the second part indicates the number of the subexpression of the equation.

```
2 \newenvironment{subequations}{%
```

First we update the `equation` counter,

```
3 \refstepcounter{equation}%
```

then we save its current value in `\c@ma inequation` and define `\thema inequation` to be the current representation of the `equation` counter.

```
4 \mathchardef\c@ma inequation\c@equation
```

```
5 \protected@edef\thema inequation{\theequation}%
```

Then we change the representation of the `equation` counter to represent the subexpression number. Finally we set the `equation` counter to zero as we use it for counting the subexpressions.

```
6 \let\theequation\thesubequation
```

```
7 \global\c@equation\z@
```

```
8 }%
```

When the environment is finished we restore the value of the `equation` counter.

```
9 \global\c@equation\c@ma inequation
```

```
10 \global\@ignoretrue
```

```
11 }
```

`\thesubequation` By default the subexpressions will be numbered with lower case letters. The representation of the `equation` counter also includes the saved value of the `equation` counter. This can be changed by redefining this command.

```
12 \newcommand{\thesubequation}{\thema inequation\alph{equation}}
```

subeqnarray

```
13 \newenvironment{subeqnarray}{%
14   \subequations
15   \@ifnextchar\label{\@lab@subeqnarray}{\eqnarray}
16 }{%
17   \endeqnarray\endsubequations
18 }
```

`\@lab@subeqnarray` This macro picks up the `\label` command and its argument and re-inserts it *before* starting the `eqnarray` environment.

```
19 \newcommand*{\@lab@subeqnarray}[2]{#1{#2}\eqnarray}
20 \end{package}
```

5 An example of the use of this package

When you run the following document through L^AT_EX you will see the difference between the `subeqnarray` and `eqnarray` environments.

```
21 (*sample)
22 \documentclass{article}
23 \usepackage{subeqn}
24
25 \begin{document}
26 This is an example of the use of the \texttt{subequations} package.
27 \begin{equation}
28   \label{a}
29   a^2 + b^2 = c^2
30 \end{equation}
31 Now we start sub-numbering.
32 \begin{subequations}
33   \label{b}
34   \begin{equation}
35     \label{b1}
36     d^2 + e^2 = f^2
37   \end{equation}
38   We can refer to equation~\ref{a}, \ref{b} and~\ref{b1}.
39   \begin{equation}
40     \label{b2}
41     g^2 + h^2 = i^2
42   \end{equation}
43   This was equation~\ref{b2}.
44   \begin{eqnarray}
45     \label{c}
46     x &=& y+z\label{c1}\\
47     u &=& v+w\label{c2}
48   \end{eqnarray}
49   This was expression~\ref{c}, consisting of parts~\ref{c1}
50   and~\ref{c2}.
51 \end{subequations}
52
53 Now lets start a \textsf{subeqnarray} environment.
54 \begin{subeqnarray}
55   \label{d}
```

```

56   x &= & y+z\label{d1}\\
57   u &= & v+w\label{d2}
58 \end{subeqnarray}
59 This was equation~\ref{d}, with parts~\ref{d1} and~\ref{d2}.
60 \end{document}
61 \</sample>

```