

L^AT_EX package eqnalign

— — making eqnarray(*) look and work like align(*) — —

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1 The goal

The goal of this package is to allow easy conversion from the insanely-looking eqnarray to the look and behaviour of align from amsmath. It is inspired by a T_EX.StackExchange question <http://tex.stackexchange.com/q/96210/11002> by a user called “Werner”, and by an answer of mine to the question.

2 The behaviour

The package is activated by simply loading it, and it does not have any package options. It just redefines eqnarray and eqnarray*, and then it makes amsthm aware of this redefinition so that \qedhere works inside these environments. At the same time, we keep the original definition of eqnarray and eqnarray* as EQNarray and EQNarray*, respectively. Note that hyperref modifies eqnarray, so the package shall be loaded after hyperref; this also means that hyperref tweaks do not make it into EQNarray(*)).

The main feature is implemented in a simple way: We keep track of & count, and we disable the 2nd & of each line. (Note that we also disable the 5th, 8th etc. ones.) We do it in a way that correctly interacts with cases such as when array or matrix is inside the environment.

3 License and remarks

- (A) The package is licensed under the L^AT_EX Project Public License version 1.3c (LPPL v1.3c) or higher. The latest version of this license is in <http://www.latex-project.org/lppl.txt>.
- (B) Note that actually, the usage of this package is discouraged, in favour of converting the code into proper “amsmath code”, using the true align and align* environments. It is intended for cases where a lot of already existing code needs to be converted and there is no capacity for doing it the right but time-consuming way.
- (C) All bugs shall be reported to the GitHub page <http://github.com/tohecz/eqnalign>. Just note that unless the bug is crucial or easy to deal with, it may not be fixed since (per the previous remark) single problematic cases shall be dealt with by other means.

4 Known issues

- (1) Due to catcode changes, eqnarray will not work inside macro arguments and similar contexts.
- (2) Note that as the package actually ignores the 2nd & of an eqnarray line, it in turn kills the alignment in cases such as the following:

```
\begin{eqnarray*}
A & = & 104 x^5 + 84 x^4 + 53 x^3 \\\
& & + 17 x^2 + 4 x - 1043
\end{eqnarray*}
```

$$A = 104x^5 + 84x^4 + 53x^3 + 17x^2 + 4x - 1043$$

This becomes, when eqnalign is loaded:

```
\begin{align*}
A & = 104 x^5 + 84 x^4 + 53 x^3 \\\
& + 17 x^2 + 4 x - 1043
\end{align*}
```

$$A = 104x^5 + 84x^4 + 53x^3 + 17x^2 + 4x - 1043$$

However, the preferred form would be, for instance:

```
\begin{align*}
A & = 104 x^5 + 84 x^4 + 53 x^3 \\\
& & \phantom{=} + 17 x^2 + 4 x - 1043
\end{align*}
```

$$A = 104x^5 + 84x^4 + 53x^3 + 17x^2 + 4x - 1043$$

This issue is actually somehow inherited from align, which in standard usage shows the very same behaviour.

5 Implementation

Note that we in general say eqnarray where we really mean either eqnarray or eqnarray*.

1 `<*package>`

Package header.

2 `\ProvidesPackage{eqnalign}[2016/09/16 v1.0a Make eqnarray(*) behave like align(*)]`

The only necessary package is amsmath so that align and align* are defined.

3 `\RequirePackage{amsmath}`

The package does some catcode mysteries that shouldn't propagate out, so we make everything in a group and use `\gdef` everywhere.

4 `\begingroup`

`\eqna@tab@amp` We store a catcode-4 (tab alignment char) `&` in a macro. We need a catcode-13 (active) `&` throughout the rest of the package.

5 `\catcode'\&=4`

6 `\gdef\eqna@tab@amp{&}`

7 `\catcode'\&=13`

`\eqna@new@amp` This will be the replacement of `&` inside eqnarray. We use `\eqna@amp@` if the innermost environment is eqnarray and `\eqna@tab@amp` otherwise; this is to allow things like arrays and matrices inside eqnarray.

8 `\gdef\eqna@new@amp{%`

9 `\ifx\@currenvir\eqna@currenvir`

10 `\expandafter\eqna@amp@`

11 `\else`

12 `\expandafter\eqna@tab@amp`

13 `\fi`

14 `}`

`\eqna@amp@i` `\eqna@amp@ii` `\eqna@amp@iii` Three macros that are “rotated”, after the first, the second shall be used, then the third. The third one ends a group since it ends a table cell, therefore after that the first one is again in action. The first `&` on a line is kept, the second is ignored, the third is kept.

15 `\gdef\eqna@amp@i{\eqna@tab@amp\let\eqna@amp@\eqna@amp@ii}`

16 `\gdef\eqna@amp@ii{\let\eqna@amp@\eqna@amp@iii}`

17 `\gdef\eqna@amp@iii{\eqna@tab@amp}`

`\eqna@doamp` The default is `\eqna@amp@i`.

```
18 \global\let\eqna@amp@\eqna@amp@i
```

`\eqna@hook` Hook executed at the beginning of `eqnarray`. We store the current environment, which is either `eqnarray` or `eqnarray*`; it is used in `\eqna@new@amp` for the test for nested environments. Then we activate `&` and make its meaning `\eqna@new@amp`.

```
19 \gdef\eqna@hook{%
20   \let\eqna@currentenv\@currentenv
21   \catcode'\&=\active
22   \let&\eqna@new@amp
23 }
```

Now we will be defining environments containing `*` in name, so we make it a letter.

```
24 \catcode'\*=11
```

`\eqna@def@env` We define a macro `\eqna@def@env` that contains the redefinitions of `eqnarray` (and `eqnarray*`). The environments themselves are like `align`, just hooked using `\eqna@hook`. We then call this macro immediately to define the environments. (All this fuss with `\eqna@def@env` is to correct things in case `hyperref` is loaded after `eqnalign`.)

```
25 \gdef\eqna@def@env{%
26   \gdef\eqnarray{\eqna@hook\align}%
27   \gdef\eqnarray*{\eqna@hook\align*}%
28   \global\let\endeqnarray\endalign
29   \global\let\endeqnarray*\endalign*
30 }
31 \eqna@def@env
```

`\eqnarray@qed` To make `amsthm`'s `\qedhere` work in `eqnarray`, we need to "hint" `amsthm` that it exists

```
\eqnarray*@qed
32 \global\let\eqnarray@qed\align@qed
33 \global\let\eqnarray*@qed\align*@qed
```

End the group we began at the very beginning.

```
34 \endgroup
```

`EQNarray` Just of sentiment, we keep the original `eqnarray` as `EQNarray`.

```
35 \def\EQNarray{%
36   \stepcounter{equation}%
37   \def\@currentlabel{\p@equation\theequation}%
38   \global\@eqnswtrue
39   \m@th
40   \global\@eqcnt\z@
41   \tabskip\@centering
42   \let\\\@eqnocr
43   $$\everycr{}\halign to\displaywidth\bgroup
44     \hskip\@centering$\displaystyle\tabskip\z@skip{##}$\@eqnswtrue
45     &\global\@eqcnt\@ne\hskip \tw@arraycolsep \hfil${##}$\hfil
46     &\global\@eqcnt\tw@ \hskip \tw@arraycolsep
47     $\displaystyle{##}$\hfil\tabskip\@centering
48     &\global\@eqcnt\thr@@ \hb@xt@\z@\bgroup\hss##\egroup
49     \tabskip\z@skip
50     \cr
51 }
52 \def\endEQNarray{%
53   \@@eqnocr
54   \egroup
55   \global\advance\c@equation\m@ne
56   $$\@ignoretrue
57 }
58 \@namedef{EQNarray*}{\def\@eqnocr{\nonumber\@seqnocr}\EQNarray}
59 \@namedef{endEQNarray*}{\nonumber\endEQNarray}
```

Last but not least, if hyperref is loaded after eqnalign (and only in that case), we issue a warning since hyperref is doing bad things to eqnarray, and we redefine eqnalign once more.

```
60 \ifpackageloaded{hyperref}{}{
61   \AtBeginDocument{
62     \ifpackageloaded{hyperref}{
63       \@latex@warning{Package 'eqnalign' should be loaded after
64       'hyperref'.\MessageBreak Redefining 'eqnarray' and 'eqnarray*' at this
65       point \MessageBreak and crossing fingers...}
66       \eqna@def@env
67     }{}
68   }
69 }

    That's all.
70 \endinput
71 \</package>
```