Welcome to the deleq package!

This is a short document to demonstrate the use of the deleq package and its commands. It uses deleq version 4.41 (July 7, 1997). deleq was written by Mats Dahlgren (`matsd@sssk.se` `http://www.homenet.se/matsd/`). Suggestions for improvements and bug reports are most welcome, see the documentation. deleq is fully compatible with the `leqno` option and most of the `fleqn` option.

We start this demonstration by a simple and well-known equation to get the equation number counter going:

$$\sin^2\alpha + \cos^2\alpha = 1 \tag{1}$$

The first example will be to make use of the `deqn` environment to get a partially numbered equation:

$$\sin(-\alpha) = -\sin\alpha \tag{2a}$$

This equation has its cosine companion, here written in the `ddeqn` environment:

$$\cos(-\alpha) = \cos\alpha \tag{2b}$$

Not so exciting, so far. :–)

In the next example we introduce the `deqarr` environment for writing equations:

$$\begin{aligned} \sin(\alpha+\beta) &= \sin\alpha\cos\beta + \sin\beta\cos\alpha &(3a)\\ \sin(\alpha-\beta) &= \sin\alpha\cos\beta - \sin\beta\cos\alpha &(3b) \end{aligned}$$

where we also have put in the label `Demo1` in the second equation. Next, notice how the environment `ddeqar` uses the same main equation number as the previous equations:

$$\begin{aligned} \cos(\alpha+\beta) &= \cos\alpha\cos\beta - \sin\alpha\sin\beta &(3c)\\ \cos(\alpha-\beta) &= \cos\alpha\cos\beta + \sin\alpha\sin\beta &(3d) \end{aligned}$$

In the first of these equations, an `\arrlabel` command with the label `Demo2` is included. Now, we will make another `eqnarray`-like structure, again in the `ddeqar` environment:

$$\begin{aligned} \sin 2\alpha &= 2\sin\alpha\cos\alpha &(4)\\ \cos 2\alpha &= \cos^2\alpha - \sin^2\alpha &(5a) \end{aligned}$$

or

$$= 2\cos^2\alpha - 1 \tag{5b}$$

This example shows the use of `\heqno` in the first equation, which produces an ordinary equation number. The first equation is also labelled, with the label `Demo3`. The next equation's number was produced by the command `\nydeqno`. Also, notice the use of `\rem{or}`, which results in the text "or" without changing the alignment. To illustrate the use of `\arrlabel{Demo2}` above, we here make a reference to it: ... in equations 3 ... which was created by typing '`\ldots{} in equations \ref{Demo2} \ldots`'.

To step the equation number counter, we want the following equations typeset in ordinary `eqnarray` environment:

$$\begin{aligned} \tan^2\alpha &= \frac{\sin^2\alpha}{\cos^2\alpha} &(6)\\ \tan\alpha &= \frac{\sin\alpha}{\cos\alpha} &(7) \end{aligned}$$

The upper equation was given the label `Demo4`.

Now one of the "recycling" commands is to be demonstrated. First of all, let's make an ordinary reference to equation 4, and then "recycle" it:

$$\sin 2\alpha = 2\sin\alpha\cos\alpha \tag{4}$$

This was obtained with `$$ ... $$` with the command `\reqno{Demo3}` at the end. Also partially numbered equations can be recycled with the `\reqno{FOO}` command, as with equation 3b:

$$\sin(\alpha-\beta) = \sin\alpha\cos\beta - \sin\beta\cos\alpha \tag{3b}$$

(However, the use of `\rndeqno{FOO}` and `\rdeqno{FOO}` will produce strange results with two (different) partial equation numbers if `FOO` refers to a partially numbered equation.)

The next equation was written with `$$ ... $$` and a `\deleqno` command at the end:

$$\tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha} \tag{7a}$$

Notice how the main equation number counter is still the same, despite that we now are outside of the `ddeqar` environment. Also, notice how the use of `\reqno` above did not affect the equation number counter. The following equation is also set within `$$ ... $$`, but it uses the command `\nydeleqno` to produce an equation number with a new main number:

$$\sin^2\alpha = 1-\cos^2\alpha \tag{8a}$$

Now we will elaborate a little on `\rndeqno{FOO}` and `\rdeqno{FOO}`. Let us use equation 6, and see what happens if we use the `\rndeqno{FOO}` command:

$$\tan^2\alpha = \frac{\sin^2\alpha}{\cos^2\alpha} \tag{6a}$$

which we rewrite:

$$\tan^2\alpha = \frac{\sin^2\alpha}{1-\sin^2\alpha} \tag{6b}$$

with `\rdeqno{Demo4}` at the end. This is great fun, so why not one more:

$$\tan^2\alpha = \frac{1-\cos^2\alpha}{\cos^2\alpha} \tag{6c}$$

Also, the middle form of equation 6 got a label, `Demo5`. In the last example, the construct

```
\ddeqreqno[-\jotbaseline]{Demo4}   \nonumber
```

in a `deqrarr` environment is used, to obtain `fleqn` compatibility.

There is still one equation to write. This time we again use the `deqarr` environment:

$$\cot\alpha = \frac{\cos\alpha}{\sin\alpha} \tag{9a}$$

where

$$= \frac{1}{\tan\alpha} \tag{9b}$$

This example also shows the use of the `\where` command, which is a special case of the `\rem` command. Now, the interesting thing of referring to the recycled equations is ahead. If one writes `\ref{Demo5}`, this is what LaTeX will return: b. That is not too instructive, since the partial equation numbers are quite common in this document. To make the complete

reference, use `\ref{Demo4}\ref{Demo5}`. The reference 6b is much more comprehensible, right? (If you get bad line-breaks at such references, put them in an `\mbox{...}`.)

Now we will show the use of the commands to recycle equation numbers in `eqnarray`-like structures. These commands are `\eqreqno{FOO}`, `\deqreqno{FOO}`, and `\ddeqreqno{FOO}`. We start by repeating equation 3b in an `deqrarr` environment:

$$\begin{aligned} \sin(\alpha-\beta) &= \sin\alpha\cos\beta-\sin\beta\cos\alpha && \text{(3b)}\\ \sin 2\alpha &= 2\sin\alpha\cos\alpha \end{aligned}$$

The second equation here shows how the alignment of the equations is preserved. Next, we can use the equation 4 for some variations:

$$\begin{aligned} \sin 2\alpha &= 2\sin\alpha\cos\alpha && \text{(4a)}\\ \sin 4\alpha &= 2\sin 2\alpha\cos 2\alpha\\ &= 2\left(2\sin\alpha\cos\alpha\left(\cos^2\alpha-\sin^2\alpha\right)\right) && \text{(4b)}\\ &= 4\left(\sin\alpha\cos\alpha\left(\cos^2\alpha-\sin^2\alpha\right)\right) && \text{(4c)} \end{aligned}$$

The features used here are `\deqreqno{Demo3}` on the first line, `\ddeqreqno{Demo3}` on the second line, and `\deqreqno[-\jotbaseline]{Demo3}` on the third. Note how the inclusion of `[-\jotbaseline]` on the third line prevents LaTeX from inserting an extra blank line. The second line ends with '`\\`', and has thus no equation number at all.

The last part shows how you may use `\eqreqno` and its relatives in `deqarr` environment:

$$\begin{aligned} \sin\alpha &= \sin\alpha\cos 0+\sin 0\cos\alpha && \text{(10a)}\\ \sin 2\alpha &= 2\sin\alpha\cos\alpha && \text{(4)}\\ \sin 3\alpha &= \sin 2\alpha\cos\alpha+\sin\alpha\cos 2\alpha && \text{(10b)}\\ \sin 4\alpha &= 2\sin 2\alpha\cos 2\alpha && \text{(10c)}\\ \sin 5\alpha &= \sin 3\alpha\cos 2\alpha+\sin 2\alpha\cos 3\alpha && \text{(4d)}\\ \sin 6\alpha &= 2\sin 3\alpha\cos 3\alpha && \text{(10d)} \end{aligned}$$

The interesting part here is an '`\eqreqno{Demo3}`' at the end of the second line and a '`\ddeqreqno{Demo3}`' at the end of the fifth line. Notice how the partial equation number counter in unaffected by the enetering of the `deqarr` environment.

Finally, the $\mathcal{ENVD}$! If you want your equation numbers left-aligned, just specify the `leqno` option for the `documentclass` you are using. It should work! If you have any suggestions, corrections or contributions, please contact me. Enjoy LaTeX!

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