The doafter* package

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Contents

1 Description

1.1 What it's all about

`\doafter` It's common for the TEX primitive `\aftergroup` to be used to 'tidy up' after a group. For example, LATEX's colour handling uses this to insert appropriate `\special`s when the scope of a colour change ends. This causes several problems, though; for example, extra grouping must be added within boxes to ensure that the `\special`s don't 'leak' out of their box and appear in odd places in the document. LATEX usually solves this problem by reading the box contents as an argument, although this isn't particularly desirable. The `\doafter` macro provided here will solve the problem in a different way, by allowing a macro to regain control after all the `\aftergroup` things have been processed.

The macro works like this:

⟨*doafter-cmd*⟩ ::= ►► `\doafter` – ⟨*token*⟩ – ⟨*group*⟩ ◄

The ⟨*token*⟩ can be any token you like, except an explicit braces, since it's read as an undelimited macro argument. The ⟨*group*⟩ is a normal TEX group, surrounded by either implicit or explicit braces, or by `\begingroup` and `\endgroup` tokens. Once the final closing token of the ⟨*group*⟩ is read, and any tokens saved up by `\aftergroup` have been processed, the ⟨*token*⟩ is inserted and processed. Under normal circumstances, this will be a macro.

There are some subtle problems with the current implementation, which you may need to be aware of:

*The doafter package is currently at version 1.2, dated 8 May 1996.

†Peter came up with the basic implementation after I posed the problem in the `comp.text.tex` newsgroup. I fixed some really piddly little things, to improve it a bit, wrote the documentation, and turned the code into a nice docced package. Then Peter gave me an updated version, and I upgraded this from memory. Then he gave me some more tweaks which I haven't incorporated.

- Since we're inserting things after all the `\aftergroup` tokens, those tokens might read something they're not expecting if they try to look ahead at the text after the group (e.g., with `\futurelet`). This is obviously totally unavoidable.
- Implicit braces (like `\bgroup` and `\egroup`) inserted using `\aftergroup` may be turned into *explicit* `{`$_1$ and `}`$_2$ characters within a `\doafter` group. This can cause probems under very specialised circumstances. The names `\bgroup` and `\egroup` are treated specially, and they will work normally (remaining as implicit braces). This should minimise problems caused by this slight difference. (This only applies to the last `\aftergroup` token in a group.)
- To handle the `\aftergroup` tokens properly, `\doafter` has to insert some `\aftergroup` tokens of its own. It will then process the other tokens some more, and set them up to be read again. This does mean that after the group ends, some assignments and other 'stomach operations' will be performed, which may cause problems in alignments and similar places.

1.2 Package options

There are a fair few docstrip options provided by this packge:

driver extracts the documentation driver. This isn't usually necessary.

package extracts the code as a standalone package, formatted for either LaTeX 2_ε or Plain TeX.

latex2e inserts extra identification code for a LaTeX 2_ε package.

plain inserts some extra code for a Plain TeX package.

macro just extracts the raw code, for inclusion in another package.

test extracts some code for testing the current implementation.

2 Implementation

2.1 The main macro

We start outputting code here. If this is a Plain TeX package, we must make '`@`' into a letter.

```
1 ⟨*macro | package⟩
2 ⟨+plain⟩\catcode`\@=11
```

`\doafter` The idea is to say `\doafter` ⟨*token*⟩ ⟨*group*⟩ and expect the ⟨*token*⟩ to be processed after the group has finished its stuff, even if it contains `\aftergroup` things. My eternal gratitude goes to Peter Schmitt, who came up with most of the solution implemented here; I've just tidied up some very minor niggles and things later.

Let's start with some preamble. I'll save the (hopefully) primitive `\aftergroup` in a different token.

```
3 \let\@@aftergroup\aftergroup
```

Now to define the 'user' interface. It takes a normal undelimited argument, although this must be a single token; otherwise eveything will go wrong. It assumes that the token following is some kind of group opening thing (an explicit or implicit character with catcode 1, or a `\begingroup` token). To make this work, I'll save the token, together with an `\@@aftergroup` (to save an `\expandafter` later) in a temporary macro which no-one will mind me using, and then look ahead at the beginning-group token.

```
\def\doafter#1{%
  \def\@tempa{\@@aftergroup#1}%
  \afterassignment\doafter@i\let\@let@token%
}
```

I now have the token in `\@let@token`, so I'll put that in. I'll then make `\aftergroup` do my thing rather than the normal thing, and queue the tokens `\@prepare@after` and the `\doafter` argument for later use.

```
\def\doafter@i{%
  \@let@token%
  \let\aftergroup\@my@aftergroup%
  \@@aftergroup\@prepare@after\@tempa%
}
```

`\@my@aftergroup` Now the cleverness begins. We keep two macros (Peter's original used count registers) which keep counts of the numbers of `\aftergroup`s, both locally and globally. Let's call the local counter n and the global one N. Every time we get a call to our `\aftergroup` hack, we set $n := n + 1$ and $N := n$, and leave the token given to us for later processing. When we actually process an `\aftergroup` token properly, set $N := N - 1$ to indicate that it's been handled; when they're all done, we'll have $N = n$, which is exactly what we'd have if there weren't any to begin with.

```
\def\ag@cnt@local{0 }
\let\ag@cnt@global\ag@cnt@local
```

Now we come to the definition of my version of `\aftergroup`. I'll just add the token `\@after@token` before every `\aftergroup` token I find. This means there's two calls to `\aftergroup` for every one the user makes, but these things aren't all that common, so it's OK really. I'll also bump the local counter, and synchronise them.

```
\def\@my@aftergroup{%
  \begingroup%
    \count@\ag@cnt@local%
    \advance\count@\@ne%
    \xdef\ag@cnt@global{\the\count@\space}%
  \endgroup%
  \let\ag@cnt@local\ag@cnt@global%
  \@@aftergroup\@after@token\@@aftergroup%
}
```

Now what does `\@after@token` we inserted above actually do? Well, this is more exciting. There are actually two different variants of the macro, which are used at different times.

`\@after@token` The default `\@after@token` starts a group, which will 'catch' `\aftergroup` tokens which I throw at it. I put the two counters into some scratch count registers. (There's a slight problem here: Plain TEX only gives us one. For the sake of evilness I'll use `\clubpenalty` as the other one. Eeeek.) I then redefine `\@after@token` to the second variant, and execute it. The `\@start@after@group` macro starts the group, because this code is shared with `\@prepare@after` below.

```
\def\@after@token{%
  \@start@after@group%
  \@after@token%
}
\def\@start@after@group{%
  \begingroup%
  \count@\ag@cnt@global%
  \clubpenalty\ag@cnt@local%
  \let\@after@token\@after@token@i%
}
```

`\@after@token@i` I have `\count@` $= N$ and `\@tempcnta` $= n$. I'll decrement N, and if I have $N = n$, I know that this is the last token to do, so I must insert an `\@after@all` after the token. This will close the group, and maybe insert the original `\doafter` token if appropriate.

```
\def\@after@token@i{%
  \advance\count@\m@ne%
  \ifnum\count@=\clubpenalty%
    \global\let\ag@cnt@global\ag@cnt@local%
    \expandafter\@after@aftertoken\expandafter\@after@all%
  \else%
    \expandafter\@@aftergroup%
  \fi%
}
```

Finally, establish a default meaning for `\@after@all`.

```
\let\@after@all\endgroup
```

`\@prepare@after` If this group is handled by `\doafter`, then the first `\aftergroup` token isn't `\@after@token`; it's `\@prepare@after`.

There are some extra cases to deal with:

- If $N = n$ then there were no `\aftergroup` tokens, so we have an easy job. I'll just let the token do its stuff directly.
- Otherwise, $N > n$, and there are `\aftergroup` tokens. I'll open the group, and let `\@after@token` do all the handling.

```
\def\@prepare@after{%
  \ifx\ag@cnt@local\ag@cnt@global\else%
    \expandafter\@prepare@after@i%
  \fi%
}
\def\@prepare@after@i#1{%
  \@start@after@group%
  \def\@after@all{\@@aftergroup#1\endgroup}%
}
```

`\@after@aftertoken` This is where all the difficulty lies. The next token in the stream is an `\aftergroup` one, which could be more or less anything. We have an argument, which is some code to do *after* the token has been `\aftergroup`ed.

If the token is anything other than a brace (i.e., an explicit character of category 1 or 2) then I have no problem; I can scoop up the token with an undelimited macro argument. But the only way I can decide if this token is a brace (nondestructively) is with `\futurelet`, which makes the token implicit, so I can't decide whether it's really dangerous.

There is a possible way of doing this[1] which relates to nobbling the offending token with `\string` and sifting through the results. The problem here involves scooping up all the tokens of a `\string`ed control sequence, which may turn out to be '`\csname\endcsname`' or something equally horrid.

The solution I've used is much simpler: I'll change `\bgroup` and `\egroup` to stop them from being implicit braces before comparing.

```
\def\@after@aftertoken#1{%
  \let\bgroup\relax\let\egroup\relax%
  \toks@{#1}%
  \futurelet\@let@token\@after@aftertoken@i%
}
\def\@after@aftertoken@i{%
  \ifcat\noexpand\@let@token{%
    \@@aftergroup{%
  \else\ifcat\noexpand\@let@token}%
    \@@aftergroup}%
  \else%
    \def\@tempa##1{\@@aftergroup##1\the\toks@}%
    \expandafter\expandafter\expandafter\@tempa%
  \fi\fi%
}
```

Phew!

```
⟨+plain⟩\catcode`\@=12
⟨/macro | package⟩
```

2.2 Test code

The following code gives `\doafter` a bit of a testing. It's based on the test suite I gave to comp.text.tex, although it's been improved a little since then.

The first thing to do is define a control sequence with an '`@`' sign in its name, so we can test catcode changes. This also hides an `\aftergroup` within a macro, making life more difficult for prospective implementations.

```
⟨*test⟩
\catcode`\@=11
\def\at@name{\aftergroup\saynine}
\def\saynine{\say{ix}}
\catcode`\@=12
```

Now define a command to write a string to the terminal. The name will probably be familiar to REXX hackers.

```
\def\say{\immediate\write16}
```

[1] Due to Peter Schmitt, again.

Test one: This is really easy; it just tests that the thing works at all. If your implementation fails this, it's time for a major rethink.

```
\say{Test one... (1--2)}
\def\saytwo{\say{ii}}
\doafter\saytwo{\say{i}}
```

Test two: Does `\aftergroup` work?

```
\say{Test two... (1--4)}
\def\saythree{\say{iii}}
\def\sayfour{\say{iv}}
\doafter\sayfour{\say{i}\aftergroup\saythree\say{ii}}
```

Test three: Test braces and `\iffalse` working as they should. Several proposed solutions based on `\write`ing the group to a file get upset by this test, although I forgot to include it in the torture test. It also tests whether literal braces can be `\aftergroup`ed properly. (Added a new test here, making sure that `\bgroup` is left as an implicit token.)

```
\say{Test three... (1--4, `\string\bgroup', 5)}
\def\sayfive{\say{v}}
\doafter\sayfive{%
  \say{i}%
  \aftergroup\say%
  \aftergroup{%
  \aftergroup\romannumeral\aftergroup3%
  \aftergroup}%
  \iffalse}\fi%
  \aftergroup\def%
  \aftergroup\sayfouretc%
  \aftergroup{%
  \aftergroup\say%
  \aftergroup{%
  \aftergroup i%
  \aftergroup v%
  \aftergroup}%
  \aftergroup\say%
  \aftergroup{%
  \aftergroup\string%
  \aftergroup\bgroup%
  \aftergroup}%
  \aftergroup}%
  \aftergroup\sayfouretc%
  \say{ii}%
}
```

Test four: Make sure the implementation isn't leaking things. This just makes sure that `\aftergroup` is its normal reasonable self.

```
\say{Test four... (1--3)}
{\say{i}\aftergroup\saythree\say{ii}}
```

Test five: Nesting, aftergroup, catcodes, grouping. This is the 'torture' test I gave to comp.text.tex, slightly corrected (oops) and amended. It ensures that nested groups and `\doafter`s work properly (the latter is actually more likely than might be imagined).

```
\say{Test five... (1--14)}
\def\sayten{\say{x}}
\def\saythirteen{\say{xiii}}
\def\sayfourteen{\say{xiv}}
\doafter\sayfourteen\begingroup%
  \say{i}%
  {\say{ii}\aftergroup\sayfour\say{iii}}%
  \def\saynum{\say{viii}}%
  \doafter\sayten{%
    \say{v}%
    \def\saynum{\say{vii}}%
    \catcode`\@=11%
    \aftergroup\saynum%
    \say{vi}%
    \at@name%
    \saynum%
  }%
  \say{xi}%
  \aftergroup\saythirteen%
  \say{xii}%
\endgroup
\end
⟨/test⟩
```

That's it. All present and correct.

Appendix

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