

The `substnote` package

Substitution notation with a switchable convention

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<https://github.com/vssekorin/substnote>

1 Introduction

There is no agreement on how to write “the result of substituting t for x in φ ”. Textbooks variously write

$$\varphi[t/x] \quad \varphi[x/t] \quad \varphi[x := t] \quad \varphi[x \leftarrow t] \quad \varphi[x \mapsto t] \quad (\varphi)_t^x$$

and the choice is a matter of house style rather than of mathematics. The two slash conventions are moreover mirror images of one another: some authors read $\varphi[t/x]$ as “ t replaces x ”, others read $\varphi[x/t]$ in the same sense. A convention fixed throughout a manuscript therefore has to be revised in full when the text is prepared for a different journal or series.

The `substnote` package provides a single command and lets the convention be chosen once, in the preamble.

2 Usage

```
\usepackage{substnote}           % or [style=updown], etc.
```

```
...
```

```
\subst{\varphi}{x}{t}
```

```
\subst{\varphi}{x}{t}            $\varphi[t/x]$ 
```

Simultaneous substitutions are written as two comma-separated lists, and the package pairs them up:

```
\subst{\varphi}{x,y}{s,t}        $\varphi[s/x, t/y]$ 
```

If the lists have different lengths, `substnote` reports an error rather than discarding the surplus entries.

Because the two arguments are read as comma lists, a term that itself contains a top-level comma must be braced, or it will be taken for two terms:

```
\subst{\varphi}{x}{f(a,b)}      % one term
\subst{\varphi}{x}{f(a,b)}      % error: 1 variable but 2 terms
```

2.1 The mark alone

`\substmark` sets the substitution mark on its own, for attaching to something already typeset:

```
\psi\substmark{x}{t}            $\psi[t/x]$ 
```

Since there is no expression to enclose, the up-down styles set the scripts alone rather than a pair of empty delimiters:

`\psi\substmark[style=updown]{x}{t}` ψ_t^x

2.2 Auto-scaling

The starred forms scale the delimiters to their contents:

`\subst*{\varphi}{x}{\frac{a}{b}}` $\varphi\left[\frac{a}{b}/x\right]$

against the unstarred

`\subst{\varphi}{x}{\frac{a}{b}}` $\varphi[\frac{a}{b}/x]$

3 Styles

The `style` key selects the convention. It can be given as a package option, for the whole document, or per use.

`\subst[style=slash]{\varphi}{x}{t}` $\varphi[t/x]$

`\subst[style=slashrev]{\varphi}{x}{t}` $\varphi[x/t]$

`\subst[style=assign]{\varphi}{x}{t}` $\varphi[x := t]$

`\subst[style=arrow]{\varphi}{x}{t}` $\varphi[x \leftarrow t]$

`\subst[style=mapsto]{\varphi}{x}{t}` $\varphi[x \mapsto t]$

`\subst[style=updown]{\varphi}{x}{t}` $[\varphi]_t^x$

`\subst[style=updownrev]{\varphi}{x}{t}` $[\varphi]_x^t$

In the `updown` styles the variable is set above and the term below, as in Kleene and much of the older literature; `updownrev` swaps them. Simultaneous substitutions stack as comma-separated lists:

`\subst[style=updown]{\varphi}{x,y}{s,t}` $[\varphi]_{s,t}^{x,y}$

The delimiters around the expression follow `fences`, so the traditional parenthesised form is:

`\subst[style=updown,fences=parens]{\varphi}{x}{t}` $(\varphi)_t^x$

4 Delimiters

The `fences` key chooses the delimiters. In the five *delimited* styles—`slash`, `slashrev`, `assign`, `arrow` and `mapsto`—they enclose the substitution mark set beside the expression:

`\subst[fences=parens]{\varphi}{x}{t}` $\varphi(t/x)$

`\subst[fences=braces]{\varphi}{x}{t}` $\varphi\{t/x\}$

`\subst[fences=none]{\varphi}{x}{t}` $\varphi t/x$

The styles fall into two families, and `fences` applies to both, though it governs different material in each:

<i>Delimited</i>	<code>slash</code> , <code>slashrev</code> , <code>assign</code> , <code>arrow</code> , <code>mapsto</code>	fences enclose the mark
<i>Up-down</i>	<code>updown</code> , <code>updownrev</code>	fences enclose the expression

An unknown value for `style` or `fences` is reported at once, together with the list of what is allowed.

5 Options and keys

The same names work as package options (for the document-wide convention) and in the optional argument of each command (per use).

`style=<name>` One of `slash` (default), `slashrev`, `assign`, `arrow`, `mapsto`, `updown`, `updownrev`. In `assign` the colon is centred on the math axis and set close to the equals sign; the symbol is taken from the font under `unicode-math`, or from `mathtools` when that is loaded, and is otherwise assembled by the package, so no further package is required.

`fences=<name>` Delimiters: `brackets` (default), `parens`, `braces` or `none`. In the delimited styles they enclose the substitution mark, in the up-down styles the expression. The up-down styles are never left undelimited, since a bare superscript would attach to the last symbol of a compound expression only; there `none` is read as `parens`.

`pairsep=<code>` What separates simultaneous substitutions. Default `,\,`.

`synonym=<name>` Additionally define copies of `\subst` and `\substmark` under the given name; see the following section. Load-time option only.

6 If a name is already taken

Some packages define their own `\subst`. In that case `substnote` *never* overwrites the existing command. Instead, load it with a synonym:

```
\usepackage[synonym=mystubst]{substnote}
```

This defines `\mystubst` as a full copy of `\subst` — the starred form and the optional argument included — together with `\mystubstmark` for the mark. The synonym is created whether or not `\subst` itself was free, so it may also serve as a shorter or a more descriptive name.

The same holds for `\substmark`, which is reported and left alone in the same way. If a name is taken and no synonym was requested, the package issues a warning to that effect and the document still compiles. Requesting a synonym whose name is itself taken produces an error.

7 Requirements

Only a L^AT_EX kernel from 2022-06-01 or newer; the package uses the kernel’s key–value interface and `expl3` list handling, and loads nothing else.

8 Implementation notes

The variables and terms are read as comma lists and paired by index, so one code path serves both the single and the simultaneous case. The style is applied to each pair separately, so that the mirror-image conventions (`slash` and `slashrev`) differ only in the order of the two arguments. The `updown` styles

are constructed differently: the delimiters enclose the expression rather than a body, and the variables and the terms are joined into a superscript and a subscript. Since `\substmark` carries no expression, it omits those delimiters, which would otherwise come out empty. The starred forms set a flag that switches the fences to `\left` and `\right`. The values of `style` and `fences` are checked as the key is set, so that a mistyped value is reported at the point where it was given rather than affecting the output silently. Writing `:=` directly would be incorrect, since the colon is a relation atom and TeX would both space it away from the equals sign and leave it on the baseline; the package therefore defers to a properly built symbol when the document provides one and otherwise centres the colon with `\mathop`, which follows the current math style, closing the remaining gap with a negative kern.

9 Changes

v0.1.0 (2026-07-30) First public version.