Package innerscript v. 1.4 User Guide

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For easy, off-the-shelf use, type the following in your document preamble and compile using LuaLaTeX:

```
\usepackage{innerscript}
```

Overview

The innerscript package optionally modifies four aspects of TeX's automatic math formatting to improve typesetting: (1) it adds extra space around relation and operation symbols in superscripts and subscripts; (2) it removes extra space around `\left`-`\right` delimiter pairs; (3) it adds extra space after right delimiters in certain situations; and (4) it forces `\left` and `\right` delimiters to completely cover their contents. Using LuaLaTeX is required.

For several years before the first release of innerscript, I wondered whether it was possible to adjust two features of TeX's automatic mathematics spacing, namely adding more space in superscripts and subscripts and removing the extra space around `\left`-`\right` delimiter pairs. LuaTeX's extra math-mode primitives make these changes possible, and innerscript grew out of my desire to implement them in my documents. For example, compare the next two lines:

$$\sum_{i=1}^{n} x_i^{1+a} \qquad f(x) = g\left(\frac{1}{x}\right) \qquad x(t)y(t) \qquad \left(\frac{x}{2}\right) \tag{1}$$

$$\sum_{i=1}^{n} x_i^{1+a} \qquad f(x) = g\left(\frac{1}{x}\right) \qquad x(t)y(t) \qquad \left(\frac{x}{2}\right) \tag{2}$$

Equation (1) uses traditional TeX formatting, and equation (2) incorporates the small tweaks characteristic of innerscript. If you like equation (2) more than equation (1), then innerscript is the package for you! This file explains how to load innerscript and enable whichever adjustments you want to use. For version history and documentation of the code, see `innerscript-code.pdf`, which is included with the package installation and is available on CTAN.

Table 1 explains which parts of equation (2) show different aspects of innerscript's behavior. At far left, the subscript under the summation symbol and the superscript of x_i have small amounts of extra space around the = and + signs respectively, and at center-left, the g is directly next to the parenthesis. At center-right, the closing parenthesis is offset from the following y, and on the right, the parentheses cover the entire fraction instead of

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Options and Behavior of innerscript

Table 1: Package Behavior Shown in Equation (2)

Part of equation (2)	Summation	Functions	Product	Fraction
Option shown	`script`	`inner`	`close`	`cover`

Table 2: Package Options for innerscript

Package Option	Meaning
`script`	Change `\scriptstyle` (and cramped style) spacing
`scriptscript`	Change `\scriptscriptstyle` (and cramped style) spacing
`inner`	Use `\mathord` spacing for `\mathinner` subformulas
`close`	Extra space between `\mathclose\mathord` pairs
`cover`	Resizable delimiters (i.e. `\left` and `\right`) fully cover contents
`no-script`	No changes to `\scriptstyle` spacing
`no-scriptscript`	No changes to `\scriptscriptstyle` spacing
`no-inner`	No changes to treatment of `\mathinner` subformulas
`no-close`	No changes to `\mathclose` atoms
`no-cover`	No changes to resizable delimiters

Table 3: Usual Space Inserted by TEX between Atoms

Consecutive Atom Types	Space Added	Consecutive Atom Types	Space Added
`\mathord\mathop`	`\thinmuskip`	`\mathclose\mathop`	`\thinmuskip`
`\mathord\mathbin`	`\medmuskip`	`\mathclose\mathbin`	`\medmuskip`
`\mathord\mathrel`	`\thickmuskip`	`\mathclose\mathrel`	`\thickmuskip`
`\mathord\mathinner`	`\thinmuskip`	`\mathclose\mathinner`	`\thinmuskip`
`\mathop\mathord`	`\thinmuskip`	`\mathpunct\mathord`	`\thinmuskip`
`\mathop\mathop`	`\thinmuskip`	`\mathpunct\mathop`	`\thinmuskip`
`\mathop\mathrel`	`\thickmuskip`	`\mathpunct\mathrel`	`\thinmuskip`
`\mathop\mathinner`	`\thickmuskip`	`\mathpunct\mathopen`	`\thinmuskip`
`\mathbin\mathord`	`\medmuskip`	`\mathpunct\mathclose`	`\thinmuskip`
`\mathbin\mathop`	`\medmuskip`	`\mathpunct\mathpunct`	`\thinmuskip`
`\mathbin\mathopen`	`\medmuskip`	`\mathpunct\mathinner`	`\thinmuskip`
`\mathbin\mathinner`	`\medmuskip`	`\mathinner\mathord`	`\thinmuskip`
`\mathrel\mathord`	`\thickmuskip`	`\mathinner\mathop`	`\thinmuskip`
`\mathrel\mathop`	`\thickmuskip`	`\mathinner\mathbin`	`\medmuskip`
`\mathrel\mathopen`	`\thickmuskip`	`\mathinner\mathrel`	`\thickmuskip`
`\mathrel\mathinner`	`\thickmuskip`	`\mathinner\mathopen`	`\thinmuskip`
		`\mathinner\mathpunct`	`\thinmuskip`
		`\mathinner\mathinner`	`\thinmuskip`

covering only most of it. Using the package will automate some or all of these changes for you depending on which options you specify.

Users can load innerscript with the standard `\usepackage` syntax, and to do so, you must typeset with LuaTEX. If it detects a different engine, innerscript will raise an error and stop loading, so you will not see any changes to the math in your document. The package provides no user-level commands—rather, you can control its functionality through the ten options in Table 2. Options `script`, and `no-script` determine how innerscript treats superscripts and subscripts, and options `scriptscript`, and `no-scriptscript` are the same except that they deal with second-order superscripts and subscripts.[1] The `inner` option tells TEX to avoid placing some extra spaces around `\mathinner` subformulas. Specifically, with this option, TEX treats the left side of a `\mathinner` subformula like a left parenthesis and treats the right side like a right parenthesis. The `close` option adds a small amount of space after a closing grouping symbol, such as a right parenthesis, when it comes before a regular variable or number, and `cover` tells TEX to make sure that resizable delimiters fully cover their contents. The `no-` variants disable formatting adjustments, and by default, innerscript enables all space adjustments described here.

The `inner`, `close`, and `cover` options are straightforward, but the options `script` and `scriptscript` warrant more explanation. With its usual math formatting, TEX adds small amounts of space between different math-mode characters depending on what types of symbols they represent, and TEX's fine-tuned math spacing is part of what makes it a great program for typesetting equations.[2] However, some spacing additions from inline and display math don't appear inside superscripts and subscripts. The `script` and `scriptscript` options address this situation by setting the interatom space in superscripts and subscripts to scaled-down versions of the standard spacing rules. Table 3 lists the space that TEX inserts between atoms of different types in display or inline math. With option `script`, innerscript sets the interatom spacing in superscripts and subscripts to be 60% of the amounts in Table 3, and with option `scriptscript`, innerscript sets the interatom space to be 40% of the amounts in Table 3.[3] Atom pairs that do not appear in Table 3 do not by default receive extra space from TEX or innerscript.

Finally, you are of course welcome to change the size of `\thinmuskip`, `\medmuskip`, or `\thickmuskip`, but I encourage you to do so before you load innerscript. If you do after loading this package, some of your changes will not register properly.

[1] Version 1.2 of innerscript provided `legacy-` options for superscripts and subscripts with slightly different spacing. As of version 1.4, those options are officially deprecated. For backwards compatibility, innerscript still accepts `legacy-script` and `legacy-scriptscript` options, but they now produce the same space adjustments as `script` and `scriptscript`.

[2] TEX classifies math symbols into eight categories: `\mathord` (ordinary), `\mathop` (big operator), `\mathbin` (binary operation), `\mathrel` (relation), `\mathopen` (opening delimiter), `\mathclose` (closing delimiter), `\mathpunct` (punctuation), and `\mathinner` ("inner" subformula). As part of its definition, every math-mode character is assigned a math class. See Donald Knuth, *The TEXbook* (Addison Wesley, 1986), 170; David Salomon, *The Advanced TEXbook* (Springer, 1995), 256–258.

[3] Technically, innerscript scales down the standard spacing twice because the exact length of a `\muskip` register varies proportionally with the surrounding font size. For example, a `\thinmuskip` inside a superscript or subscript will be about two-thirds the size of a `\thinmuskip` in regular inline math. If innerscript inserted the same `\muskip` amounts from Table 3 in superscripts and subscripts, the spacing would be exactly proportional to inline and display spacing. However, doing so produces math where the symbols appear too far apart visually, so before using them, innerscript scales down the `\muskip` amounts in Table 3.