

# The `halloweenmath` package: scary and creepy math symbols with $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{\LaTeX}$ integration\*

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## Abstract

This document describes a  $\text{\LaTeX}$  package that originates from a question asked for enjoyment on  *$\text{\TeX}$ - $\text{\LaTeX}$  Stack Exchange* (see [1]) by the user `cfr`; this package defines a handful of commands for typesetting mathematical symbols of various kinds (including “large” operators, extensible arrow-like relations, and growing arrow-like math accents) that all draw from the classic Halloween-related iconography (pumpkins, witches, ghosts, cats, and so on) while being, at the same time, seamlessly integrated within the rest of the mathematics produced by  $\text{\LaTeX}$ / $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\text{\LaTeX}$ .



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## Copyright notice

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This document has been produced by feeding to a  $\text{\LaTeX}$  typesetting engine the file `halloweenmath.dtx` version 0.01 (2017/01/06). This file is part of a work named “halloweenmath package”, and may be distributed and/or modified only as a part thereof. Subsection 3.3 on page 9 explains the conditions under which the halloweenmath package may be distributed and/or modified.

The halloweenmath package has the following LPPL maintenance status: “author-maintained”.

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Note, though, that distribution of this document alone is “distribution of only part of the Work” in the sense of the  $\text{\LaTeX}$  Project Public License, and should therefore be avoided: please distribute, in addition, the source file `halloweenmath.dtx` together with all other files listed in `manifest.txt`, as explained as well in Subsection 3.3 and in the file `manifest.txt` itself.

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Please include the *exact* phrase `halloweenmath_package` in the *subject* of your message; otherwise, your message could be thrown away by a mail filter. In this regard, the weakness of the laws concerning the protection of privacy forces me to explicitly forbid the use of the above address for any kind of advertising, marketing, polling, or similar commercial or statistical contact.

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## Introduction

On October 31, 2016, around 3 in the morning (GMT), user `cfr` asked a question [1] on the *TeX - LaTeX Stack Exchange network*, challenging other users to contribute  $\text{\LaTeX}$  documents that showcased “the spookiest, creepiest images” ever possible. I was aware of a method—well known, nonetheless—to integrate arbitrary pictures into math formulas as though they were mathematical symbols, so, on the pretext “that, since  $\text{\LaTeX}$  is a language primarily designed to handle text with math, the lack of a ‘math-flavored’ answer . . . was a gap that ought to be filled”, I wrote an answer implementing a command that drew a (not particularly spooky or creepy) little witch astride of her broom, but with the silly distinctive feature of being seen by  $\text{\LaTeX}$  as a mathematical “large” operator like `\sum`, `\prod`, `\int`, or `\bigcup`; this first command was named `\mathwitch` and was “intended for denoting the operation of applying black magic to the ensuing subformula”.

I subsequently added an extensible math accent similar to `\overrightarrow`, but with the arrow replaced by a broom carrying the same witch and a black cat, and my answer ended up winning the contest (the presence of the cat turned out to be a decisive factor); besides, some users were so enthusiast of the new commands that they requested that they were re-implemented as a new, stand-alone package. And here it is.

In the writing of the package, more features, and creatures, have been added. Also available now are:

- ghosts, both still and hovering (or, if you prefer, acting both as ordinary symbols and as math accents similar to `\overrightarrow`);
- a `\pumpkin` binary operator, with an associated “large” operator named `\bigpumpkin`<sup>1</sup> (cf. `\cup` vs. `\bigcup`, `\cap` vs. `\bigcap`, `\vee` vs. `\bigvee`, `\oplus` vs. `\bigoplus`, . . .);
- extensible “arrow-like” brooms that act as relation symbols;
- clouds, for denoting unscrutable subformulas (this one is even sensible!);
- and still more.

All the above are available for the **bold** math version as well as for the **normal** one. The symbols provided should prove sufficient for preparing lecture notes, slides, tests, or even exams to amuse (?) your students with during the Halloween period. Of course, any suggestion for additions and/or improvements are most welcome: you can find my addresses on page 3.

As for the name of this new package, `cfr` initially **proposed** `mathwitch` (from the name of the main command); **Guilherme Zanutelli** then **suggested** `mathmagics` (a truly befitting pun!); but in the end I decided to choose `halloweenmath` because (1) it instantly and clearly communicates the context in which the package arose, as well as the purpose for which it was written, and (2) it is 13 characters long.

This work is dedicated to `cfr`, without whom it would have never seen the light, and to whom I am offering it “as an Epiphany present”—or rather, as one would say in Italian, “*come regalo per la Befana*”, where the last word bears not-so-subtle connections with the world of witches. . .

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<sup>1</sup>`\greatpumpkin` is available as a synonym, in homage to Linus van Pelt.

## Disclaimer

Although a  $\text{\LaTeX}$  package is a piece of software that executes in a rather protected environment and should therefore be relatively incapable of doing serious damages, no warranty is given, as usual with computer software, that this code will work properly, or even that it will work at all. To be on the safe side, be aware that using this code can even result in loss of data and/or damages to your disks and your storage media. If you use this code, you do so exclusively at your own risk!

See Subsection 3.3 and the  $\text{\LaTeX}$  Project Public Licence for more information.

## About this document

This document, like many documentation files distributed for  $\text{\LaTeX}$ , is divided into two parts.

The first part, *User's Manual*, contains all the documentation you need to be able to *use* the `halloweenmath` package. Every user of this package will probably want to read this part.

The second part, *Implementation*, can be omitted if you want (explanations on how to omit it are given at the beginning of the part itself), and contains information that concerns only “hackers” who want to learn how the package that this document presents is *implemented*. Actually, this part contains the complete listing of the  $\text{\LaTeX}$  code that implements the macros, in the usual `DocStrip` format; if you are not a  $\text{\LaTeX}$  hacker, this part will probably have little meaning to you.

As I said above, this package is an Epiphany gift for `cfr`, and, for this reason, I want to submit it to CTAN on January 6, 2017. Regrettably, I couldn't write most of the comments in the *Implemenation* part in time for the submission, which, on the other hand, I don't want to defer to a later date for any reason whatsoever. Some sparse comments, nonetheless, are sprinkled throughout the code at certain key places, and I hope they will suffice to understand what's going on. I apologize for submitting this work in an incomplete form; unfortunately, at present I cannot even foresee when I'll be able to finish it.

# Part I

## User's Manual

### 1 About this part

This part tells you how to use the `halloweenmath` package. It also contains detailed instructions on how to install it and how to generate this same documentation, but normally you need not bother reading this information, either because your  $\text{\TeX}$  distribution already includes both the package code and its documentation, or because package installation is implicitly dealt with by the automatic update mechanism provided by the distribution itself.

### 2 How to use the `halloweenmath` package

This section explains everything you need to know in order to be able to use the `halloweenmath` package. However, to keep this document independent of the package itself, the output produced by the various commands is not shown here: for this, you are referred to [2] and to [3].

#### 2.1 Package loading

The usual `\usepackage` declaration is used, as in

```
\usepackage{halloweenmath}
```

It should be noted, however, that the `halloweenmath` package requires the `amsmath` package, and loads it (without specifying any option) if it is not already loaded. If you want to pass options to `amsmath`, load it before `halloweenmath`.

The `halloweenmath` package defines no options by itself; nevertheless, it does honor the `[no]sumlimits` options from the `amsmath` package (see below).

#### 2.2 Scary symbols

This package defines some commands *for use in mathematical mode*, which provide a handful of symbols, all of which honor the `bold` math version, when in force. They can be loosely grouped as follows.

##### 2.2.1 Pumpkins

`\pumpkin`  
`\bigpumpkin`  
`\greatpumpkin`

It is even too obvious to begin with pumpkins. In this regard, the package provides two interrelated commands:

- `\pumpkin` yields a binary operator symbol in the shape of a (little) pumpkin;
- `\bigpumpkin` is the “large” operator that is to `\pumpkin` as `\bigoplus` is to `\oplus`; it typesets a somewhat bigger pumpkin in in-line formulas, which becomes significantly larger in displayed formulas.

The `[no]sumlimits` options from the `amsmath` package also affect the `\bigpumpkin` command. As a homage to Linus van Pelt, `\greatpumpkin` is available as a perfect synonym for `\bigpumpkin`.

## 2.2.2 Witches, brooms, and black cats

All this arose from a witch.

`\mathwitch` The `\mathwitch` command yields a “large” operator symbol, similar to `\sum`, representing a witch astride of a broom (in my answers to [1], I claimed that this symbol denotes the operation of applying black magic to the ensuing subformula, a fundamental operation in so many mathematical proofs...). There is also a `\reversemathwitch` command, which produces an operator that looks like a mirror image of the above, for denoting the inverse operation of undoing the black magic. Both commands honor the `[no]sumlimits` options from the `amsmath` package.

`\xrightwitchonbroom` Witches infest the field of extensible “arrow-like” symbols too: the commands `\xrightwitchonbroom` and `\xleftwitchonbroom` are syntactically identical to, *e.g.*, `\xrightarrow`, but produce an extensible broom with a witch sitting on it. That is to say, the syntax for `\xrightwitchonbroom` is as follows

`\xrightwitchonbroom` [*under text*]{*over text*}

and `\xleftwitchonbroom` is similar.

`\overrightwitchonbroom` Finally, the four commands  
`\overleftwitchonbroom` `\overrightwitchonbroom` {*subformula*}  
`\underrightwitchonbroom` `\overleftwitchonbroom` {*subformula*}  
`\underleftwitchonbroom` `\underrightwitchonbroom`{*subformula*}  
`\underleftwitchonbroom` {*subformula*}

are similar to, *e.g.*, `\overrightarrow`, and typeset a broom, with a witch sitting on it, over or under the subformula specified in their argument.<sup>2</sup>

**Important note:** All the commands described in this subsection have a *\**-form that adds a black cat on the broomstick. The syntax should be easy to remember, since the additional asterisk can be thought of as reminiscent of the cat.

## 2.2.3 Ghosts

Of course, on Halloween, ghosts cannot be missing either.

`\mathghost` There are three similar commands (without arguments) that produce ordinary symbols, that is, symbols that are treated like letters: the `\mathghost` command yield a symbol resembling a ghost standing upfront; the `\mathrightghost` (resp., `\mathleftghost`) command gives a symbol that looks like a ghost moving toward the right (resp., the left).

`\xrightswishingghost` Once again, ghosts too haunt the region of extensible “arrow-like” symbols:

`\xleftswishingghost` `\xrightswishingghost` [*under text*]{*over text*}  
`\xleftswishingghost` [*under text*]{*over text*}

are analogous to, *e.g.*, `\xrightarrow`, but, in place of the arrow, draw a ghost swishing, respectively, toward the right and toward the left.

`\overrightswishingghost` It is now easy to guess what the following four commands do:

`\overleftswishingghost` `\overrightswishingghost` {*subformula*}  
`\underrightswishingghost` `\overleftswishingghost` {*subformula*}  
`\underleftswishingghost` `\underrightswishingghost`{*subformula*}  
`\underleftswishingghost` {*subformula*}

<sup>2</sup>It should be noted that, in my answers to [1], only the command that now corresponds to `\overrightwitchonbroom` was provided, but under the different name `\overrightbroom`.

## 2.2.4 Other symbols

The `halloweenmath` package implements one more symbol that could loosely be connected with the world of witches.

`\mathcloud`  
`\reversemathcloud`

Mathemagicians often deal with unscrutable formulas. To represent them, the `\mathcloud` command (without arguments) is available, which produces a symbol, with the form of a cloud, that behaves to a certain extent like a fraction, in that it is typeset in a significantly larger size in displayed formulas than in in-line ones. The companion command `\reversemathcloud` yields a mirror image of the same symbol.

## 2.3 Script-style version of standard over/under arrows

In order to implement our over/under “arrow-like” symbols, we had to develop an extension of some internal macros of the `amsmath` package. These extensions can be applied to produce variants of the standard over/under arrows too.

`\overscriptrightarrow`  
`\overscriptleftarrow`  
`\overscriptleftrightarrow`  
`\underscriptrightarrow`  
`\underscriptleftarrow`  
`\underscriptleftrightarrow`

The following six commands are analogous to their standard counterparts whose names do not contain the `script` substring, but the arrows they put above or below the given subformulas are typeset in their relative script style, instead of in the same style as the subformulas themselves (as the standard commands do):

`\overscriptrightarrow`      $\{\langle subformula \rangle\}$   
`\overscriptleftarrow`      $\{\langle subformula \rangle\}$   
`\overscriptleftrightarrow`  $\{\langle subformula \rangle\}$   
`\underscriptrightarrow`      $\{\langle subformula \rangle\}$   
`\underscriptleftarrow`      $\{\langle subformula \rangle\}$   
`\underscriptleftrightarrow`  $\{\langle subformula \rangle\}$

# 3 Installing the halloweenmath package and generating this manual

As usual for L<sup>A</sup>T<sub>E</sub>X distributions, the `halloweenmath` package is distributed in the form of a `.dtx` file, namely `halloweenmath.dtx`, and an accompanying `.ins` file, namely `halloweenmath.ins`.

## 3.1 Installation

To extract the code, run L<sup>A</sup>T<sub>E</sub>X (or plain T<sub>E</sub>X) once on the file `halloweenmath.ins`. This will generate the following L<sup>A</sup>T<sub>E</sub>X input file:

`halloweenmath.sty`

To finish the installation, move it to a L<sup>A</sup>T<sub>E</sub>X input directory. The above listing of the files you need to move is also displayed on the terminal at the end of the run of the file `halloweenmath.ins`. The documentation of your T<sub>E</sub>X installation should tell you how to find the L<sup>A</sup>T<sub>E</sub>X input directory/ies, and probably also how to create new L<sup>A</sup>T<sub>E</sub>X input directories reserved to contain your private classes and packages.

The *proposed* TDS-compliant directory where the above file should be put is

`$TEXMF/tex/latex/halloweenmath/`



Please note that before using the `halloweenmath` package you must read its license (see Subsection 3.3) to see whether its terms are acceptable for you, especially for what concerns the lack of any warranty; if they are not, don't use this program.

## 3.2 Documentation

To produce this documentation, run  $\text{\LaTeX}$  three times (for the table of contents to be correct) on the file `halloweenmath.dtx`. This won't produce the index and the change history, however: for those, you have to run *MakeIndex* on the files `halloweenmath.idx` and `halloweenmath.glo`, produced during the last of the aforesaid three  $\text{\LaTeX}$  runs, with the styles `gind.ist` and `gglo.ist`, respectively (these styles are part of the standard  $\text{\LaTeX}$  distribution); then pass `halloweenmath.dtx` through  $\text{\LaTeX}$  twice more.

The documentation produced by default includes the *Implementation* part too; see the beginning of this part for instructions on how to omit it.

## 3.3 License

The `halloweenmath` package is *not* in the public domain: its author, Gustavo MEZZETTI, owns the copyright, and in general retains all the rights therein; but as a special exception, the author grants you the permissions indicated below.

### 3.3.1 Distribution and/or modification

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`http://www.latex-project.org/lppl.txt`

and version 1.3 or later is part of all distributions of  $\text{\LaTeX}$  version 2005/12/01 or later.

The `halloweenmath` package has the LPPL maintenance status “author-maintained”.

The file `manifest.txt` included along with this file specifies what the `halloweenmath` package consists of; more precisely, it explains how the locutions “Work” and “Compiled Work”, used in the  $\text{\LaTeX}$  Project Public License, are to be interpreted in the case of this work.

### 3.3.2 Use

The use of the `halloweenmath` package is unrestricted, provided that you accept the terms and conditions of the  $\text{\LaTeX}$  Project Public License and of the following subsection for what concerns the absence of any warranty.

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## References

- [1] *Seasonal Challenge (Contributions from T<sub>E</sub>Xing Dead Welcome)*,  
<http://tex.stackexchange.com/q/336768/69818>
- [2] *A short manual for the halloweenmath package*, in preparation.
- [3] *A sample article that uses the halloweenmath package*, in preparation.

## Change History

0.01

General: First writing of the code . 1

## Index

Numbers in *italics* refer to the page where the corresponding entry is described, the ones underlined to the code line of the definition, the rest to the code lines where the entry is used.

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