Imaxima Manual

Version 1.0
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Imaxima

Imaxima is a package for displaying the output from the computer algebra system Maxima as images typeset by TEX.

This manual documents imaxima version 1.0. You can download the latest version of imaxima from http://sites.google.com/site/imaximaimath/.

Since version 1.0b, imaxima and imath supports inline graph.

Send suggestions and bug reports to Yasuaki Honda.

1 Installation

Install imaxima by unpacking the tarball and doing the usual incantation

```
./configure
make
make install
```

and put

```
(autoload 'imaxima "imaxima" "Image support for Maxima." t)
```

in your '`.emacs`' file.

If you use Interactive Math minor mode, put

```
(autoload 'imath-mode "imath" "Interactive Math minor mode." t)
```

in your '`.emacs`' file.

To do line breaking imaxima requires the LaTeX package `breqn`. This package is officially distributed by Morten Hgholm from http://www.ctan.org/tex-archive/macros/latex/contrib/mh as mh.zip.

Alternatively, for the easy installation, you may download http://members3.jcom.home.ne.jp/imaxima/breq Compared to mh.zip, breqn097a.zip contains all the '`*.sty`' and '`*.sym`' files in it.

The files in `breqn` must be installed in a place where TEX can find them. In a typical teTeX installation you should put the '`*.sty`' and '`*.sym`' files in

'`/usr/share/texmf/tex/latex/breqn/`'

and the documentation files in

'`/usr/share/texmf/doc/latex/breqn/`'.

The files can also be installed in a number of other places—consult your TEX documentation for details.

Now run `texhash` after installing the files. You can use the command `kpsewhich` to verify that TEX is able to find the files, e.g.

```
kpsewhich breqn.sty
```

To get the best image quality a fairly recent version of Ghostscript is recommended. See Section 4.3 [Miscellaneous], page 6, for options suitable for using older versions of Ghostscript or not using Ghostscript at all

1.1 Manual installation

If you cannot use `make`, the manual steps required for installation are

- Byte compile '`imaxima.el`' and '`imath.el`'.
- Place the files '`imaxima.el`', '`imaxima.elc`', '`imath.el`', '`imath.elc`', '`imaxima-autoconf-variables.el`' and '`imaxima.lisp`' in Emacs' `load-path` (see Section "Lisp Libraries" in *The Emacs manual*).
- Install the TEX files in the way explained above.

2 Usage

To start using imaxima just type *M-x imaxima*.

`imaxima` [Function]
: Starts a Maxima session in an Emacs buffer.

You can turn image generation off by evaluating

```
display2d:true
```

in Maxima. Output from Maxima is then shown with the usual ASCII graphics. To turn images on again, evaluate

```
display2d:imaxima
```

If there is an error in a LaTeX expression you can press *Mouse-2* (or `RET`) on the error message to view the error log and *Mouse-3* (or *M-RET*) to view the LaTeX source file.

`imaxima-use-maxima-mode-flag` [User Option]
: Set to non-`nil` to use the Maxima mode from `maxima.el`.

  By default `imaxima.el` uses a very simple mode which doesn't provide any custom menus, font-locking or key-bindings. You can, however, combine `imaxima.el` with the Emacs mode from the Maxima distribution to get these features.

`imaxima-latex` [Function]
: Converts the Maxima buffer to a LaTeX document and opens it in LaTeX mode. *Note:* This command does not work in XEmacs.

`imaxima-to-html` [Function]
: Converts the Maxima buffer to a HTML document named session.html and opens it in HTML mode. All the PNG files generated by imaxima for each output from Maxima are gathered in a folder named session-images and referenced from session.html. *Note:* This command does not work in XEmacs.

`imaxima-clean-up` [Function]
: Delete temporary files created by imaxima and kill the Ghostscript process if it is running. Normally imaxima does this automatically when you quit Maxima. This command is just a convenience if this doesn't happen.

`imaxima-version` [Function]
: Display the package name and the version number of the imaxima imath package in the mini buffer. You should make sure the version information when you want to make bug reports.

3 Inline Graph

Since version 1.0b, imaxima and imath supports the inline graph display feature. That is, if a special graph command (such as wxplot2d, wxplot3d) is used in the maxima session, the graph generated by the command is inserted in the maxima session buffer, instead of displaying in other window.

Before using this feature, you must make sure `plot2d` does work with Gnuplot by trying:

```
(%i1) plot2d(x^2,[x,-5,5],[plot_format,gnuplot]);
```

If this works fine, then quite likely `wxplot2d` works, too.

Following commands can be used in a maxima session to draw graphs to be displayed inline: `wxplot2d`, `wxplot3d`, `wxdraw2d`, `wxdraw3d`, `wximplicit_plot`, and `wxcontour_plot`.

They correspond to their original commands `plot2d`, `plot3d`, `draw2d`, `draw3d`, `implicit_plot`, and `contour_plot`.

The syntax of the wx-prefixed versions of the commands and their arguments are the same as the ones of the corresponding original commands. Hence, `wxplot2` draws a graph inline in maxima session, while `plot2d` displays the same graph in the different window.

The wx-prefixed versions of the commands set up arguments so that Gnuplot is used to draw the graph and writes the graph in extended postscript format into a temporary file. So, it is suggested not to use plot options such as `plot_format`.

`wxdraw2d` and `wxdraw3d` autamatically load the draw package since they call `draw2d` and `draw3d` internally.

4 Options

All options can be changed in the Emacs customize interface, use *M-x customize-group RET imaxima RET*.

4.1 Appearance

`imaxima-pt-size` [User Option]
The type size used in LaTeX. This can be '`9`', '`10`', '`11`' or '`12`' pt.

`imaxima-fnt-size` [User Option]
Default size of font. Options include '`small`', '`normalsize`', '`large`', '`Large`', '`LARGE`', '`huge`' or '`Huge`' (in non decreasing order).

`imaxima-scale-factor` [User Option]
Scale all images by this factor. The default is '`1.0`'.

Note: The options `imaxima-pt-size`, `imaxima-fnt-size` and `imaxima-scale-factor` are highly non-orthogonal.

`imaxima-equation-color` [User Option]
Color used for equations.

`imaxima-label-color` [User Option]
Color used for output labels (red by default).

`imaxima-bg-color` [User Option]
Background color used in the imaxima buffer. `nil` if you don't want to change the default color.

`imaxima-fg-color` [User Option]
Foreground color used in the imaxima buffer. `nil` if you don't want to change the default color.

`imaxima-latex-preamble` [User Option]
LaTeX expression inserted at the start of the document preamble when TeX'ing equations. This can be used to change, say, the document font. E.g.

```
\usepackage{concrete}
\usepackage{euler}
```

will use Herman Zapf's Euler math fonts and the accompanying Concrete roman fonts. These are probably better suited as screen fonts than the default Computer Modern, which works best at high resolutions.

`imaxima-latex-error-face` [User Option]
Face used for LaTeX errors. This option is ignored when using `maxima.el`.

4.2 Line Breaking

Imaxima usually does a decent job of breaking lines that are too wide to fit in the buffer (thanks to the `breqn` LaTeX package). However, this doesn't work so well for very long fractions, superscripts and subscripts. Imaxima has two ways of dealing with this:

- Scaling.
- Rewriting the equation in a "linear" form which can be split over several lines.

The following options control how this is done.

`imaxima-max-scale` [User Option]
: Maximum amount of scaling allowed to fit wide equations in the buffer. The default is `0.85`, which allows images to be scaled down to 85% of the original size. `nil` disables scaling and `t` allows unlimited scaling.

`imaxima-linearize-flag` [User Option]
: Non-`nil` allows fractions, superscripts, subscripts and square roots to be linearized to fit in the buffer. That is

$$a^b \quad a_b \quad \frac{a+b}{c+d} \quad \sqrt{a+b}$$

: are written as

$$\mathrm{expt}(a,b) \quad \mathrm{subscript}(a,b) \quad (a+b)/(c+d) \quad (a+b)^{1/2}$$

4.3 Miscellaneous

If the required files are in your path, you shouldn't normally need to change these options.

`imaxima-image-type` [User Option]
: Image type used in the buffer. PNG, JPEG, TIFF and PostScript are supported. In my opinion PNG gives the best results, but if your Emacs wasn't compiled with PNG support you could try one of the others. PostScript doesn't require Ghostscript to be installed. XEmacs can not display PostScript images, so this type does not work in XEmacs.

`imaxima-gs-program` [User Option]
: Ghostscript executable

`imaxima-gs-options` [User Option]
: Options passed to `gs` when converting EPS to other image formats. Older versions of Ghostscript don't support anti-aliasing. In that case you might have to remove the options '`-dTextAlphaBits=4`' and '`-dGraphicsAlphaBits=4`'.

`imaxima-dvips-program` [User Option]
: Dvips executable.

`imaxima-dvips-options` [User Option]
: Command line options passed to `dvips` when converting EPS files to DVI.

`imaxima-tmp-dir` [User Option]
Directory used for temporary files created by imaxima. '`/tmp`' by default.

`imaxima-lisp-file` [User Option]
The Lisp file used to initialize Maxima.

`imaxima-tex-program` [User Option]
TEX executable.

`imaxima-initex-option` [User Option]
Option passed to TEX to start it in the "initial" form capable of dumping format files.

`imaxima-maxima-program` [User Option]
Maxima executable.

`imaxima-maxima-options` [User Option]
Command line arguments passed to Maxima. If you have Maxima versions compiled with different Lisps, you can use this to select which one to use. E.g. '`--lisp=cmucl`' will choose the version compiled with CMUCL.

`imaxima-startup-hook` [User Option]
Hook run when starting imaxima.

`imaxima-exit-hook` [User Option]
Hook run when exiting imaxima.

`imaxima-html-dir` [User Option]
When imaxima-to-html function is called, the function determines the directory into which the session.html file and the session-images directory are created. The default value is "~".

5 Imath minor mode

The imath minor mode provides a small set of functions to aid insert math formulas into plain text.

A math formula is written using a Maxima form whose syntax is {maxima a formula maxima} where a formula is a string which can be accepted as Maxima command input. C-c [inserts a template for a maxima form.

The other way to write a math formula is to use LaTeX form whose syntax is {latex a formula latex} where a formula is a valid LaTeX commands. C-c] inserts a template for a latex form.

Example maxima and latex forms are:

```
{maxima integrate(f(x),x) maxima}
{maxima sum(a[n],n,0,i) maxima}
{latex  \\int {f\\left(x\\right)}{\\;dx} latex}
{latex  \\sum_{n=0}^{i}{a_{n}} latex}
```

Assuming the cursor position is right after a form or in the middle, C-c ! transforms the form into the formula image using the Imaxima functionality.

If the resulting image is not what you want, you may want to edit the formula again. To do this, place the cursor right after the image and C-c &. Then the image is removed and original form appears at the position.

When saving the buffer into a file, images are discarded. However, maxima forms and their correspoding latex forms are kept there in the text. If the text is loaded again into Emacs and imath minor mode is enabled, you can type C-c $ to restore all the images for the forms in the buffer.

```
\C-c[   Compose Maxima form
\C-c]   Compose Latex form
\C-c!   Transform a form to an image
\C-c$   Transform all forms to images
\C-c&   Remove the image to restore the original form text
```

You can export the imath mode buffer contents into HTML using a command named imath-to-html. This command can be invoked by M-x imath-to-html. Then a buffer is created, visiting a file whose name is the same as the original imath text file, only exception being .html as the file extension. Upon saving, the file is placed in the same directory as the original file. Also a directory is created whose name is the same as the imath text file, but removing the extension and add -images. Images for formulas are copied in this directory.

6 Index

(Index is nonexistent)

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