

# CATEX DOCUMENTATION

YVES GUIRAUD

INRIA  $\pi r^2$ , IRIF, Université Paris 7  
yves.guiraud@pps.univ-paris-diderot.fr

## 1. PRESENTATION

Catex is an external tool for (pdf)Latex to produce diagrams for 2-cells in free 2-categories. It is made of a Latex package and a program, available in two versions, one for Windows and one for a Java virtual machine. The Catex package extends Latex with additional commands to define graphical representations of the generating 2-cells, like  $\nabla$ ,  $\triangleleft$  or  $\bowtie$  for  $\mu : 2 \Rightarrow 1$ ,  $\delta : 1 \Rightarrow 2$  and  $\tau : 2 \Rightarrow 2$ , respectively. To build diagrams, one writes algebraic expressions for 2-cells in the Latex source file, like

$$(\delta * \delta) * (1 * \tau * 1) * (\mu * \mu).$$

The Catex program translates those expressions into Latex commands (using the TikZ package), so that another Latex compilation yields



## 2. INSTALLATION

**2.1. List of files.** The distribution of Catex contains the following files:

- `catex.sty` is the Latex package. In a standard Latex installation, it should be placed in a subdirectory `/tex/latex/catex/` of your local Latex installation.
- `catex.exe` is the Windows executable. It should also be usable on Linux and Mac OS X with Wine, see <http://www.winehq.org>.
- `catex.jar` is the Java executable. *\* Not updated currently \**
- `documentation.pdf`, this document.
- `documentation.tex` is the source Latex file used to produce this document. It can be used to test if your Catex installation is correct.

**2.2. MiKTeX users.** The Latex package file `catex.sty` should be placed in a directory such as `C:\Program Files\MiKTeX 2.8\tex\latex\catex\`. Then, one has to update the package database so that MiKTeX is aware of this package existence. For that, open MiKTeX settings (there should be a link in the MiKTeX directory of the Start Menu), go to the General tab and click the Update Formats button. See <http://www.miktex.org> for more information.

**2.3. WinShell users.** To make a WinShell user tool, go to WinShell Options menu, select User tools. Choose an empty slot, choose a name, insert the path to `catex.exe` and write `"%c.catex"` in the Command field. Check the box "(pdf)Latex first" if you want (pdf)Latex to be run automatically before Catex when the source file has been changed. Check the box "DOS" if you want to redirect the standard output from the shell to WinShell output window. See <http://www.winshell.org> for more information.

## 3. USAGE

**3.1. General usage.** Catex is used like Bibtex:

1. A first Latex run on `xxx.tex` creates a list of diagrams in an auxiliary file `xxx.catex`.
2. An execution of Catex on `xxx.catex` computes the diagrams and exports them in TikZ format in `xxx.catix`. It is (only) necessary when one changes diagrams in the source file.
3. A second Latex run on `xxx.tex` includes all the computed diagrams.

**3.2. Loading the Catex package.** The command

```
\usepackage{catex}
```

loads the Catex package. It requires and loads the TikZ package.

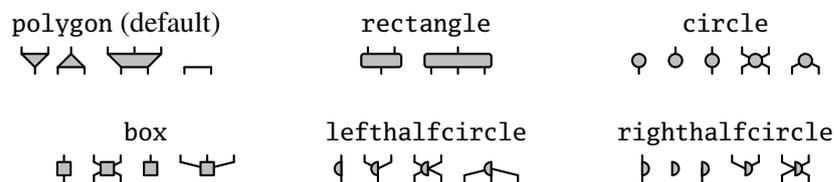
**3.3. Defining generating 2-cells.** The command

```
\deftwozell[options]{xxx : m -> n}
```

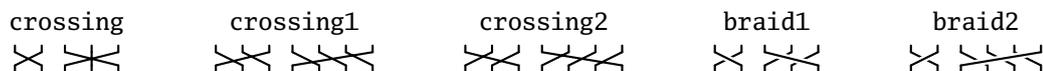
defines a new generating 2-cell called `xxx`, with source and target of size `m` and `n` respectively. The optional argument can precise its shape and/or its colour, separated by a comma and in any order. The command can be issued anywhere before the 2-cell is required in a diagram. The defined generating 2-cell replaces any other one with the same name in every subsequent diagram in the Latex file.

The colours of generating 2-cells can be chosen among the ones recognised by the `xcolor` package, with `lightgray` as default value. The shapes of generating 2-cells can be chosen among:

- General shapes:



- Various crossings, whose source and target must be equal:







```
&& {\twoocell{(mu *0 mu) *1 mu }}
\ar@3@/_2ex/ [urr] _-^{*+{\twoocell{(mu *0 2) *1 alpha}}
\ar@{} "src";[] |-{\twoocell{aleph}}
}
\]
```

There is a compatibility issue between Catex and `\CompileMatrices` option of `xypic`: the first Latex run compiles the matrices before Catex has compiled the diagrams inside them, so that matrices are not adjusted according to the size of the Catex diagrams they contain. Thus, one should either comment out the option or replace the guilty `\xymatrix` command with an `\xymatrixnocompile` for one Latex run.

## 5. COMMENTS

**5.1. Tools used.** Catex has been made using the following tools:

- The Catex program is coded in OCaml, see <http://ocaml.org>.
- The Java version is compiled using Caml-Java, see <http://www.ocamljava.org>.
- The Latex code produced by Catex relies on the PGF macro package and its syntax layer called TikZ, see <http://sourceforge.net/projects/pgf>.

**5.2. Acknowledgments.** I wish to thank Éric Domesjoud, for his invaluable help with the integration of Catex with Latex, both for the general Bibtex-like design and for the Latex package, and Xavier Clerc, for his help in producing the Java version of Catex with OCaml-Java.