

GNU T_EX_{MACS}, a free software platform for scientific editing*

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*. This document has been written using the GNU T_EX_{MACS} text editor (see www.texmacs.org).

The T_EX_{MACS} project in summary

- Inspired from Emacs and L^AT_EX.
- Project initiated by JORIS VAN DER HOEVEN, in 90's.
- Licenced under GNU GPL v3.
- Cross-platform (works under GNU/Linux, Windows, MacOS and some other unices).
- Mainly developed within MAX team, at LIX laboratory (in south of Paris).
- About 10 regular developers/contributors.
- 347 000 lines of code (almost Scheme and C++).
- Popcon Debian : around 1500 regular users.
- Current version : T_EX_{MACS} 1.0.7.19.
- Website : www.texmacs.org.
- Users' mailling list : texmacs-users@texmacs.org.

Example of use

Anyone caught using formulas such as $\sqrt{x+y} = \sqrt{x} + \sqrt{y}$ or $\frac{1}{x+y} = \frac{1}{x} + \frac{1}{y}$ will fail.

The binomial theorem is

$$(x+y)^n = \sum_{k=0}^n \binom{n}{k} x^k y^{n-k}.$$

A favorite sum of most mathematicians is

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}.$$

Likewise a popular integral is

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

Theorem 1. *The square of any real number is non-negative.*

Proof. Any real number x satisfies $x > 0$, $x = 0$, or $x < 0$. If $x = 0$, then $x^2 = 0 \geq 0$. If $x > 0$ then as a positive time a positive is positive we have $x^2 = x x > 0$. If $x < 0$ then $-x > 0$ and so by what we have just done $x^2 = (-x)^2 > 0$. So in all cases $x^2 \geq 0$. \square

See also : [Noeth.tm](#)

A structured word processor

Inspired from L^AT_EX:

- We describe a document whereas drawing it (content/presentation separation).
- The content rendering is contextualized.
- We use stylesheets.

But:

- It's *WYSIWYG*! (no need to struggle with/against esoteric *T_EX compiler).
- Not Ascii-only (scientific documents (even maths!!) has a right to pictures!).
- Abilities for interactive contents.
- Revised ergonomics (structured {browsing, editing, selecting}, menus and toolbars contextualized).

And also main features needed in a word processor:

- orthographic correction;
- slides mode;
- revision management;
- etc.

Mathematic typography

Inputing formulas (e.g. fraction):

- Via the menus : e.g. Insert → Fraction.
- Via L^AT_EX ‘compatibility mode’ : e.g. `\ F R A C` Return.
- Via T_EX_{MACS} shortcuts : e.g. `Alt+F`.

Efficient symbols inputing (in math mode `$`) :

- Via graphical mimetism : e.g. `=>` insert \Rightarrow ; `~ -` insert \simeq .
- Via some variants : e.g. `=> Tab` insert \Downarrow ; `A Tab` insert α .
- Via structure variants : e.g. switching between $\begin{pmatrix} a & b \\ 0 & c \end{pmatrix}$ and $\begin{vmatrix} a & b \\ 0 & c \end{vmatrix}$.
- Comparison with L^AT_EX :

	L ^A T _E X	T _E X _{MACS}
$\sum \alpha^i$	<code>p(x) = \sum \alpha^i</code>	<code>Shift+F5 Shift+S A Tab ^ I</code>
$a \neq 0 \Rightarrow a = 1$	<code>a \neq 0 \Leftrightarrow a = 1</code>	<code>A = / 0 < = > A = 1</code>

Semantic editing :

$$O(O(d^\omega + \dots + \log_2 q))$$

$$O(d^\omega + \dots + \log_2 q)$$

Extensibility

Document programming:

- Variable assignation: $\langle \text{assign} | \text{speed} | \overrightarrow{V_{\text{aero}}} \rangle$.
- Macros assignation: $\langle \text{assign} | \text{pderiv} | \langle \text{macro} | \text{what} | \text{by} | \frac{\partial \text{what}}{\partial \text{by}} \rangle \rangle$
 $\langle \text{pderiv} | \langle \text{speed} \rangle | \text{t} \rangle \Rightarrow \frac{\partial \overrightarrow{V_{\text{aero}}}}{\partial t}$
- Local assignation: $\langle \text{with} | \text{color} | \text{red} | \text{Attention !!!} \rangle \Rightarrow \text{Attention !!!}$

TEX_{MACS} programming:

- TEX_{MACS} is dynamically extensible via Scheme.

```
Scheme] (kbd-map ("t h m" (make 'theorem))))
```

- Any TEX_{MACS} buffer is accessible and modifiable from Scheme.

```
Scheme] (tree-replace (buffer-tree) '(concat (TeXmacs) " programming:") "Foo bar")
```

```
Scheme] (tree-replace (buffer-tree) "Foo bar" '(concat (TeXmacs) " programming:"))
```

Interface for symbolic and algebraic calculus

Welcome to Mathemagix-light 0.4

This software falls under the GNU General Public License

It comes without any warranty whatsoever

www.mathemagix.org

(c) 2001-2010

```
Mmx] use "symbolix"
```

```
Mmx] derive(p(x)^x, x)
```

$$\left(\frac{p'(x)x}{p(x)} + \log(p(x)) \right) p(x)^x$$

```
Mmx] | a b |
      | c d |
```

$$ad - bc$$

```
Mmx] ( a 0 ) ( d )
      ( b c ) ( e )
```

$$\begin{bmatrix} ad \\ bd + ce \end{bmatrix}$$

```
Mmx] ( a 0 )
      ( b c )
```

$$\begin{bmatrix} a & 0 \\ b & c \end{bmatrix}$$

Interface for numeric calculus

scilab-5.3.3

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```
-->A=[0,1;0,0]
```

A =

$$\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$$

```
-->B=[1;1];
```

```
-->C=[1,1];
```

```
-->S1=syslin('c',A,B,C)
```

S1 =

$$\begin{cases} \dot{X}(t) = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} X(t) + \begin{pmatrix} 1 \\ 1 \end{pmatrix} U(t) \\ Y(t) = (1 \ 1) X(t) \end{cases}$$

```
-->ss2tf (S1)
```

ans =

$$\frac{1+2s}{s^2}$$

Advanced Interfaces for symbolic calculus

- Switches:

$$\text{Mathemagix } \text{derive}(p(x)^x, x) \Rightarrow \left(\frac{p'(x)x}{p(x)} + \log(p(x)) \right) p(x)^x$$

- Substitution:

The derivative of $p(x)^x$ w.r.t x is: $\text{derive}(p(x)^x, x)$.

$$\text{Ctrl+Return} \Rightarrow \text{The derivative of } p(x)^x \text{ w.r.t } x \text{ is: } \left(\frac{p'(x)x}{p(x)} + \log(p(x)) \right) p(x)^x.$$

- Label/reference evaluation:

The derivative of $\overset{\text{func}}{p(a)^x}$ w.r.t. $\overset{\text{var}}{x}$ is: $\text{derive}(\text{func}, \text{var})$.

\Rightarrow The derivative of $\overset{\text{func}}{p(a)^x}$ w.r.t. $\overset{\text{var}}{x}$ is: $p(a)^x \log(p(a))$.

- Spreadsheet:

$a x$	$=\text{derive}(a1, x)$	\Rightarrow	$a x$	a
x^a	$=\text{derive}(a2, x)$		x^a	$x^{a-1} a$
$u(x) v(x)$	$=\text{derive}(a3, x)$		$u(x) v(x)$	$u'(x) v(x) + v'(x) u(x)$

Interoperability

Possibles imports:

- HTML / MathML.
- L^AT_EX (demo).
- BibT_EX.

Possibles exports:

- Paper (ps, pdf).
- Web (HTML/MathML).
- L^AT_EX.
- BibT_EX.
- XML Tree (without DTD).
- Plain text.