Giac and its interfaces

Frederic Han

Université Paris 7, IMJ-PRG

September 3, 2015

- Giac is the main C++ library used in the CAS **Xcas**
- author: Bernard Parisse (Institut Fourier Grenoble, France) `www-fourier.ujf-grenoble.fr/~parisse/giac.html`
- 2000-
- GPLv3+
- formal calculus by GIAC helped by GMP, MPFR, PARI, NTL ...
- numeric computations, plots, stats ... uses GSL, MPFI ...
- Native binaries provided for linux, macos, windows 32 and 64. (Fastest is linux 64)
- For low configurations (ex Pocket Calculator HP Prime), most functions stay available without PARI, NTL, GSL, MPFI...

Xcas

The FLTK based GUI by B. Parisse

- FLTK based GUI. (well documented)
- Symbolic style similar to maple. (no ring, no conversions, expressions are not automatically expanded..., rootof...)
- Educational sofware mixing symbolic calculus and interactive geometry 2D and 3D Opengl).
- symbolic and numeric solver for equations and some inequations, integration ...
- interesting implementation of products and groebner basis.

Other interfaces with giac syntax

- the console interface provided by B. Parisse is named **icas** or **giac** (linux, macos, windows)
- Since 2012 there is a Qt interface: **Qcas** by Loic Lecoq and FH.
  - `http://webusers.imj-prg.fr/~frederic.han/qcas`
  - Calculus is implemented with mathml output. Most of the 2D output and interactive geometry is implemented but 3D output is not implemented nor the spreadsheet.

Giacpy: a Cython interface to giac

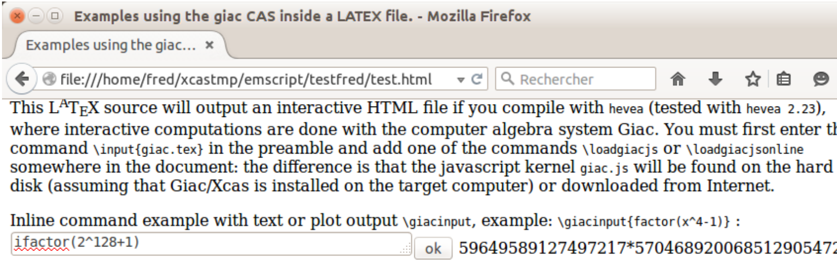
http://webusers.imj-prg.fr/~frederic.han/xcas/giacpy

- One version for python 2 or 3.
  - debian packages avaible in giac's debian repo.
  - windows binaries for some python versions are avaible on my page.
- A fork for sage.
  - use of gmp integers between sage/giac instead of strings.
  - optional spkg of giac and giacpy are avaible since sage 6.8.

Building interactive html pages from latex files

(Developpement feature. giac.js is built from giac with **emscript**)

- giac.tex + giac.js + hevea.sty ⇒ interactive html pages.


Examples using the giac CAS inside a LATEX file. - Mozilla Firefox
Examples using the giac... ×
file:///home/fred/xcastmp/emscript/testfred/test.html
Rechercher

This $\LaTeX$ source will output an interactive HTML file if you compile with `hevea` (tested with `hevea 2.23`), where interactive computations are done with the computer algebra system Giac. You must first enter th command `\input{giac.tex}` in the preamble and add one of the commands `\loadgiacjs` or `\loadgiacjsonline` somewhere in the document: the difference is that the javascript kernel `giac.js` will be found on the hard disk (assuming that Giac/Xcas is installed on the target computer) or downloaded from Internet.

Inline command example with text or plot output `\giacinput`, example: `\giacinput{factor(x^4-1)}` :

```
ifactor(2^128+1)
```
ok 59649589127497217*57046892006851290547

- Online example to test yourself at:

`www-fourier.ujf-grenoble.fr/~parisse/giac/xcasen.html`

Local computing in javascript with giac.js

On my 2012 notebook, computing offline in firefox:

- **ifactor(2**128+1)** in 0.15s, **ifactor(3**128+1)** in 2.4s. (2 times slower than with the C++ giac library)
- with **f:=normal((x+y+z+1)**32+1):;** (6545 terms) then expanding the product with **normal(f*(f+1)):;** takes 3.5s (10 times slower than with the C++ giac library)

Thank You