

Giac and polynomial computations

Frederic Han

Université Paris 7, IMJ-PRG

September 3, 2015

- Products of polynomials (since 3 or 4 years)
- Groebner basis over \mathbb{Q} (since 2 years? revlex only in the current stable version: 1.2.0)

Products examples

- to expand and simplify terms with giac use **ratnormal** or **normal**.

Ex: $f := \text{normal}((x + y + z + 1) ** 34 + 1) ;;$

- the **expand** command is very slow (pedagogical tool?)
- Let f be the expanded form of $(x + y + z + 1)^n + 1$ and compute the expanded form of $f * (f + 1)$:

Products examples

- to expand and simplify terms with giac use **ratnormal** or **normal**.

Ex: $f := \text{normal}((x + y + z + 1) ** 34 + 1) ;;$

- the **expand** command is very slow (pedagogical tool?)
- Let f be the expanded form of $(x + y + z + 1)^n + 1$ and compute the expanded form of $f * (f + 1)$:
- with giac 1.2.0 from sage, for $n \leq 34$ giac stays under 1s.
 $n = 34$ giacpy cpu/wall: 0.79s, 0.48s (sage and singular > 15s)

Products examples

- to expand and simplify terms with giac use **ratnormal** or **normal**.

Ex: $f := \text{normal}((x + y + z + 1) ** 34 + 1) ::$

- the **expand** command is very slow (pedagogical tool?)
- Let f be the expanded form of $(x + y + z + 1)^n + 1$ and compute the expanded form of $f * (f + 1)$:
- with giac 1.2.0 from sage, for $n \leq 34$ giac stays under 1s.
 $n = 34$ giacpy cpu/wall: 0.79s, 0.48s (sage and singular $> 15s$)
- $n = 35$ giacpy cpu/wall: 3.13s, 3.13s
- $n = 36$ giacpy cpu/wall: 3.31s, 3.31s

Groebner basis examples

- `giac` **gbasis** over the rational field has a modular algorithm with either probabilistic reconstruction or not.
- from `sage`: computation with `giacpy` + conversion to `sage` polynomial ring of a groebner basis for:
 - cyclic 8 over Rational Field GB computation with `giac` with proba reconstruction Time: CPU 292.47 s, Wall: 64.42 s
 - cyclic 8 over Rational Field GB computation with `giac` without proba reconstruction Time: CPU 425.84 s, Wall: 165.59 s
Polynomial Sequence with 372 Polynomials in 8 Variables
 - cyclic 9 over Rational Field with proba reconstruction cyclic 9 over Rational Field
Time: CPU 47h, Wall: 7h (< 8Go of RAM)