

*-Combinat

Sharing algebraic combinatorics since 2000

Florent Hivert, Nicolas M. Thiéry et al.

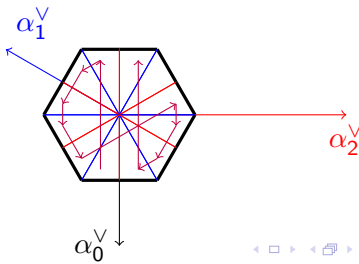
LITIS, Université de Rouen

Laboratoire de Mathématiques d'Orsay, Université Paris Sud / UC-Davis

*-Combinat Workshop, July 25-29, 2008

<http://mupad-combinat.sf.net/>

<http://combinat.sagemath.org/>



*-Combinat

An open-source framework
For computer exploration
In algebraic combinatorics

*-Combinat in a nutshell

Short history and why switch to Sage

Demo

Status of the switch to Sage, advanced demo, and future directions

It all started there



*-Combinat figures

- 50+ research articles
- NSF Sponsored
- 115000 lines of MuPAD, 15000 lines of C++, 32000 lines of tests, 600 pages of doc
- 180 tickets integrated in sage.
- Nicolas Borie, Daniel Bump, Jason Bandlow, Adrien Boussicault, Vincent Delecroix, Tom Denton, Teresa Gomez Diaz, Mike Hansen, Florent Hivert, Brant Jones, Sébastien Labbé, Gregg Musiker, Franco Saliola, Anne Schilling, Mark Shimozono, Lenny Tevlin, Nicolas Thiéry, Justin Walker, Mike Zabrocki

*-Combinat is all about

- Sharing

Remember: this goes both ways!

- Building a community

- Integration: a well organized repository body of code (?)

- Using a bit of computer science

To organize the code and the community

To put a bit more math in the machine

- Doing research!

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State of the art in 2000

Algebraic combinatorics packages

- guess, combstruct, gfun, CS (Projet Algo, INRIA)
- SF (Stembridge)
- ACE, μ -EC (Marne-la-Vallée)
- Symmetrica (Bayreuth)
- Rate, ...

Platforms

- Maple / Maxima
- GAP
- Magma
- Axiom / Aldor
- MuPAD

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The MuPAD-Combinat team in (full) action



How to scale further?

- Design thingies, speed, ...
- Architecture, modeling, ...
- Identifying highest return value algorithms

Our community was not broad enough

- Sharing did not yet pay off (for me)!
- Too much management work
- Too much engineering underground work
- Too much off topic work

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The platform was not broad enough

- MuPAD is not a widely used language and system
- MuPAD is not open-source

Dealing with it

- Negotiation with the MuPAD team
- 2002 Open source computer algebra workshop
- 2005 SAGE on radar
- 2006-2007 Axiom meetings → Aldor-Combinat
- 2007 Mike Hansen on radar
- 2008 February SAGE days 7
- 2008 June: switch!
- 2008 September: MuPAD bought out by Mathworks
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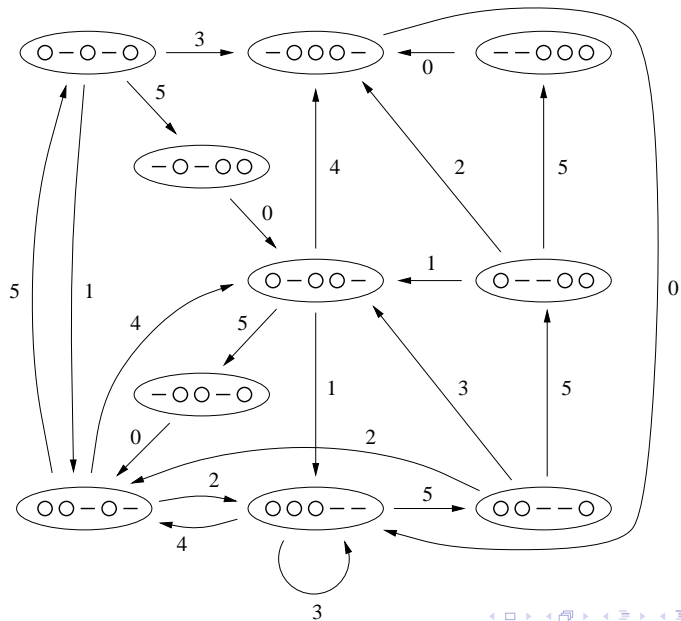
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*-Combinat building steps (combinatorics)

Concentrate on the foundations

1. Support tools:

- Counting functions / generating series
(lazy Karatsuba product, plethysm, implicit equation)
- Generators / Iterators, continuations (yield)
- Data structures for combinatorial objects
(partitions, trees, tableaux, permutations, graphs, ...)
- Category hierarchy

2. Generic tools:

- Decomposable classes / species
- Linear extensions of a poset
- Lexicographic enumeration of list of integers
- Integral points of a polyhedron
- Objects mod a group action

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*-Combinat building steps (algebra)

Trivial code that solves trivial problems is precious

1. `FreeModule(Combinatorial Class, Coefficient Ring)`
Categories: `AlgebraWithBasis` and friends
Support for seamless linear algebra
`Hom(..., ...)`
Unification with polynomials, ...
2. Spaces with several representations, Bases changes...
3. Functors: tensor products, tensor, exterior, and symmetric algebra, submodules, quotients, ...
4. Generic Gröbner/Involutive elimination tools
5. Permutation groups, ...

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The Sage-Combinat team in action



Want to help?

mupad-combinat.sf.net

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<http://www.risc.uni-linz.ac.at/people/hemmecke/AldorCombinat/>

