

## CoCoA-5 - Feature #883

### gin: return/print a suitable change of variables

10 May 2016 11:11 - John Abbott

<b>Status:</b>	Closed	<b>Start date:</b>	10 May 2016
<b>Priority:</b>	Normal	<b>Due date:</b>	
<b>Assignee:</b>	Anna Maria Bigatti	<b>% Done:</b>	100%
<b>Category:</b>	enhancing/improving	<b>Estimated time:</b>	2.01 hours
<b>Target version:</b>	CoCoA-5.2.0 spring 2017	<b>Spent time:</b>	2.10 hours
<b>Description</b>			
Werner Seiler asks whether it would be possible to make gin also produce a "good" linear change of variables (ideally a fairly simple one).			
<b>Related issues:</b>			
Related to CoCoA-5 - Feature #588: Resume code for "gin" (generic initial ideal)			<b>Closed</b> <b>15 Jul 2014</b>

### History

#### #1 - 10 May 2016 13:54 - Anna Maria Bigatti

John Abbott wrote:

Werner Seiler asks whether it would be possible to make gin also produce a "good" linear change of variables (ideally a fairly simple one).

Indeed not: gin actually chooses horrible linear changes to "guarantee genericity".  
(then it performs the computation with RingTwinFloats for considerable speed up).

If required we could make a function looking for a "simple" linear change providing gin (i.e. should compute gin, then try with small linear changes and return the first one providing the same LT)

#### #2 - 10 May 2016 15:28 - John Abbott

- Status changed from New to In Progress

- % Done changed from 0 to 10

Werner also asked whether the transformation used is triangular or square.

It might be nice to have the option to receive a suitable transformation; the result would then have to be a record?

Another possibility would be a separate function which takes an ideal and its gin, then produces a suitable transformation... but there is then the risk that it is called with incorrect args.

**NOTE** Anna, do you have any idea how much it might cost to check a single "simple" transformation?

**#3 - 10 May 2016 16:30 - Anna Maria Bigatti**

John Abbott wrote:

Werner also asked whether the transformation used is triangular or square.

triangular (auxiliary function RandIdeal in monomial\_ideals.cpkg5)

It might be nice to have the option to receive a suitable transformation; the result would then have to be a record?

Well, non in gin: that should do just the gin!  
We could call it `LT(ideal(apply(phi, gens(I))))` ;-)

Another possibility would be a separate function which takes an ideal and its gin, then produces a suitable transformation... but there is then the risk that it is called with incorrect args.

**DANGER DANGER!!**

**NOTE** Anna, do you have any idea how much it might cost to check a single "simple" transformation?

It depends how simple... computation in QQ may just take longer than a hard transformation with TwinFloats. Do you want me to make a "gin tools" to play with?

**#4 - 10 May 2016 16:41 - John Abbott**

- % Done changed from 10 to 20

How about a new fn which computes both gin and a "simple" suitable transformation?  
Or maybe a fn which takes an ideal and its supposed gin, then makes some some number of trials to find a suitable simple transformation (or indicates failed if no suitable transformation was found). This fn should then be safe against bad inputs -- presumably it would always return failure.

Perhaps Werner could write here a better description of what he is hoping for.

**#5 - 07 Apr 2017 10:19 - Anna Maria Bigatti**

- Status changed from *In Progress* to *Feedback*
- Assignee set to *Anna Maria Bigatti*
- Target version changed from *CoCoA-5.???* to *CoCoA-5.2.0 spring 2017*
- % Done changed from *20* to *90*
- Estimated time set to *2.01 h*

Final decision is:

- two good changes of coordinates are printed when verbosity is set
- a simpler change of coordinates giving gin may then be determined *//a posteriori//*

If I find a good way to make a simple change of coordinates giving gin I'll write a paper about it!! ;-)

**#6 - 07 Apr 2017 11:43 - John Abbott**

Printing out the changes of coordinates is OK as a "temporary fix".

An equivalent function in CoCoALib should certainly not print out anything.

It would still be nice to have a fn which finds a simple GIN coord change (presumably by searching a posteriori). "simple" should probably mean sparse and with small integer coeffs.

**#7 - 07 Apr 2017 16:31 - Anna Maria Bigatti**

John Abbott wrote:

Printing out the changes of coordinates is OK as a "temporary fix".

Well, depends on what Werner wanted to do with it ;-)

An equivalent function in CoCoALib should certainly not print out anything.

Certainly does, if you use `SetVerbosityLevel!`  
That's how it is done in CoCoA-5.

It would still be nice to have a fn which finds a simple GIN coord change (presumably by searching a posteriori). "simple" should probably mean sparse and with small integer coeffs.

Not sure what you would need it for, if you do it a posteriori, after computing the gin.  
... but if you can do it a priori, write a paper about it! ;-)

**#8 - 07 Apr 2017 16:31 - Anna Maria Bigatti**

- Related to Feature #588: Resume code for "gin" (generic initial ideal) added

**#9 - 26 Apr 2017 17:25 - Anna Maria Bigatti**

- Subject changed from *gin: return a suitable change of variables* to *gin: return/print a suitable change of variables*

- Status changed from *Feedback* to *Closed*

- % Done changed from 90 to 100

With verbosity we print the changes used. I think this was the actual request by Werner Seiler, so I close this issue.  
(any improvement on this will be in a related issue)