CoCoALib - Design #832

Generalize grading matrix

04 Dec 2015 15:08 - Anna Maria Bigatti

Status:	New	Start date:	04 Dec 2015
Priority:	Low	Due date:	
Assignee:		% Done:	20%
Category:	Data Structures	Estimated time:	6.00 hours
Target version:	CoCoALib-1.0	Spent time:	0.95 hour
Description		•	

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Currently matrices for gradings must be full rank and have no negative entries.

In princicple we could accept negative entries and "redundant" weights just adding to the PPOrdering a "converting matrix" from the internal non-negative format to any format.

Probably not so difficult, but have no requests in all these years, so I'm setting this to low-priority.

Related issues:					
Related to CoCoALib - Bug #1789: GradingMat with negative weights should com	Closed	12 Mar 2024			
Related to CoCoA-5 - Feature #823: NewPolyRing with weights better interface?	Closed	26 Nov 2015			

History

#1 - 14 Jun 2018 21:04 - John Abbott

I have just started working on an implementation of isomorphic-to-subring. For example, given QQ[x,y,z] it should be possible to create an isomorphic copy of the subring generated by z: effectively a poly ring QQ[#1] is created together with two homomorphisms. One hom sends x |--> 0 and y |--> 0 but z |--> #1; the reverse hom sends #1 |--> z.

The question is what term-ordering to put on the newly created ring. The default is to have an ordering which is the restriction of the term-ordering in the big ring. However there seems to be a "problem" with gradings.

Suppose the grading of z is (0,1); this means that a compatible grading on Q[#1] also has to be (0,1) but the ring has only 1 indet, and we have supposed that the term-ordering is compatible with the grading **and** the term-ordering is given by a square matrix... not possible in this case! What to do? Just forget the grading?

#2 - 13 Mar 2024 20:48 - John Abbott

- Related to Bug #1789: GradingMat with negative weights should complain (or deal with them properly!!) added

#3 - 13 Mar 2024 21:11 - John Abbott

My current preference is to allow gradings with negative weights, and possibly linearly dependent weight matrices. This would mean that the internal repr of the grading differs from that which the user expects to see, but the two are in 1--1 correspondence (via a matrix, not nec invertible!).

Taking the example at the end of comment 1 (<u>#832#note-1</u>). The internal grading would be [1] for z, but this would be mapped into ZZ^2 by multiplying by the 2x1 matrix ColMat([0,1]). This does make functions such as wdeg more complicated, and slower, but that may not matter. Also there would have be functions to map from the grading the user expects to the internal representation, and *vice versa*.

#4 - 14 Mar 2024 11:22 - Anna Maria Bigatti

- Related to Feature #823: NewPolyRing with weights -- better interface? added

#5 - 14 Mar 2024 11:29 - Anna Maria Bigatti

- % Done changed from 0 to 20

John Abbott wrote:

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I totally agree, just a bit tedious to implement.

Meanwhile, I'm making a CoCoA-5 preliminary-package with Robbiano, to explore the applications/consequences of such gradings.