

CoCoA-5 - Design #549

Automatic conversion from RINGELEM to INT or RAT

07 May 2014 21:11 - John Abbott

Status:	Closed	Start date:	07 May 2014
Priority:	Normal	Due date:	
Assignee:	John Abbott	% Done:	100%
Category:	Incomplete function	Estimated time:	5.00 hours
Target version:	CoCoA-5.1.1 Seoul14	Spent time:	2.30 hours
Description			
It could be helpful sometimes to allow "automatic" conversion from RINGELEM to INT or RAT. I discovered this when an expression like <code>FloatStr(eval(f,alpha))</code> which caused <code>FloatStr</code> to complain that it wanted a RAT but found a RINGELEM.			
Related issues:			
Related to CoCoA-5 - Feature #453: Automatic conversion from INT (or RAT) to ...		In Progress	03 Mar 2014
Related to CoCoA-5 - Feature #1313: Automatic conversion from RINGELEM to INT		New	11 Sep 2019

History

#1 - 07 May 2014 21:14 - John Abbott

I'm not sure how widespread this should be.

Perhaps the best approach would be to implement separately for a few functions, and then decide whether we want to (and can) automate the "coercion" from RINGELEM to INT or RAT.

I do have some doubts (=gut feeling) about automatic conversion for some "number theory" functions.

NOTE for instance `gcd`

#2 - 07 May 2014 21:20 - John Abbott

I note that `FloatStr` used to be implemented in `approx.cpkg5` and would accept a RINGELEM argument (which was presumably converted by `AsRAT`).

The problem arose when I tried running last year's examples for system solving...

#3 - 08 May 2014 12:58 - John Abbott

- Status changed from *New* to *In Progress*

- Assignee set to *John Abbott*

- % Done changed from 0 to 20

- Estimated time set to 5.00 h

I now think that it is appropriate for `FloatStr`, `DecimalStr` and `ScientificStr` to accept RINGELEM and auto convert the value to RAT (or error if not possible). I do not see how it could be harmful, and it is definitely helpful in some likely/natural contexts.

I have implemented and documented the above decision

Which other RAT fns should behave similarly?

- `MantissaAndExponent10`, `MantissaAndExponent2` - **done**
- `FloatApprox` - **done**

#4 - 02 Sep 2014 11:40 - John Abbott

- % Done changed from 20 to 30

#5 - 03 Sep 2014 15:03 - John Abbott

Here are the fns which can be applied to RAT according to the C5 online help system:

```
? abs -- absolute value of a number
? AsINT -- convert into an INT
? AsRAT -- convert into a RAT
? ceil -- round rational up to integer
? CFApprox -- continued fraction approximation
? CFApproximants -- continued fraction approximants
? ContFrac -- continued fraction quotients
? floor -- round rational down to integer
? FloorLog2, FloorLogBase -- integer part of the logarithm
? IsZero -- test whether an object is zero
? max -- a maximum element of a sequence or list
? min -- a minimum element of a sequence or list
? num -- numerator
? product -- the product of the elements of a list
? round -- round to integer
? SimplestRatBetween -- find simplest rational in a closed interval
? sum -- the sum of the elements of a list
? TimeFrom -- time elapsed since a given moment
```

I think that abs, max, min, floor, ceil should **not** do auto conversion to RAT because they are operations defined on elements of ordered rings -- if the ring is not ordered, they should fail.

Similarly num and den should **not** do auto conversion because they are defined for elements of fraction fields.

sum and product would convert from INT|RAT to RINGELEM, and not the other way.

The only doubtful cases are: CFApprox, CFApproximants, ContFrac, ILogBase, round, SimplestRatBetween. At the moment I prefer not to have automatic conversion from RINGELEM to RAT for these functions.

#6 - 03 Sep 2014 15:20 - John Abbott

- % Done changed from 30 to 40

Here are what I think are the potentially doubtful cases for INT:

- binomial, BinomialRepr, BinomialReprShift
- factorial, FloorRoot, FloorSqrt, valuation
- IsEven, IsOdd
- RatReconstructByContFrac, RatReconstructByLattice

In all cases, I prefer at the moment not to have automatic conversion.

#7 - 03 Sep 2014 16:00 - John Abbott

- Subject changed from Automatic conversion from RINGELEM to INT or RAT to Automatic conversion from RINGELEM to INT or RAT

- Status changed from In Progress to Closed

- % Done changed from 40 to 100

Since the current code has been running without problems for 4+ months, I'm closing. If further closely related issues arise, the notes here should help.

#8 - 11 Sep 2019 15:47 - John Abbott

- Related to Feature #1313: Automatic conversion from RINGELEM to INT added