

CoCoALib - Feature #667

factor: multivariate + finite characteristic

02 Mar 2015 11:23 - Anna Maria Bigatti

Status:	New	Start date:	02 Mar 2015
Priority:	Normal	Due date:	
Assignee:		% Done:	0%
Category:	New Function	Estimated time:	0.00 hour
Target version:	CoCoALib-1.0	Spent time:	0.50 hour
Description (if I remember well) The problem about factorizing a multivariate polynomial in finite characteristic was just the square free decomposition. Now that that step has been solved+implemented can we close the factor limitation?			
Related issues: Related to CoCoALib - Feature #664: Impl small non-prime finite fields (using... Resolved 11 Feb 2015			

History

#1 - 04 Mar 2015 13:31 - John Abbott

The squarefree decomposition is the normal first step, but there are other problematic steps (e.g. mapping down to univariate by substitution).

Here is an example: $((x^3-x)y+1)((y^3-y)x+1)$ in FF_3 any substitution will make one of the factors collapse to 1; to avoid this one normally passes to an algebraic extension, factorizes there, and then recombines the factors to obtain the factorization in the smaller field.
[actually, my information may be outdated now]

Kaltofen mapped down to bivariate; I think he showed that this is "safe with high probability". The final step down to univariate remains a problem though, I think. I will have to reread the relevant articles.

#2 - 04 Mar 2015 16:45 - Anna Maria Bigatti

John Abbott wrote:

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ah, ok. Far more difficult that I thought.

Problem 2: and how difficult is it to factorize on an algebraic extension? (supposing we have algebraic extensions ;-)

#3 - 04 Mar 2015 20:08 - John Abbott

Factorizing in $F_q[x]$ is largely the same as factorizing in $F_p[x]$; the algorithm is essentially the same (but coeff arithmetic is not, of course).
Werner asked for a decent impl of F_q , at least for small field sizes. I just have to find the time and energy to do it..