Aspects of rewriting

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Work at Bangor involving Anne Heyworth, Larry Lambe, Chris Wensley, Ronnie Brown and other colleagues on several useful extensions, relations and strengthenings of rewriting theory will be sketched.

The standard setting for rewriting theory is a presentation $\mathcal{P} = \langle \Delta : X : R \rangle$ of a monoid B. There is a Knuth-Bendix procedure, which may or may not complete to give a complete rewrite system.

1. Rewriting for Kan extensions. This is related to work of Carmody-Walters. It requires a notion of presentation of Kan extension, and an extended rewrite process. The output is an action of a category on sets defined as languages.

2. [Heyworth and Wensley] Logged rewriting (for group presentations). This recording of the new rules as consequences of the original rules is necessary for computational methods for generators of identities among relations, in a new procedure of Brown and Razak Salleh.

3. [Heyworth] Rewriting for monoids is a special case of non commutative Gröbner basis theory for rings.

4. [Heyworth and Reinert (Kaiserslautern)] Gröbner bases for integral group rings can be applied, with (3) above, to compute small crossed resolutions of finite groups from a presentation.

5. [Heyworth and Chandler (Lancaster)] Non commutative Gröbner bases can be applied to reachability problems in Petri nets, and hence to computerised navigation for excavators.