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A generalization of Gröbner basis algorithms to polycyclic group rings. (English)

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Group rings are the subject of extensive studies in mathematics. In 1981 Baumslag, Cannonito and Miller showed that for an integral group ring of a polycyclic group, i.e., a group with a finite subnormal series with cyclic factors, several decision problems including the membership problem for submodules are computable. Studying these ideas Sims described how the connections between special submodule bases enable the membership problem and conventional Gröbner bases to be solved.

In this paper we present our results which generalize reduction and Gröbner bases to polycyclic group rings. We want to point out that instead of using the fact that every group ring over a polycyclic group is Noetherian, our approach is oriented towards rewriting which leads to a syntactical characterization of Gröbner bases in terms of s-polynomials and a completion-based algorithm with which to compute them.

MSC:

16S34	Group rings
68Q70	Algebraic theory of languages and automata
20C07	Group rings of infinite groups and their modules (group-theoretic aspects)
16Z05	Computational aspects of associative rings (general theory)
13P10	Gröbner bases; other bases for ideals and modules (e.g., Janet and border bases)

Keywords:

integral group rings; decision problems; membership problem; Gröbner bases; polycyclic group rings; rewriting systems

Full Text: DOI