

THE COMPLEXITY OF THE EQUATION SOLVABILITY PROBLEM OVER SEMIPATTERN GROUPS

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The complexity of the equation solvability problem over finite groups is not completely solved yet. Goldmann and Russel [1, 2] proved that if the group \mathbf{G} is nilpotent then the equation solvability problem over \mathbf{G} is in P, while if \mathbf{G} is not solvable, then the equation solvability problem is NP-complete. Horváth and Szabó proved in [3, 4] that the equation solvability problem over \mathbf{G} is solvable in polynomial time for some semidirect products of Abelian groups. We provide a new polynomial time algorithm for deciding the equation solvability problem over certain semidirect products, where the first factor is not necessarily Abelian. Our main idea is to represent such groups as matrix groups, and reduce the original problem to equation solvability over the underlying field. Further, we apply this new method to give a much more efficient algorithm for equation solvability over nilpotent rings than previously existed.

- [1] MIKAEL GOLDMANN, ALEXANDER RUSSELL, The complexity of solving equations over finite groups, *Proceedings of the 14th Annual IEEE Conference on Computational Complexity*, Atlanta, Georgia, (1999), 80–86.
- [2] MIKAEL GOLDMANN, ALEXANDER RUSSELL, The complexity of solving equations over finite groups, *Information and Computation*, **178** (2002), 253–262.
- [3] GÁBOR HORVÁTH, The complexity of the equivalence end equation solvability problems over meta-abelian groups, *Journal of Algebra*, **433** (2015), 208–230.
- [4] GÁBOR HORVÁTH AND CSABA SZABÓ. The complexity of checking identities over finite groups, *International Journal of Algebra Computation*, **16(5)** (2006), 931–940.