The subpower membership problem for 2-nilpotent Mal'cev algebras

Patrick Wynne (patrick.wynne@colorado.edu)
University of Colorado Boulder

The Subpower Membership Problem for an algebra A, denoted SMP(A), is the following decision problem: given tuples $a_1, \ldots, a_k, b \in A^n$, decide if b is in the subalgebra of A^n generated by $a_1, \ldots, a_k$. For certain finite algebras, SMP(A) is decidable in polynomial time, while for other finite algebras, SMP(A) is EXPTIME-complete. We investigate the structure of 2-nilpotent Mal'cev algebras by decomposing the term clone using an associated clonoid between abelian Mal'cev algebras. We use this decomposition to show that a large class of finite 2-nilpotent Mal'cev algebras have Subpower Membership Problem decidable in polynomial time. In particular, if A is a 2-nilpotent Mal'cev algebra of squarefree order then SMP(A) is decidable in polynomial time.