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Loop Theory and Automated Deduction

In the past 15 years, automated deduction tools such as Prover9 and finite model builders such as Mace4 have increasingly played an important role in finding new results in loop theory. A *loop* is a quasigroup with an identity element, that is, it is a set Q with a binary operation $\cdot$ such that for each $a, b \in Q$, the equations $a \cdot x = b$ and $y \cdot a = b$ have unique solutions $x, y \in Q$. (Besides groups, probably the class of loops best known to people outside the field are Moufang loops.)

In this talk, I will focus on a major automated deduction project in loop theory which is pushing all the available software to its limits: the AIM project (AIM = Abelian Inner Mappings). The problem is to find the correct loop theoretic generalization of the following classical fact from group theory: a group is nilpotent of class at most 2 if and only if its inner automorphism group is abelian. Progress toward the main conjectures in the loop setting has been slow but substantial, and I will concentrate on recent work.