Moving frame methods for solving $SL(2)$ symmetric variational problems

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In 1918 Emmy Noether proved, in the seminal paper "Invariante Variationsprobleme", that for differential systems derived from a variational principle, conservation laws could be obtained from Lie group actions that leave the functional unchanged. In recent work, we showed the mathematical structure behind both the Euler-Lagrange system and the set of conservation laws, in terms of the differential invariants of the group action and a moving frame. In this talk we will illustrate how the knowledge of this structure helps reduce extremising problems, in particular for one-dimensional variational problems that are invariant under $SL(2)$.