Speeding Up Real Algebraic Geometry

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We present a new and sharper upper bound on the number of connected components of a semialgebraic set. Our new bound is novel in that it is stated in terms of the volumes of certain polytopes and, for a large class of inputs, beats the best previous bounds by a factor exponential in the number of variables. We then show how to similarly lower earlier complexity bounds for the existential theory of the reals.