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Diego Cifuentes* (diegcif@mit.edu), 77 Massachussets Avenue, Office 32-D760, Cambridge, MA 02139, and **Pablo A Parrilo**. *Sampling Algebraic Varieties for Sum of Squares Programs*.

We study sum of squares (SOS) relaxations to optimize polynomial functions over a set $\mathcal{V} \cap \mathbb{R}^n$, where \mathcal{V} is a complex algebraic variety. We propose a new methodology that, rather than relying on some algebraic description, represents \mathcal{V} with a generic set of complex samples. This approach depends only on the geometry of \mathcal{V} , avoiding representation issues such as multiplicity and choice of generators. It also takes advantage of the dependencies in the coordinate ring of \mathcal{V} to reduce the size of the corresponding semidefinite program (SDP). In addition, the input can be given as a straight-line program. Our methods are particularly appealing for varieties which are easy to sample from but for which the defining equations are complicated, such as $SO(n)$, Grassmannians or rank k tensors. Nonetheless, for arbitrary varieties we can obtain the samples by using the tools of numerical algebraic geometry. In this way we connect the areas of SOS optimization and numerical algebraic geometry. (Received August 31, 2016)