

From Petri Nets to Polynomials: Modeling, Algorithms, and Complexity (Abstract) (Invited Talk)

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Abstract. Petri nets are a widely-used model for parallel and distributed systems of concurrent systems using common resources. They admit a precise algebraic formalization as *vector addition* or *vector replacement* systems. If one considers *symmetric* VRS's, it turns out that they are equivalent to finitely presented commutative semigroups or to binomial ideals in a multivariate ring over \mathbb{Q} .

We outline and survey the interaction between these domains of computational algebra, system modeling and verification, and, in particular, complexity theory. While many of the fundamental computational problems in these areas turn out to be very complex (*i.e.*, EXPSPACE-complete or even worse, we also present some new results concerning better complexity for restricted subclasses of the problems.