

Algorithms and complexity in commutative algebra & algebraic geometry

Reparametrization of curves, semi-groups,
implicit notation & multiplicity sequences

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Abstract

In this report various algorithms within the realm of commutative algebra and algebraic geometry are presented. The focus is set on reparametrization of plane algebraic curves, semi-groups, implicit notation and multiplicity sequences. Highlights include self-developed algorithms that re-parametrize plane algebraic curves to the form $(\pm t^n, p(t))$ or $(p(t), \pm t^n)$, where $\mathbf{o}(p) \geq n$, calculation of the generators of semi-groups corresponding to given sub-rings to $\mathbb{C}[x]$, search for the implicit notation of a curve, given a parametrization, generation of multiplicity sequences from the implicit notation as well as reversely find a family of curves that correspond to a given multiplicity sequence. The report finishes with an empiric study of the complexity of the number sequence N_i of the number of multiplicity sequences whose multiplicity sum corresponds to i .