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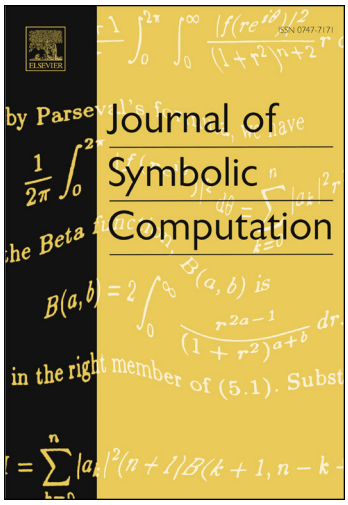

Deterministic Genericity for Polynomial Ideals

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Deterministic Genericity for Polynomial Ideals

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Abstract

We consider several notions of genericity appearing in algebraic geometry and commutative algebra. Special emphasis is put on various stability notions which are defined in a combinatorial manner and for which a number of equivalent algebraic characterisations are provided. It is shown that in characteristic zero the corresponding generic positions can be obtained with a simple deterministic algorithm. In positive characteristic, only adapted stable positions are reachable except for quasi-stability which is obtainable in any characteristic.

1. Introduction

Genericity appears in many places in algebraic geometry and commutative algebra, as many results considerably simplify, if one assumes that the considered ideal is in a sufficiently generic position. While genericity is well studied theoretically, its algorithmic side has been treated much less. There are two natural questions related to a generic position. To apply the corresponding theoretical results in a concrete computation, one must firstly be able to verify effectively whether a given ideal is in the considered generic position. If this is not the case, one would secondly like to find a (preferably sparse) linear transformation into generic position.

From a theoretical point of view, the second goal is easily achieved by applying a random transformation. In practise, this will destroy all sparsity typically present in problems of interest. Therefore we will study here deterministic algorithms that give us a reasonable chance to render a position generic with a fairly sparse transformation. We make no claims of getting an optimal solution for this problem. In one of the very few articles dealing with such questions, Eisenbud and Sturmfels (1994) argue that different notions of optimality exist. Furthermore, they showed that various related problems are NP-complete.

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