WHY DOES THE DESCARTES SOLVER WORK?

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Abstract. Isolating the real roots of univariate polynomials is a fundamental problem in symbolic computation and it is arguably one of the most important problems in computational mathematics. The problem has a long history decorated with numerous ingenious algorithms and furnishes an active area of research. However, the worst-case analysis of root-finding algorithms does not correlate with their practical performance. Among the algorithms for which this phenomenon happens, we find the Descartes solver to isolate the real roots of a real univariate polynomial. In this talk, we show that the average bit complexity of this solver is almost optimal for a broad class of random polynomials, explaining, therefore, the practical performance of this algorithm.

This is joint work with Alperen A. Ergür and Elias Tsigaridas.

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