

Counting Solutions of Polynomial Systems and the Complexity of the Euler Characteristic

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One of the main research interests of T.Y. Li in the last years has been the solution of polynomial systems of equalities. He developed algorithms for computing solutions of such systems. This is a computational difficult problem as shown by Blum, Shub and Smale who proved the problem to be NP-complete over the reals.

In a recent work jointly done with Peter Buerigisser, we considered the problem of counting the number of solutions of a system as above and we proved that this problem is complete in the class $\#P$ over the reals. More interestingly, we proved that computing the Euler characteristic of a semialgebraic set is also complete in this class so these two problems are equivalent (up to polynomial time).
