A p-adic Descartes solver: the Strassman solver

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Solving polynomials is a fundamental computational problem in mathematics. In the real setting, we can use Descartes' rule of signs to efficiently isolate the real roots of a square-free real polynomial. In this poster, we translate this method into the p-adic worlds. We show how the p-adic analog of Descartes' rule of signs, Strassman's theorem, leads to an algorithm to isolate the roots of a square-free p-adic polynomial. Moreover, we show that this algorithm runs in $\mathcal{O}(d^2 \log^3 d)$-time for a random p-adic polynomial of degree d. To perform this analysis, we introduce the condition-based complexity framework from real/complex numerical algebraic geometry into p-adic numerical algebraic geometry.