A dichotomic Newton-Puiseux algorithm using dynamic evaluation.

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Puiseux series (generalisation of Taylor series above critical points) are a fundamental object in the theory of plane algebraic curves [5]. This talk will focus on the arithmetic complexity of the well-known Newton Puiseux algorithm and its variants. Denoted D the total degree of the input bivariate polynomial, Duval proved a $\mathcal{O}(D^8)$ complexity result [1]. This has been improved to $\tilde{\mathcal{O}}(D^5)$ in [2] by truncating powers of X during the computation and introducing fast multiplication.

After providing the tools of the Newton-Puiseux algorithm and recall the improvments in [2], we will first present results of [3] that enable to reduce the total number of recursive calls of the algorithm from $\mathcal{O}(D^2)$ to $\tilde{\mathcal{O}}(D)$, leading to a complexity in $\tilde{\mathcal{O}}(D^4)$. Finally, we will present a new divide and conquer algorithm that reduces the complexity to $\tilde{\mathcal{O}}(D^3)$ [4].

This work begun during my PhD, under the supervision of Marc Rybowicz ; the recent ameliorations started from a collaboration with Marc in 2011, that led to [3]. The new divide and conquer algorithm [4] is a collaboration with Martin Weimann. This paper is dedicated to Marc Rybowicz, who sadly passed away in November 2016

Références

[1] D. Duval. Rational Puiseux Expansions. *Compositio Mathematica*, 70 :119–154, 1989.

[2] Adrien Poteaux. *Calcul de développements de Puiseux et application au calcul de groupe de monodromie d'une courbe algébrique plane.* PhD thesis, Université de Limoges, 2008.

[3] A. Poteaux & M. Rybowicz *Improving Complexity Bounds for the Computation of Puiseux Series over Finite Fields.* ISSAC 2015.

[4] A. Poteaux & M. Weimann *A dichotomic Newton-Puiseux algorithm using dynamic evaluation.* arXiv :1708.09067.

[5] R. J. Walker. *Algebraic Curves.* Springer-Verlag, 1950.