POINT COUNTING ON NON-HYPERELLIPTIC GENUS 3 CURVES WITH AUTOMORPHISM GROUP $\mathbb{Z}/2\mathbb{Z}$ USING MONSKY-WASHNITZER COHOMOLOGY

YIH-DAR SHIEH
INSTITUT DE MATHÉMATHIQUE DE LUMINY

Abstract. In [4], Kedlaya gave an algorithm to compute the zeta functions of hyperelliptic curves over finite fields which uses the Monsky-Washnitzer cohomology. The method is applied to superelliptic curves, $C_{a,b}$ curves and non-degenerate curves, see [1], [2] and [3]. I use this method to compute the zeta function of any non-hyperelliptic genus 3 plane curve C over a finite field with automorphism group $\mathbb{Z}/2\mathbb{Z}$. The family of curves treated includes $C_{3,4}$ curves which is done in [2] already. The generic curves in this family contain some degenerate curves (as a closed subset in this family). Using the relation between the Monsky-Washnitzer cohomology of C and its quotient $E := C/G$, the computation splits into 2 parts: in a subspace of the Monsky-Washnitzer cohomology and the point counting on elliptic curves. By the result on point counting on elliptic curves and working with fewer precision and matrices of smaller size,we obtain a faster algorithm than working directly on the curve C.

References

[1] Castryck, W., *Point counting on nondegenerate curves.* Katholieke Universiteit Leuven, Thesis, 135 pp. (2006). Avaiable at: http://wis.kuleuven.be/algebra/castryck/thesis.pdf
[2] Denef, J.; Vercauteren, F., *Counting Points on C_{ab} Curves using Monsky-Washnitzer Cohomology.* Finite Fields and Their Applications, Volume 12, Issue 1, pp. 78-102 (2006)
[3] Gaudry, P.; Gürel, N., *An extension of Kedlaya's algorithm to superelliptic curves.* Proc. Asiacrypt 2001, Springer, Berlin, Lecture Notes in Comput. Sic., 2248: 480-494 (2001)
[4] Kedlaya, K., *Counting Points on Hyperelliptic Curves using Monsky-Washnitzer Cohomology.* J. Ramanujan Math. Soc. (4), 16: 323-338 (2001)

E-mail address: chiapas@gmail.com