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

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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

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