Computing Feng-Rao distances for AG codes

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Abstract. The weight hierarchy of one-point algebraic geometry codes can be estimated by the generalised order bounds, also called generalised Feng-Rao distances. This talk shows a general view of the main results obtained during the last years, with special focus on the asymptotic behaviour of the order bounds and some particular cases of Weierstrass semigroups.

The order bound distance was introduced by Feng and Rao for the decoding of one-point algebraic geometry codes (AG codes in short) up to half the Feng-Rao distance. In particular, such distance is a lower bound for the minimum distance of these codes. The computation of the Feng-Rao distance involves combinatorics on a certain Weierstrass semigroup of the underlying curve. The first interesting results were given by Kirfel and Pellikaan for telescopic semigroups. Other results were obtained later for symmetric, acute and Arf semigroups, among others.

On the other hand, the generalised order bounds were proven by Heijnen and Pellikaan to be also lower bounds for the generalised Hamming weights. These generalised Feng-Rao distances are far harder to deal, and very few results have been obtained in this direction. First Farrán and Munuera proved that they have a similar Goppa-like lower bound, for some constants that were called Feng-Rao numbers. After this work some papers were addressed to compute the Feng-Rao numbers for semigroups with two generators, telescopic semigroups, semigroups generated by intervals, and inductive semigroups. For Arf semigroups, it is possible to compute precisely the second Feng-Rao distance in the whole range, generalising the results for the classical Feng-Rao distance.

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