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Subtowers of towers of function fields

The function $A(q)$, which measures how large the number of rational places in function fields (over finite fields) with respect to their genus can be, was introduced by Ihara in 1981. Few things are known about the exact value of this quantity and its importance appears, for example, in coding theory since good positive lower bounds for this function imply the existence of arbitrary long codes with asymptotically good parameters.

One way of obtaining non-trivial lower bound for Ihara's function is through the construction of asymptotically good towers of function fields over finite fields. An important contribution in this setting came from the hands of Garcia and Stichtenoth who exhibited explicit towers of function fields with asymptotically good limits using only basic facts of valuation and ramification theory. In general, it is not easy to determine whether a given explicit tower is asymptotically good or not. In some cases, the asymptotic behavior of the tower can be determined from the asymptotic behavior of a simpler subtower or supertower.

In this talk we will present a method to construct explicit and proper subtowers and supertowers of a given explicit tower. We will also give conditions to check if two apparently different equations define the same subtower or not. An interesting feature of our method is that it can be easily implemented in a computer so the search for explicit equations defining subtowers is rather simple.