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A computability challenge: asymptotic bounds and isolated error-correcting codes

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(Submitted on 21 Jul 2011)

Consider the set of all error--correcting block codes over a fixed alphabet with q letters. It determines a recursively enumerable set of points in the unit square with coordinates $(R,\delta):=$ {\it (relative transmission rate, relative minimal distance).} Limit points of this set form a closed subset, defined by $R\le \alpha_q(\delta)$, where $\alpha_q(\delta)$ is a continuous decreasing function called {\it asymptotic bound.} Its existence was proved by the author in 1981, but all attempts to find an explicit formula for it so far failed.

In this note I consider the question whether this function is computable in the sense of constructive mathematics, and discuss some arguments suggesting that the answer might be negative.

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