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A general upper bound in extremal theory of sequences

Comment.Math.Univ.Carolinae 33,4 (1992) 737-746.

Abstract: We investigate the extremal function $f(u,n)$ which, for a given finite sequence u over k symbols, is defined as the maximum length m of a sequence $v = a_1 a_2 ... a_m$ of integers such that 1) $1 \leq a_i \leq n$, 2) $a_i = a_j, i \neq j$ implies $|i - j| \geq k$ and 3) v contains no subsequence of the type u. We prove that $f(u,n)$ is very near to be linear in n for any fixed u of length greater than 4, namely that

$$f(u,n) = O(n 2^{O(\alpha(n)^{|u|-4})}).$$

Here $|u|$ is the length of u and $\alpha(n)$ is the inverse to the Ackermann function and goes to infinity very slowly. This result extends the estimates in [S] and [ASS] which treat the case $u = ababa...$ and is achieved by similar methods.

Keywords: sequence, Davenport-Schinzel sequence, length, upper bound
AMS Subject Classification: 05D99