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Designing preference functions for de Bruijn sequences with forbidden words. (English)
Zbl 07589701
Des. Codes Cryptography 90, No. 10, 2319-2335 (2022)

Summary: A preference function provides a method to build periodic sequences by specifying a set of rules that determine which symbols are to be attempted before others, when the sequence is constructed one symbol at a time. The well-known prefer-one, prefer-opposite, and prefer-same binary de Bruijn sequences are all constructed using appropriate preference functions. In this article we provide some fairly general results that give conditions for a pair of an initial word and a preference function on a $q$-ary alphabet to produce sequences that include every pattern of given size $n \geq 1$-except possibly some specified set of patterns. We provide several old and new constructions that showcase the flexibility of the results. Specifically, we give a construction for square-free and general separative de Bruijn sequences. The existence of these sequences was established more than a decade ago but nonconstructively. An important special case of these separative sequences produces universal cycles for permutations. We also build a preference function for binary de Bruijn sequences of patterns with a maximum density of ones. As for full de Bruijn sequences, the main result helps furnish a recursive construction from arbitrary cyclic permutations of $q$ symbols. Finally, we build a preference function that extends a full de Bruijn sequence of order $n$ into one of order $n + 1$.

MSC:
68R15 Combinatorics on words
68R05 Combinatorics in computer science

Keywords:
de Bruijn sequence; Ford sequence; preference function; forbidden words

Full Text: DOI

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