

1096-05-1226

Solomon W Golomb* (sgolomb@usc.edu), 3740 McClintock Ave, EEB 504A, Los Angeles, CA 90089-2565. *Modified de Bruijn Sequences and m-Sequences*. Preliminary report.

The *de Bruijn sequences of degree n* are binary sequences of period 2^n in which every possible binary vector of length n occurs exactly once per period. In each period there are 2^{n-2} runs of 1's alternating with 2^{n-2} runs of 0's. These include one run of n 1's and one run of n 0's, plus 2^{n-k-2} runs of length k of each type for $1 \leq k \leq n-2$. As shown by N.G. de Bruijn (and earlier by C. Flye Sainte-Marie), there are $2^{2^{n-1}-n}$ cyclically distinct de Bruijn sequences of degree n .

A *modified de Bruijn sequence of degree n* results when a single 0 is omitted from the longest run of 0's, leaving a sequence of period $2^n - 1$, with the same run lengths as above except for a single run of $n-1$ 0's in place of a single run of n 0's. There are (still) $2^{2^{n-1}-n}$ such sequences of degree n .

The "*m-sequences*" (binary sequences of period $2^n - 1$ obtained from an n -stage linear shift register with feedback) of degree n form a subset of modified de Bruijn sequences of degree n .

An unsolved problem is to settle the conjecture that the *m-sequences* are the only modified de Bruijn sequences with the two-level autocorrelation property, for every degree $n \geq 1$. (Received September 13, 2013)