Radioelectronics and Communications Systems
Vol. 48, No. 2, pp. 34–36, 2005

Izvestiya VUZ. Radioelektronika
Vol. 48, No. 2, pp. 50–54, 2005
UDC 621.391.2

A REGULAR RULE FOR GENERATION OF FULL CLASSES OF OPTIMAL SYSTEMS OF DF-SIGNALS BASED ON THE METHOD OF DECIMATION

M. I. Mazurkov and V. S. Dmitrenko

Odessa National Polytechnic University, Ukraine

Based on the method of intrinsic decimation of an arbitrary sequence of different positive integers, where the sequence has the length *p*, a regular rule is suggested for generation of full classes of linear and nonlinear optimal systems of discrete frequency (DF) signals.

The methods of decimation and redecimation of *M*-sequences have many radio-engineering applications: investigation of structural properties of *M*-sequences [1–3]; generation of large ensembles of signals based on composite *M*-sequences [4]; treatment of the problem of obtaining different-in-structure (isomorphic) *M*-sequences without readjustment of feedback in a generator of *M*-sequences [5], etc.

The present work shows that the decimation method can be successfully used for construction of optimal systems of DF-signals permitting no more than a single coincidence [6].

The purpose of this work is to offer a regular rule for creating the full classes of linear and nonlinear optimal systems of DF-signals based on the method of decimation of an arbitrarily set sequence of p different positive integers, where p is a prime number.

Let the N-sequence be an arbitrary sequence of different natural numbers of length p having the form

$$N = \left\{ n_1, n_2, \ldots, n_i, \ldots, n_p \right\} = \{n_i\},\ i = \overline{1, p}, \tag{1}$$

where p is a prime number.

Definition 1. A sequence $D = \{n_{di}\}$, produced from $\{n_i\}$ by exclusion selection of the $d$ith entries $i = \overline{1, p}$, is the result of decimation of N-sequence (1) in terms of the index d.

Obviously, the sequence D has the period p, since the greatest common divisor $(d, p) = 1$. The respective decimation is called intrinsic or normal [4]. These decimations are just the ones considered below.

Definition 2. By the frequency-time code based on decimation of an arbitrary N-sequence from (1), or D-code for brevity, is meant a set of code words defined by the rule

$$D = \begin{bmatrix} \{n_{1\cdot i}\} \\ \{n_{2\cdot i}\} \\ \vdots \\ \{n_{d\cdot i}\} \\ \vdots \\ \left\{ n_{(p-1)\cdot i} \right\} \end{bmatrix}, \quad i = \overline{1, p}. \tag{2}$$

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9 July 2004