

MODEL OF OPTIMAL INFORMATION SYSTEMS ON TWO-DIMENSIONAL COMBINATORIAL CONFIGURATIONS

Volodymyr Riznyk

Automated Control Systems Department, Lviv Polytechnic National University, S. Bandery Str., 12, Lviv, 79013, UKRAINE, E-mail: rvv@polynet.lviv.ua

This paper in systems engineering is aimed at improving the qualitative indices of the vector data information technologies (e.g. 2D vector data coding design) with respect to the reliability, the precision and other significant operating characteristics of the systems based on the combinatorial configurations theory, namely the Ideal Ring Bundles (IRB)s. Some problems of the computer engineering and the information technology, which deal with the profitable use of the mathematical models and the methods for optimization of the systems based on the two-dimensional combinatorial configurations, such as 2D Ideal Ring Bundles (2D-IRB)s are regarded. The properties of underlying models are favorably, since these methods and their results are generalized to improve and optimize a larger class of the engineering devices or the information systems. The optimization has been embedded in the underlying combinatorial models. One-dimensional graphic model of the system with the optimal placement of the structural elements in spatially distributed systems for the ring topology sequences of the positive integers is depicted. Also, the two-dimensional model of such systems with the optimal placement of the elements using the vector ring sequences is described. For example, these design techniques make it possible to configure the 2D vector coding systems using fewer code combinations than at the usual systems, while the code size is maintained using the high speed corrected coding system. The special attention is paid to the geometric interpretations of the two-dimensional Ideal Ring Bundles and its transformation groups using the theoretical relation of the 2D-IRBs with the reference to the cyclic difference sets theory. To illustrate the underlying mathematical models of the system for constructing the optimal 2D arrangement of elements over 2×3 and 3×4 references, the graphic charts of these models are given. The set of examples show the possibility of optimizing the two-dimensional vector code systems based on 2D-IRBs. The proposed models are shown to provide the design of the high performance vector data coding and the control systems using the combinatorial optimization. Besides, these methods are developed for the synthesis of the non-uniformly spaced thinned antenna arrays with the low level of side lobes.

Keywords – information technology, mathematical model, system, combinatorial configuration, optimization, structure, vector data coding, two-dimensional Ideal Ring Bundle, control system, antenna array.