

## PARALLEL COMPUTING FOR MULTI-DIMENSIONAL SIGNALS ACQUISITION AND PROCESSING

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This paper presents the design and research results of the digital systems with parallel computing for the acquisition and processing of multi-dimensional signals. The obtained results can be applied to solve the problem of parametric and functional testing of Printed Circuit Board (PCB), in which concurrent processes are specific for real-time data acquisition and processing [1,2,3].

For this aim, the Printed Circuit Board (PCB) is defined based on a two-dimensional space with: a set of nodes for the test signals generating  $U^{In} = \{u_i^{In}, \forall i = \overline{1, N}\}$  and a set of nodes for acquisition of state signals  $U^{Out} = \{u_j^{Out}, \forall j = \overline{1, K}\}$ .

The state signals acquisition is performed by approximating them by applying the Fuzzy logic method determined by the equation  $Y_{j,l} = \begin{cases} 1 & |A_l \dot{u}_j^{Out} \in \Delta u_l, \\ 0 & |A_l \dot{u}_j^{Out} \notin \Delta u_l \end{cases}, \forall l = \overline{1, L}$ , where  $L$  is the number of bits for the speed approximating of the input signal increase.

Parametric and functional analysis of Printed Circuit Board is performed based on mathematical models [2,3]:

$$F\left(\frac{U^{Out}}{U^{In}}\right) = \begin{bmatrix} \frac{\partial u_1^{Out}}{\partial u_1^{In}} & \dots & \frac{\partial u_K^{Out}}{\partial u_1^{In}} \\ \dots & \dots & \dots \\ \frac{\partial u_1^{Out}}{\partial u_N^{In}} & \dots & \frac{\partial u_K^{Out}}{\partial u_N^{In}} \end{bmatrix} \text{ and } F\left(\frac{U^{Out}}{U^{Out}}\right) = \begin{bmatrix} \frac{\partial u_1^{Out}}{\partial u_1^{Out}} & \dots & \frac{\partial u_K^{Out}}{\partial u_1^{Out}} \\ \dots & \dots & \dots \\ \frac{\partial u_1^{Out}}{\partial u_K^{Out}} & \dots & \frac{\partial u_K^{Out}}{\partial u_K^{Out}} \end{bmatrix}, \forall i = \overline{1, N}, j = \overline{1, K}$$

**Keywords:** *Parallel computing; Data acquisition and processing; Multi-dimensional signals; Printed Circuit Boards.*

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