# Theory, Topology and Building Technology of Multibasis Specialized Processors

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*Abstract* – **Trends in theory of methodology and technology of computer system processors set by the theoretical and ideological saturation in potential options of application for the Rademacher's basis for building a logic-arithmetic processor component, which include more stringent requirements for performance, improving regularity and enhancement requests.**

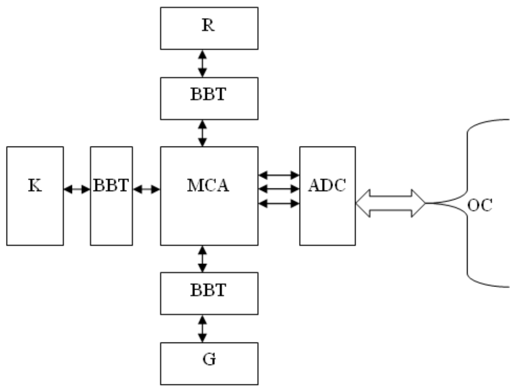
*Keywords* - **theoretical digital basis (TDB), collective memory access, analog-digital converter (ADC), specialized processor, between bases transformation.**

## I. Introduction

Major achievement progress in the construction of specialized processor based on the combined use of different theoretical digital basis (TDB). For example, the Haar-Krestenson's, Krestenson-Galois' [1], and also high multibasises RCG-processors on the Rademacher's, Krestenson's and Galois's bases [2].

## II. Specialized processor in different TDB

Promising direction in development of theory and technology building a universal computer is the realization of super fast multibasis RCG - processors based on the Rademacher's, Krestenson's and Galois' bases (Fig. 1).




R - processing element in the Rademacher's basis, K - processing element in the Krestenson's basis, G - processor element in the Galois' basis, MCA – memory of collective access, BBT - between-basic transformer, ADC - analog-digital converter, OC – controlling object.

Fig.1. Structural diagram of a multibasis specialized processor.

## III. Arithmetic operations in various bases

Researching results and reviews of functionality and basic arithmetic functions on numbers in the Rademacher's, Krestenson's and Galois' bases. Comparative reviews of features studied by TDB presented in table 1.

Table 2 n - digit capacity representation of numbers, and v - duration of reaction in microelectronic equipment.

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*Table 1*

**Functional capabilities of investigated TDB**

| | Basic operation | Rademacher | Krestenson | Galois |
|---|---|---|---|---|
| 1 | Addition | *2nv* | *v* | *3v* |
| 2 | Shift | *v* | - | *2v* |
| 3 | Multiplication | 2*v*(2n+1) | *v* | ? |
| 4 | Equality | *v* | *v* | *v* |
| 5 | Sign | *nv* | ? | ? |
| 6 | Subtraction | *(3n+5)v* | ? | ? |
| 7 | Division | $n^2v$ | ? | - |
| 8 | Modular | $n^2v$ | *2nv* | ? |

## IV. Between-basic transformation in different TDB.

Received reviews of the existence and complexity in the between-basic transformation algorithms studied by TDB are presented in table 2.

*Table 2*

**Between-basic transformation of investigated TDB.**

| Theoretical digital basis | Algorithm of between bases transformation |
|---|---|
| Rademacher – Krestenson | $N_k = (a_{n-1},\ldots,a_i,\ldots,a_0); a_i \in \overline{0,1}; N_k = \sum_{i=0}^{n-1} a_i \cdot 2^i;$ <br> $N_k = \rightarrow b_1, \ldots b_i, \ldots b_k$ $b_i = res N_k (mod p_i); N_k = a_i p_i + b_i, P = \prod_{i=1}^{k} p_i;$ <br> $0 \le N_k \le P, p_i \not\equiv p_j.$ |
| Rademacher – Galois | $N_k \rightarrow \sum_{i=0}^{n-1} i \rightarrow G_0, G_1 .. G_{i-1}; G_0 = (11...1); G_{i+1} = G_i \oplus G_{i-n}; i \in \overline{0, n-1}.$ |
| Krestenson – Rademacher | $N_k = res \sum_{i=1}^{k} b_i \cdot B_i (\mathrm{mod}\ P) \cdot B_i = \frac{P}{p_i} \cdot m_i \equiv 1 (\mathrm{mod}\ P_i) \cdot$ |
| Krestenson – Galois | $N_k = (b_1,..b_i,..b_k) \rightarrow \sum_{i=0}^{n-1} i \rightarrow G_i, ..G_{i-n}; G_0 = (11..1); G_{i+1} = G_i \oplus G_{i-n}; i \in \overline{0, n-1}.$ |
| Galois – Rademacher | $G_i, G_{i-1}..G_{i-n} \rightarrow \sum_{i=0}^{n-1} i \rightarrow N(a_{n-1},..., a_i,.., a_0) \rightarrow N_k; a_i \in \overline{0,1}.$ |
| Galois – Krestenson | $G_i, G_{i-1}..G_{i-n} \rightarrow \sum_{i=0}^{n-1} i \rightarrow N_k = (b_1, b_2, \ldots, b_i, \ldots, b_k).$ |

Transformation between Rademacher-Galois' and Galois-Krestenson's bases is based on an intermediate transformation in a unitary basis.

## V. Conclusion

Analysis of the current state of basic functions studied by TDB aimed at creating high-performance specialized processor and processing of large digit numbers suggests that the development of the Krestenson's TDB theory, to implement all the basic functions of arithmetic processors are promising and relevant scientific and technical problem.

## References

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