Quadrature Compression of Images in Polyadic Space

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Abstract - **In this paper proposed a compression method based on wavelet processing with further processing of the data obtained in a polyadic space.**

Keywords - **Image; Compression; Wavelet; Polyadic Space; Dynamic Range.**

I. INTRODUCTION

Currently, issues of image compression for transmission through communication channels is a pressing task. For airborne systems and monitoring terrestrial objects approach to image compression must provide a high degree of compression and preservation detailing elements.

II. PROCESSING OF THE QUADRATURES

At the initial stage of processing define the boundaries of the image and the basis of wavelet transform. Each received quadrature transform DWT transform the number of elements is 4 times smaller than the original image and are characterized by certain frequency composition.

Each has its own distinctive squaring the frequency response and therefore requires an individual approach to treatment. The values of the elements of each of the quadratures are given a limited dynamic range of the top and have varying degrees of correlation between adjacent samples. Presentation of each quadrature in a polyadic space occurs through its division into smaller units, which are further processed, while reducing the spatial redundancy of the image.

In accordance with the peculiarities of polyadic encoding transforms the array Y_τ is formed by the system bases Ψ_τ

$$\Psi_\tau = \{\psi_{ij}^{(\tau)}\} \quad i=\overline{1,m}\,;\ \ j=\overline{1,n}\,;\ \ \psi_{ij}^{(\tau)} > y_{ij}^{(\tau)}, \qquad (1)$$

where - $\psi_{ij}^{(\tau)}$ base (i,j)-th τ-th element of the array component transform.

To reduce the volume of business data is proposed to form a system base array (τ+1) for the system under the preceding second array τ. To do this, all components of the array $Y_{\tau+1}$ are divided into two classes [4]. The first class $Y_{\tau+1}^{(1)}$ includes components, the system bases the array Ψ_τ. In this case, the Eq. 2

$$Y_{\tau+1}^{(1)} = \{y_{ij}^{(\tau+1)} \,|\, \psi_{ij}^{(\tau)} > y_{ij}^{(\tau+1)}\};\ \ i=\overline{1,m}\,;\ \ j=\overline{1,n}\,. \qquad (2)$$

The components included in the set of the second class $Y_{\tau+1}^{(2)}$ on the contrary, Eq. 3 is not satisfied,

$$Y_{\tau+1}^{(2)} = \{y_{ij}^{(\tau+1)} \,|\, \psi_{ij}^{(\tau)} \le y_{ij}^{(\tau+1)}\};\ \ i=\overline{1,m}\,;\ \ j=\overline{1,n}\,. \qquad (3)$$

We are then required for the components of the set $Y_{\tau+1}^{(2)}$ to form its own system of bases, for which the inequality (4)-(5)

$$\psi_{ij}^{(\tau+1)} > y_{ij}^{(\tau+1)};\quad \Psi_{\tau+1} = \Psi_{\tau+1}^{(1)} \cup \Psi_{\tau+1}^{(2)}; \qquad (4)$$

$$\Psi_{\tau+1}^{(1)} = \{\psi_{ij}^{(\tau)}\}.; \Psi_{\tau+1}^{(2)} = \{\psi_{ij}^{(\tau+1)}\}. \qquad (5)$$

Therefore, to reduce the amount W_k proposed to use differential polyadic representation of the components of the second set. Limits the dynamic range of the component, not only from the top $\psi_{ij}^{(\tau+1)}$, but with the bottom $\psi_{ij}^{(\tau)}$. This allows you to navigate to the processing of components with lower values. Polyadic number in the difference system is given by the Eq. 6 [5].

$$z_{ij}^{(\tau+1)} = y_{ij}^{(\tau+1)} - \psi_{ij}^{(\tau)};\quad z_{ij}^{(\tau+1)} < d_{ij}^{(\tau+1)}. \qquad (6)$$

where $d_{ij}^{(\tau+1)}$ the differential base (i,j)-th element of the (τ+1)-th second set of components

$$d_{ij}^{(\tau+1)} = (\psi_{ij}^{(\tau+1)} - \psi_{ij}^{(\tau)}). \qquad (7)$$

The values of the elements of differential polyadic numbers and values of systems of bases transferred to compact.

III. CODE NUMBER FORMATION

In accordance with relation (8) code-number $R_{\tau+1}$differential polyadic numbers calculated by the Eq. 8:

$$R_{\tau+1} = \sum_{i=1}^{m'} \sum_{j=1}^{n'} z_{ij}^{(\tau+1)} \rho_{ij}^{(\tau+1)}. \qquad (8)$$

where - $\rho_{ij}^{(\tau+1)}$ weight coefficient of element (τ+1)-th differential polyadic numbers (9)

$$\rho_{ij}^{(\tau+1)} = \prod_{\xi=i+1}^{m'} d_{\xi j}^{(\tau+1)} \prod_{\xi=i+1}^{m'} \prod_{u=1}^{n'} d_{\xi u}^{(\tau+1)}. \qquad (9)$$

The value of code numbers for the differential polyadic numbers decreased in comparison with the code numbers of the absolute polyadic numbers.

Due to the transition from a system of absolute grounds for a differential system of bases would reduce the value of the code numbers on the array representation transformants.

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