Hypercomplex Models of Multichannel Images

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Abstract—We present a new theoretical approach to the processing of multidimensional and multicomponent images based on the theory of commutative hypercomplex algebras, which generalize the algebra of complex numbers. The main goal of the paper is to show that commutative hypercomplex numbers can be used in multichannel image processing in a natural and effective manner. We suppose that animal brains operate with hypercomplex numbers when processing multichannel retinal images. In our approach, each multichannel pixel is regarded as a K-dimensional (KD) hypercomplex number rather than a KD vector, where K is the number of different optical channels. This creates an effective mathematical basis for various function–number transformations of multichannel images and invariant pattern recognition.

Keywords: multichannel images, hypercomplex algebras, image processing.

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