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Abstract

A Common Assessment Space for Different Sensor Structures †

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The study of the evolution process of our visual system indicates the existence of variational spatial arrangement; from densely hexagonal in the fovea to a sparse circular structure in the peripheral retina. Today's sensor spatial arrangement is inspired by our visual system. However, we have not come further than rigid rectangular and, in a minor scale, hexagonal sensor arrangement. Even in this situation, there is a need to be able to directly assess differences between the rectangular and hexagonal sensor arrangements, i.e., without the conversion of one arrangement to another. In this paper, we propose a method to create a common space for directly assessing the differences among any spatial arrangements, e.g., between the rectangular and hexagonal. Such a space is created by implementing a continuous extension of discrete Weyl Group orbit function transform which extends a discrete arrangement to a continuous one. The implementation of the space is demonstrated by comparing two types of generated hexagonal images from each rectangular image with two different methods of the half-pixel shifting method and virtual hexagonal method. In the experiment, a group of ten texture images are generated with variational curviness content using ten different Perlin noise patterns adding to an initial 2D Gaussian distribution pattern image. Then, the common space is obtained from each of the discrete images to assess the differences between the original rectangular image and its corresponding hexagonal image. The results show that the space facilitates an easy tool to assess the changes between different spatial arrangements by which, in the experiment, the hexagonal images show richer intensity variation, nonlinear behavior, and larger dynamic range in comparison to the rectangular images.

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