Image reconstruction in a color mosaic with random arrangement of chromatic samples

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Recent high resolution imaging of the retina (Roorda et al., 1999) shows that the mosaic of cones follows a random arrangement. Moreover, arrangement and proportion of cones differs largely from individual to individual. These finding renew the understanding of color vision because most of the models of color vision ignore the mosaic sampling. Here we propose a simulation of mosaic sampling applied on color image. From the simulation, we can infer the processing needs for retrieving spatial and chromatic information without ambiguity from the mosaic. We show that with linear processing it is possible to recover spatial and chromatic information from a mosaic of chromatic samples arranged randomly. We also show that low frequency component of achromatic information could serve for contour discrimination, which enables improving the interpolation of chromatic information. As an analogy to the mosaic of cones, it may be possible that in the cortex, the low frequency achromatic spatial information of the magnocellular pathway helps the reconstruction of chromatic information coming from the parvocellular information.

Roorda and Williams, Nature, 1999.