Perceptual basis of some rules of thumb in photography

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Photographers utilize many rules of thumb for creating natural-looking pictures. The explanations for these guidelines are vague and probably incorrect. I will explore two common photographic rules and argue that they are understandable from a consideration of the perceptual mechanisms involved and peoples’ viewing habits.

The first rule of thumb concerns the lens focal length required to produce pictures that are not spatially distorted. Photography texts recommend choosing a focal length that is ~3/2 film width. The texts state vaguely that the rule creates "a field of view that corresponds to that of normal vision", "the same perspective as the human eye", or “approximates the impression human vision gives”. Two phenomena are related to this rule. One is perceived spatial distortions in wide-angle (short focal length) pictures. I argue that the perceived distortions are caused by the perceptual mechanisms people employ to take into account oblique viewing positions. I present some demonstrations that validate this explanation. The second phenomenon is perceived depth in pictures taken with different focal lengths. The texts argue that pictures taken with short focal lengths expand perceived depth and those taken with long focal lengths compress it. I argue that these effects are due to a combination of the viewing geometry and the way people typically look at pictures. Some demonstrations validate this.

The second rule of thumb concerns the camera aperture and depth-of-field blur. Photography texts do not describe a quantitative rule and treat the magnitude of depth-of-field blur as arbitrary. I examine the geometry of apertures, lenses, and image formation. From that analysis, I argue there is a natural relationship between depth-of-field blur and 3D layout of the photographed scene. I present demonstrations that humans are sensitive to this relationship. In particular, depicted scenes are perceived differently depending on the relationship between blur and 3D layout.