

There are four fundamental attributes of an object that are maintained constant over a wide range of lighting conditions.

Lightness: lightness is the perceptual attribute related to reflectance. In most lighting situations, it is possible to distinguish between the illuminance on a surface and its reflectance, i.e. to perceive the difference between a low-reflectance surface receiving a high illuminance and a high-reflectance surface receiving a low illuminance, even when both surfaces have the same luminance. It is this ability perceptually to separate the luminance of the retinal image into its components of illuminance and reflectance that makes the use of luminance as the basis of lighting design criteria problematical.

Colour: physically, the stimulus a surface presents to the visual system depends on the spectral content of the light illuminating the surface and the spectral reflectance of the surface. However, quite large changes in the spectral content of the illuminant can be made without causing any changes in the perceived colour of the surface, i.e. colour constancy occurs. Colour constancy is similar in many ways to lightness constancy. There are two factors that need to be separated; the spectral distribution of the incident light and the spectral reflectance of the surface. As long as the spectral content of the incident light can be identified the spectral reflectance of the surface, and hence its colour, will be stable.

Size: as an object gets further away, the size of its retinal image gets smaller but the object itself is not seen as getting smaller. This is because by using clues such as texture and masking, it is usually possible to estimate the distance and then to compensate unconsciously for the increase in distance.

Shape: as an object changes its orientation in space, its retinal image changes. Nonetheless, in most lighting conditions the distribution of light and shade across the object makes it possible to determine its orientation in space. This means that in most lighting conditions a circular plate that is tilted will continue to be seen as a tilted circular plate even though its retinal image is elliptical.

These constancies represent the application of everyday experience and the integration of all the information about the lighting available in the whole retinal image to the interpretation of a part of the retinal image that bears several alternative interpretations. Constancy is likely to break down whenever there is insufficient or misleading information available from the surrounding parts of the visual field. The constancies are most likely to be maintained when there is enough light for the observer to see the object and the surfaces around it clearly, the light being provided by an obvious but not necessarily visible light source, there are a variety of surface colours, including some small white surfaces and there are no large glossy areas. Lighting conditions used in display lighting sometimes set out to break the constancies, particularly lightness constancy, in order to give the display some drama.

2.7.2 Attributes and modes of appearance

While lighting has an important role in preserving or eliminating constancy, it also has a role in determining the perceived visual attributes of objects. Objects can have five different attributes: brightness, lightness, hue, saturation, transparency and glossiness, depending on their nature and the way they are lit. These attributes are defined as follows.

Brightness: an attribute based on the extent to which an object is judged to be emitting more or less light.