

COMPUTATIONAL ASPECTS IN IMAGE ANALYSIS OF SYMMETRY AND OF ITS PERCEPTION

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Symmetry as a characteristic of shape and form has been widely studied both in the artistic and aesthetic aspect on one hand and in the mathematical and computational aspect on the other. Symmetry is typically viewed as a discrete feature: an object is either symmetric or non-symmetric. However visual perception and natural behaviour and phenomena treat symmetry as a continuous feature, relating to statements such as "one object is more symmetric than another" or "an object is more mirror symmetric than rotational symmetric. With this notion in mind, we view symmetry as a continuous feature and define a Continuous Symmetry Measure (CSM) to quantify the "amount" of symmetry of different shapes and the "amount" of different symmetries of a single shape.

A preliminary study showed that the Symmetry Measure developed, is commensurate with human perceptual experience.

The computational approach can embed both the hierarchical and continuous, nature of symmetry of objects.

Thus global and local features can be evaluated for their symmetry content.

CSM has been applied to real images and to shapes and forms extracted from measured data such as faces, chairs, and more. Global symmetry has been evaluated for these shapes and forms. Additionally, using the CSM locally symmetric regions can be found in images. In this manner faces are found and extracted from images.

The CSM gives rise to a method of reconstructing symmetry of occluded shapes. This method has been extended to deal with symmetries of noisy and fuzzy data.

We also consider grayscale images as 3D shapes, and use the CSM to find the orientation of symmetric objects from their images. For example face orientation is found based on the symmetry of 3D faces.