Symmetry in Art

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Abstract

Symmetry is an aspect of art that pervades our lives. Three types of symmetry - rotational symmetry, plane symmetry and point symmetry - were studied with respect to the artworks on the MIT campus. Out of 86 pieces of art, it was found that asymmetry was more commonly seen than symmetry, and that plane symmetry was the most ubiquitous amongst the three categories of symmetry. The results shed light on possible influences of symmetry on the perception of aesthetic beauty and call for further research on the ways in which humans response to symmetry in art.

1 Introduction

Symmetry is undeniably a key factor in influencing Mankind's appreciation and judgement of art. As Randy Blakely, Chair in Molecular Neuroscience commented, "Not only does the mind create art, it also perceives it". Several forms of symmetry exist, most notably rotational symmetry (Section 1.1), plane symmetry (Section 1.2) and point symmetry (Section 1.3). Hence, for the sake of satiating one's curiosity, a study was done to determine if asymmetry or symmetry would be more common, as well as determine the most prevalent type of symmetry amongst the artworks on the MIT campus. Artworks were also classified into four categories as suggested by the List Visual Arts Center website: Sculptures, Architecture, Installations and Drawings/Paintings.

1.1 Rotational Symmetry

Rotational symmetry revolves around the concept of rotating an object about an axis through the object. Should there be a point in the object around which it can be rotated a certain number of degrees and look invariant, the object is said to be rotationally symmetrical [1]. For instance, Figure 1 is said to exhibit rotational symmetry about its geometric centre.

1.2 Plane Symmetry

Plane symmetry essentially centres around having an imaginary plane that bisects an object into halves that are mirror images of each other[2].

1.3 Point Symmetry

Objects that exhibit point symmetry have a point of reflection about which reflection of the object produces invariant images. For instance, a sphere possesses point symmetry as it is invariant when rotated about its geometrical centre.

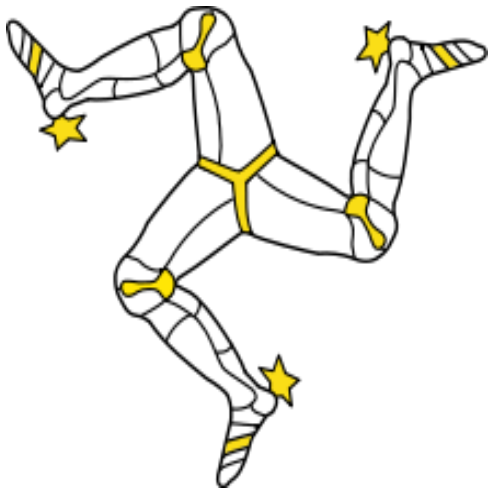

Figure 1: Rotational Symmetry

2 Hypothesis

From firsthand experience, although many art pieces seem to exhibit symmetry, they tend to be asymmetrical due to minute details. For instance, as seen in Figure 2, although the statue of Abraham Lincoln initially seems symmetrical, his right coattail is resting on his lap whilst the left is resting on the armchair, acting as an example of how seemingly symmetrical artworks could in fact, be non-symmetrical.

In addition, amongst the three types of symmetry, it is likely that plane symmetry has the highest rate of occurrence as an object only requires one plane of symmetry to be considered as possessing plane symmetry. This is unlike the case of point symmetry, whereby an infinite number of planes of symmetry are required in order for a point of inversion to exist. In addition, rotational symmetry would likely be less common than plane symmetry as rotational symmetry requires an object to be invariant when rotated through an angle, as opposed to plane symmetry whereby the only requirement is that an imaginary plane bisects an object into two congruent halves.

Bearing these in mind, it was thus hypothesised that asymmetry would be more ubiq-

Figure 2: Example of Non-Symmetrical,Symmetrical-Looking Sculptures

uitous than symmetry amongst the MIT artworks, and that amongst the three types of symmetry discussed in this paper, plane symmetry would be the most commonly exhibited form of symmetry observed.

3 Materials and Methodology

Artwork sampled includes 86 pieces of the Massachusetts Institute of Technology's Public Art collection as listed on the MIT Public Art Collection Map provided by the List Visual Arts Center.

In determining whether art works possessed symmetry, measurements and images of sculptures were obtained from the List Visual Arts Center website in order to ensure precision and accuracy of data collected as well as to maximise efficiency. This method was especially crucial in determining the symmetrical properties of artwork whose dimensions would have been difficult to measure accurately, such as those with irregular shapes and/or large sizes (for instance, buildings and architecture).

4 Results

Out of 86 art pieces, 26 exhibited symmetry whilst the remaining 60 were non-symmetrical. Several pieces amongst the 26 symmetrical artworks exhibited more than one type of symmetry as seen in Table 1.

Type of Symmetry	Number of Artworks Possessing Type of Symmetry
Rotational Symmetry	11
Plane Symmetry	23
Point Symmetry	7

Table 1: Number of Artworks Possessing Different Types of Symmetry

The modal type of symmetry was plane symmetry with a modal number of 23. In addition, out of the 26 artworks, 15 were of architectural value (e.g. MacLaurin Buildings) whilst 6 were installations and 5 were sculptures (Table 2). Lastly, it was interesting that no paintings were symmetrical.

Category of Artwork Exhibiting Symmetry	Number of Artworks
Architecture	15
Installations	6
Sculptures	5

Table 2: Number of Artworks Possessing Different Types of Symmetry

5 Discussion

Results gathered support the hypotheses that asymmetry is more common than symmetry and that plane symmetry is the most prevalent type of symmetry amongst the artworks on the MIT campus. One noteworthy point would be the categorical distribution of artworks that exhibited symmetry. Architectural buildings comprised the greatest proportion (57.7%) of artwork possessing symmetry, followed by installations (23.1%) and sculptures (19.2%).

The abovementioned results are due to the fact that most building facades exhibit plane symmetry about the middle, as can be seen from the example of the MacLaurin Building [Figure 3]. Despite possessing plane symmetry, only 2 of the architectural buildings exhibited point symmetry as they were asymmetrical about other planes. In addition, as both facades of buildings were usually different,rotational symmetry in architecture was rare.

All three types of symmetry were also more rare amongst sculptures and installations than in buildings. Purely built for aesthetic purposes (as opposed to buildings which also have functional value), the lower occurrence rate of symmetry in non-architectural artworks could be because the artists had made deliberate choices to avoid symmetry so as to create artworks that would seem less rigid and more dynamic.

Figure 3: Building Facade Exhibiting Plane Symmetry

6 Conclusion and Future Directions

All in all, this study has shown that amongst the extensive collection of artwork on the MIT campus, asymmetry is more prevalent than symmetry and plane symmetry is the most common form of symmetry as hypothesised.

As for future research, the response of humans to symmetrical and asymmetrical artworks can be studied so as to determine what kind of artwork humans find more appealing, as well as to possibly give us an insight into the choices that artists make when deciding whether to include symmetry as an integral part of their artwork.

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8 Other Requirements

$$x_{xy} = \sum_{i=1}^{i=n} W_i X_{xyi}$$

References

[1] U. of Illinois at Urbana-Champaign. Rotational symmetry. Retrieved 28 June 2012 from http://www.geom.uiuc.edu/ demo5337/s97a/rotate.html.

[2] U. V. University. Plane of symmetry - ochempal. Retrieved 28 June 2012 from http://science.uvu.edu/ochem/index.php/alphabetical/o-p/plane-of-symmetry/c.