

Nested Square Model

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Project Overview

The nested square model is a 3D printing project that creates a cube-like structure with square holes in each layer. Each layer features a square hole that is half the area of the square hole in the layer above it. The side length of each square is calculated using the formula:

$$L_x = \sqrt{2} \left(\frac{L_{x-1}}{2} \right)$$

where:

- L_x is the length of the side of the square hole in layer x ,
- L_{x-1} is the length of the side of the square hole in the layer above layer x ,
- L_0 is the length of the side of the square hole at the top layer.

Design Process

Formulas Creation

The first step was to create the formulas that define the relationship between the square shapes in each layer. The formula $L_x = \sqrt{2} \left(\frac{L_{x-1}}{2} \right)$ was employed to calculate the side length of each square based on the previous layer's side length.

Area Summation

Next, a summation was devised to represent the total area of all the square holes in the cube:

$$\sum_{n=0}^{\infty} 1 (0.5)^n$$

Each term in the summation signifies the area of each layer's square hole, illustrating how the area decreases with each successive layer until it approaches zero or reaches the bottom layer of the cube.

Implementation in Blender

The derived formulas were applied in Blender to calculate and construct each layer of the cube, ensuring the correct square hole size for each layer.

Transfer to Tinkercad

The project was then transferred to Tinkercad, where the summation representing the total area added to the side of the cube by all the square holes was incorporated.

Conclusion

The nested square model is a visually compelling 3D printing project that illustrates the concept of geometric progression in a tangible and visually engaging manner.