

SUDOKU Puzzle Generates a Minimal Art Sculpture

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Abstract:

A SUDOKU puzzle is a magic square with 9 rows and 9 columns and 81 squares. Each SUDOKU puzzle that is solved can be used as a source of design parameters for a Minimal Art based Sculpture.

9x9

A SUDOKU puzzle is a magic square with 9 rows and 9 columns and 81 squares. Each row and column contains 9 squares. Each square contains a number between 1 and 9. Each number may appear just once in a row or in a column. Each SUDOKU puzzle that is solved can be used as a source of the design parameters for a minimal art based sculpture.

Consider each square of the 81 squares as a cube. The 81 cubes will be the elements of a sculpture. To realize a 3D object each cube must have a position in space. Consider the number on each cube as a height coordinate which determines the third dimension, the level of the cube. The cubes with number 1 stay at the bottom, with number 9 take position at the top. The other cubes hold position at a level in between. The result is an object, with the property that you can see all the 81 cubes in all 6 axis-parallel views. So, no cube is hidden by another cube. Not only the top and bottom view, but also the front and back view as well as the left and right view. In all the 6 views you see a 9 by 9 square! But in a random perspective view you see a mash of cubes, an optical illusion, an anamorphic image.

8x8

I did not develop this principle on a SUDOKU puzzle square. I had never seen a puzzle like that when I was busy with this subject in 2001. My inspiration to realize a Minimal Art Sculpture myself was excited when I visited a Minimal Art Exhibition in the Gemeentemuseum in The Hague. As a result I developed a magic cube with a base of 8 rows and 8 columns and 64 cubes. This is the story:

I wondered if it is possible to create a piece of art, which looks, seen from 6 different views, like a chessboard, using only 64 cubes. That is what I asked myself, having visited a Minimal Art Exhibition in the Gemeentemuseum in The Hague in the Netherlands, seeing work from Sol LeWitt, an artist of the Minimal Art movement. I read about LeWitt, that in his vision, the idea behind the art work is much more important than the construction of the work of art itself.

In my thoughts I saw my Chessboard "Cube" right in the middle of a roundabout, at the crossing of two rectangular roads. On your way to the roundabout you see in front of you the view of the chessboard; while driving on the roundabout, you experience an optical illusion, because the position of each cube in relation to the other cubes changes constantly. Leaving the roundabout you see in your rear-view mirror again the chessboard, independently whether you leave at $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$ of the full circle.

I think it is a good idea, and a good result as well. According to Sol LeWitt's point of view it is a win-win-situation.

At that time I became a user of the Program Rhinoceros. A computer program you can easily make 3D models with. I tried to reach a result by trial and error. But I did not succeed. Trial and error is not a good practice to solve the problem.

If you look at the number of possibilities of the system you find there are millions of possibilities within billions of impossibilities. It is like searching for a needle in a haystack. I have tried to find out how

many. But I stopped. Trying to solve the problem, I drew a chessboard with 8 x 8 squares, and I wrote in each square a number, representing the position of height in the cube. In every row and column you have to use the numbers 1 to 8. Each number just once. See the left square in figure 1.

1	2	3	4	5	6	7	8
8	1	2	3	4	5	6	7
7	8	1	2	3	4	5	6
6	7	8	1	2	3	4	5
5	6	7	8	1	2	3	4
4	5	6	7	8	1	2	3
3	4	5	6	7	8	1	2
2	3	4	5	6	7	8	1

1	2	3	4	5	6	7	8
2	1	4	3	6	5	8	7
3	4	1	2	7	8	5	6
4	3	2	1	8	7	6	5
5	6	7	8	1	2	3	4
6	5	8	7	2	1	4	3
7	8	5	6	3	4	1	2
8	7	6	5	4	3	2	1

Figure 1: Two Squares filled with numbers, the right one is used as design parameters for the object

The problem is related to the problem of a magic square, in which the sum of every row and column is equal. There are millions of solutions, so you can make a choice, searching for beauty, constructability, stability, etc.

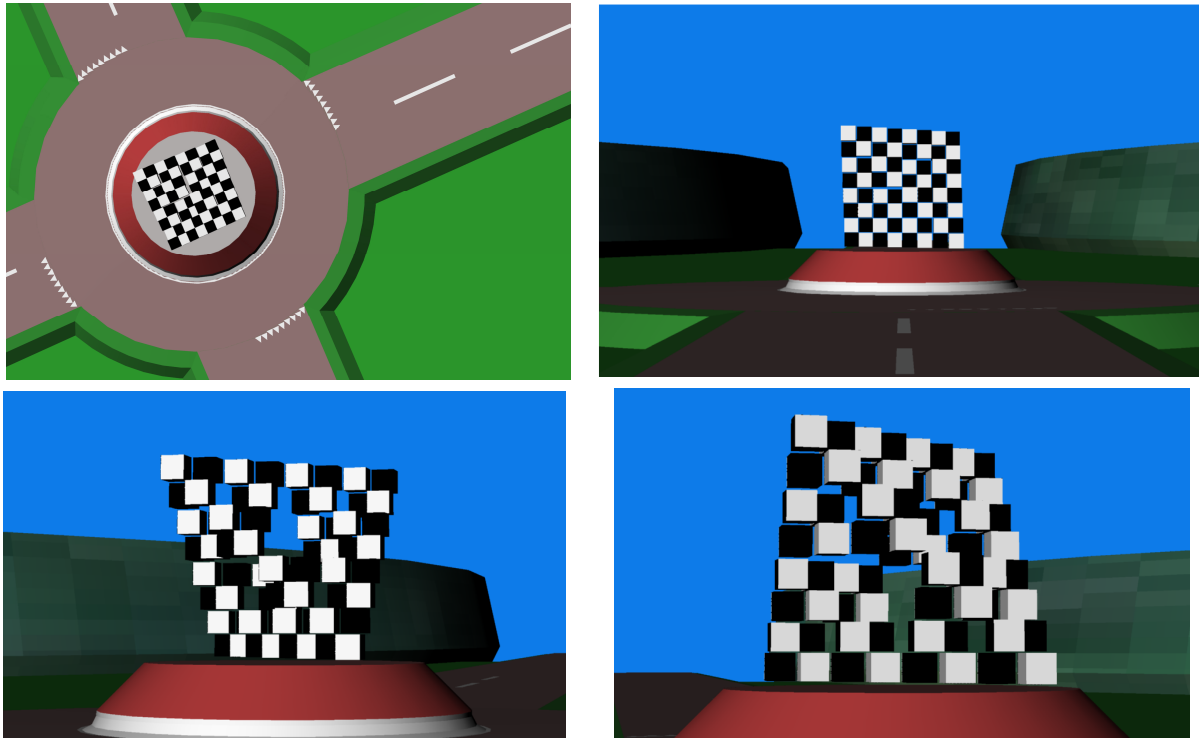


Figure 2: Minimal Art Chessboard on a roundabout seen from 4 different views

In figure 2 you see one of my minimal chessboards, in which the 6 diagonals are in the outer shell. It is just one. There are more!! It is not possible to make these pieces of Minimal Art with 32 white and 32 black cubes. To arrange the view of a chessboard each cube has 3 white and 3 black sides. Thanks to Sol LeWitt for the inspiration.

Later, seeing for the first time in my life a SUDOKU puzzle I realized that my 3D Minimal Art Sculpture and the 2D SUDOKU puzzle are based on the same principles.

REFERENCES

- [1] Hans Kuiper, Minimaal schaakbord als kunstwerk voor de openbare ruimte, Arthesis, 2002, nr. 1 & 2
- [2] Animated picture: <http://home.hccnet.nl/jc.kuiper/minimal/rotonde.html>
- [3] related work: Hideki Tsuiki, <http://www.bridgesmathart.org/art-exhibits/bridges2007/tsuiki.html>