

Halving Processes in a Square

Alex Van Bogaert

J.B. Dekyserstraat 55/10, B-3090 Overijse, Belgium;
alexvanbogaert@gmail.com www.alexvanbogaert.wordpress.com

Abstract

As a visual artist retired from a professional life engaged in architectural implementations, I come personally back this year to Bridges to share my passion for the square. **I deliberately chose to present a significant range of the preparation work** of my colorful geometric acrylic compositions, to help interested readers **to decipher** them, beyond a pleasing eye catch for the rapid proceedings browser. This shows how, as a non-mathematician, I consistently designed them for years according to a number of simple variations of the successive halving processes (*halvings*) of portions of the square.

Background

The square shape constituted by four equal 90° corners and four equal length sides associated with a rich collection of geometrical properties beyond my non-mathematical understanding also symbolizes durability, security, equilibrium and the rational arrangement of space. It further represents honesty, integrity and morality and in China it was the symbol of Earth [3].



Figure 1: *Work example.*

Perhaps inspired by Karl Gerstner ideas [1], for more than forty years the *halvings* of the square almost fill entirely my artistic creations. My work contains a fascinating search of the structure and variability aspects of the square. It is not a cold approach of form, but an outspoken fondness of a certain abstract style, where the suggested geometrical contrasting surfaces also display warm feelings thanks to a harmonious use of color mixing, hence the particular climate of the work. The viewer grasps an acutely ordered geometric image often containing symmetries, yet in several respects seems subordinate to linear and color powers. See Figure 1 (**Interested and puzzle gamer readers are urged to check out the colored and enlargeable online text similar to [2] to dig in !**)

The quivering color play obtained from three or four transparent acrylic layers indeed conveys a ludical eye-caressing and powerful expressive presence to each canvas. Preference of red, blue and yellow tints, sometimes mixing into secondary colors, enrich the paintings thanks to a range of variants. The form of the composition which constitutes the essence of this paper, proceeds from a pure geometric and mathematically assumed simple construction: I work with successive *halvings* in the square, changing the new half in opposite color to obtain an alternation when at next step the last half is halved again, with the last half at each step being alternatively white or black.

3 introductory remarks on how my main *halvings* operate (1st of 3 quite different parts I to III)

1. The first schemes I gradually developed (1, 3, 5, 6) show the 4 first elements of infinite sequences of squares containing consecutive halvings, and those 4 are most likely to be used in my artworks.
2. These halvings work in four directions, only the first one is shown, starting from a non-shown white square.
3. These sequences indeed start from a white or a black square. The examples of their use here provided also contain parts generated from a black square as well as parts containing white and black squares.

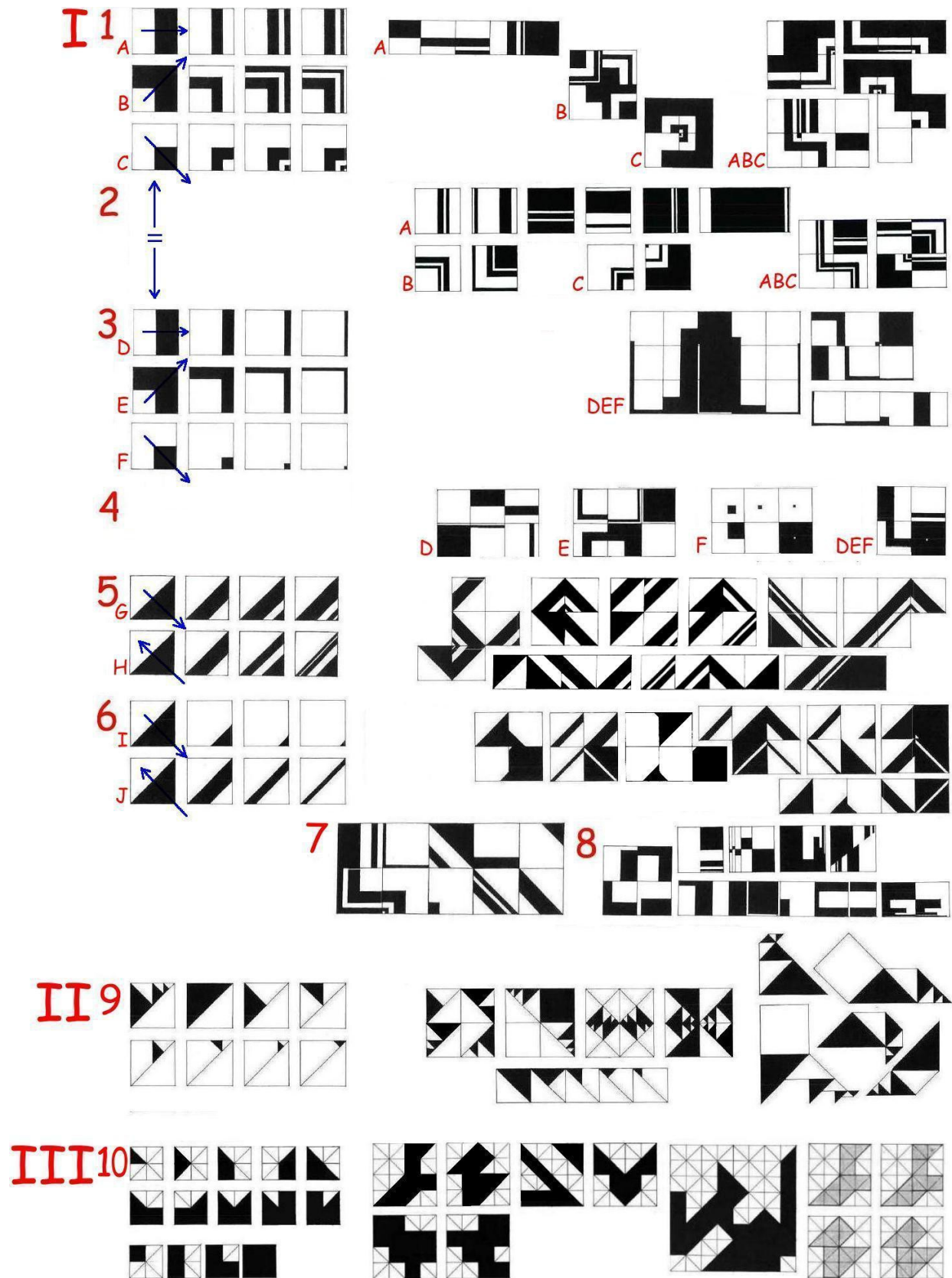


Figure 2: Setup of 3 kinds of halving strategies and examples. See explanations on facing page.

Explanations of Different Schemes of Subdividing the Square in Figure 2

The left hand side of the figure list the halving schemes, and examples are provided at the right (justified).

Part I: Main Halving Schemes

1. 4 shown successive early square halvings include the previous ones in 3 kinds, A: vertical halvings going to the right of the square are shown, possibly also going to the left, and possibly horizontal halvings going up or down of the square, B: corner halvings going outside to the upper right of the square are shown, also possibly going to the three other corners of the square, C: corner halvings going inside of the square down to the right are shown, also possibly to the three other directions. Examples of A, B and C separate; examples of A, B, C combining.
2. Any number of halves of point 1 above can change places in the square, possibly in 3 non shown other directions. Examples for A, B and C separate; examples for them combining.
3. As one simple possibility of above point 1, the 4 shown halvings D, E, F do not include the previous halvings and present only the last of the successive halvings in the square, possibly for all directions non shown, with an accompanying alternate change of color. Examples for D, E, F separate; examples for D, E, F combining.
4. The previous 4 shown halvings D, E, F can also change places in the square, possibly for 3 other directions non shown. Examples for D, E, F separate and combined.
5. The 4 shown successive halvings G, H including the previous halvings are divisions in diagonals of the square. possible for three other directions non shown. Mixed examples for G, H separate and combining: funny exercise to sort them out by now!
6. As one simple possibility of above point 5, the 4 shown halvings I, J do not include the previous halvings and present only the last of the successive diagonal halvings in the square, possible for all directions. Examples for I, J separate; examples for I, J combining.
7. Example showing all A to J halvings in one example. Examples of Figure 3 below go beyond.
8. An interesting additional possibility is to produce halves in other directions simultaneously, examples.

Part II: Other Combinable Triangular and Square Halvings

9. Following halvings with triangles can be made in a square; examples; with base squares and triangles different compositions can be made.

Part III: Triangular and Square Based Shapes in a Square

10. Ten different shapes involving triangles sit in a square divided in eight triangles; four different shapes involving squares sit in a square subdivided in four squares; shapes can be combined, examples of combined shapes involving triangles; of combined shapes involving squares; of both kinds combined; example of all shapes combined in one image; examples of two above complex shapes can be combined in different ways (I herewith like to mention that all combinations proceeding from the tangram puzzle dear to RAM8 colleague Samuel Verbieste are included in this category, but not addressed in my work).

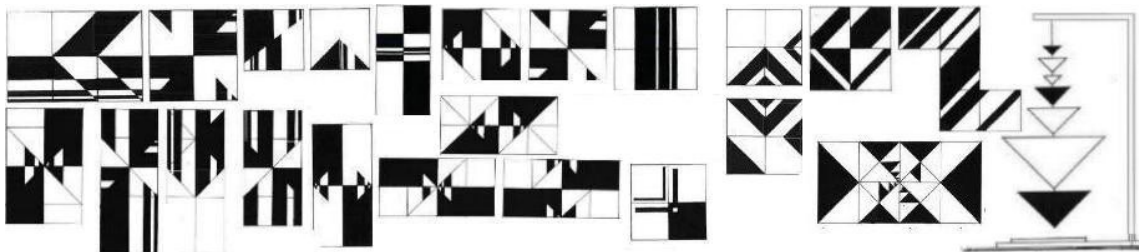


Figure 3: More Complex Halving Constructions Beyond Above Schemes to discover.

Examples of Works as Seen in Exhibitions and in Bridges Conferences

Figure 4 provides some simple and complex paintings designed in accordance to described schemes accompanied with my participation in 8 Bridges conferences with co-operative works of our 'RAM-8 Groep' local artist collective [2 and consecutive years to 2019].

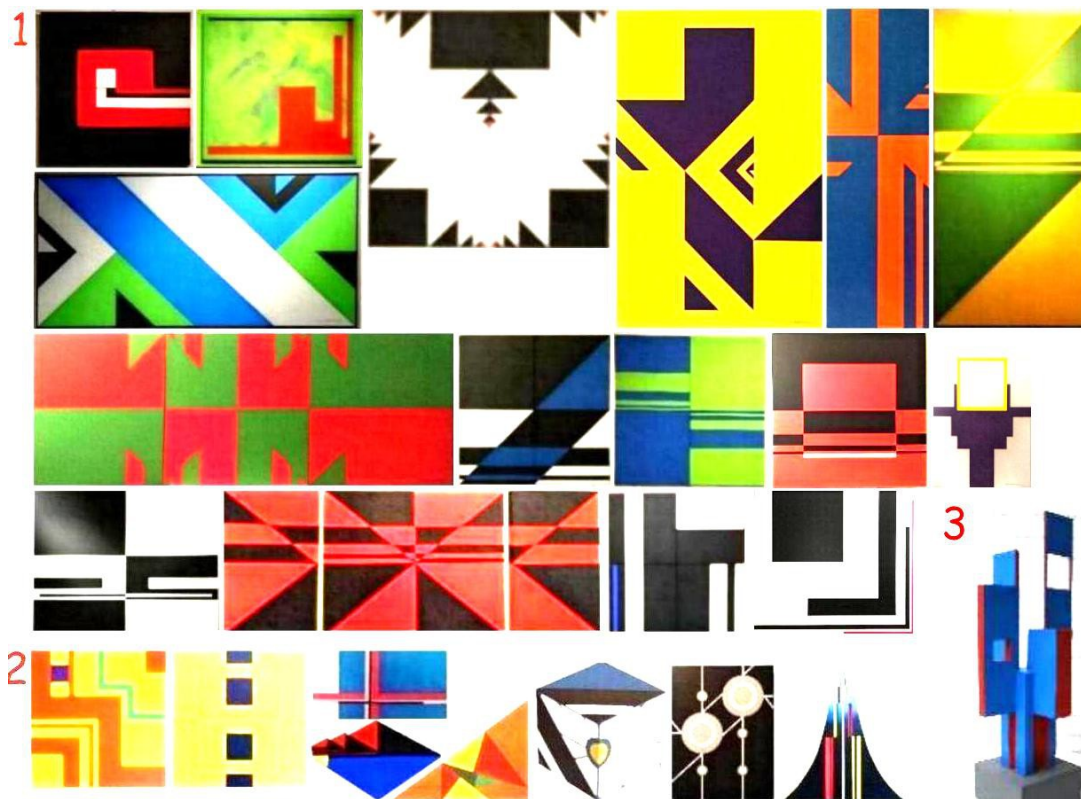


Figure 4: 1. Some of my halving artworks; 2. My Bridges works parts of 'RAM-8 Groep' co-operative sculptures; 3. Blue and red sculpture model as last image.

Conclusion

I hope this multitude of different creations spawned by very simple and inviting means described in this paper might inspire artists and students **to decipher them** and to join playing. Online searches for fractal aspects, like "simple fractal square" suggested by a reviewer lead to deeper mathematics far beyond my understanding, but I now envision that options for further progress do exist to develop some naming convention characterizing the essence of the numerous instances of the halving processes.

Acknowledgments

I herewith like to thank the members of our joyous 'RAM-8 Groep' artist collective, the happy visitors of the exhibits for their warm support, and the reviewers who creatively provided important improvements.

References

- [1] K. Gerstner. *Forms of Color: The Interaction of Visual Elements Paperback*. MIT Press, 1990.
- [2] RAM-8 Groep. <http://gallery.bridgesmathart.org/exhibitions/2013-bridges-conference/ram-8-groep>.
- [3] Wikipedia. *Temple of Earth*. https://en.wikipedia.org/wiki/Temple_of_Earth