

**Then Try This • Algorithmic Pattern Salon**

# Tiling through Typography

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**Then Try This**

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**ABSTRACT**

In this paper, we provide a concise introduction to Sebastien Truchet's 17th-century combinatorial approach and Dominique Douat's notation, with the aim of modernising it for computer-based applications and contemporary interpretation.

**Introduction**

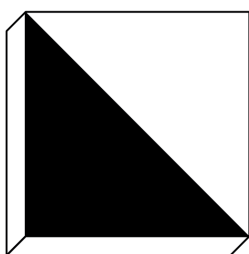
The purpose of this paper is to create a stable framework for the combinatorial composition method through typography, from a theoretical and practical point of view.

In this study different fields are involved, such as combinatorics, geometry and decoration, and typography. In order to define a general method, we briefly introduce the work of Sebastien Truchet and focus on the notation introduced by Dominique Douat. Both apply combinatorics to the tiling problem for aesthetic purposes, to identify the more pleasing tessellations rather than seeking new ways to divide the plane.

Finally we explain how Douat notation can be used nowadays with digital fonts and how it can be implemented.

**Truchet Tilings**

Sébastien Truchet was a 17th-century French Dominican priest whose contributions spanned in different fields, including hydraulics, tilings and typography. Our paper begins with a trip near a canal, leads through the untiled floor of a church and ends in a virtual typographic chase.



**Figure 1**  
The Truchet Tile

During a trip on the Canal d'Orleans, Truchet sees some ceramic tiles and decides to examine *which* compositions can be made with such tiles.

*In order to be able to form pleasing designs and patterns by arranging these tiles, I first examined the number of ways in which they could be joined together in pairs [...] <sup>1</sup>*

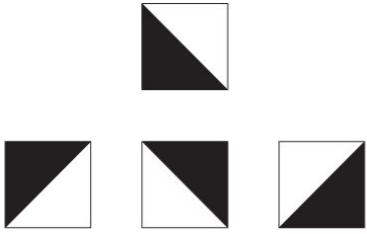
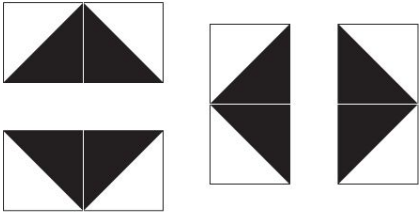
Truchet applies combinatorics to tiles ([Tav. 1](#)) and orders all the combinations in a catalogue ([Tav. 2,3](#)). Finally, he uses elements from this catalogue to create [compositions](#)<sup>2</sup>.

**The Combinatorial Method**

In order to create a simple framework, we introduce a new lexicon, give an overview of the passages of the combinatorial method, and shortly discuss each of its passages.

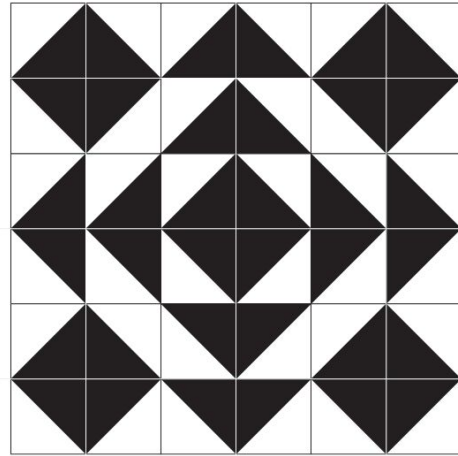
## Lexicon: modules, nodes, compositions

This method is based on the combination of modules into nodes, which are then recombined to create the final compositions. Let's clarify the nomenclature of these elements<sup>3</sup> in the Table 1.

Table 1	
<p><b>Modules</b> Indicate the tile and its spatial configurations</p>	 <p><b>Figure 2</b> Sebastien Truchet's modules</p>
<p><b>Nodes</b> Refer to the elements resulting from the combination of modules</p>	 <p><b>Figure 3</b> Some of Sebastien Truchet's nodes, obtained by combining them two-by-two</p>

**Compositions**

Denote the objects obtained from the combination of nodes

**Figure 4**

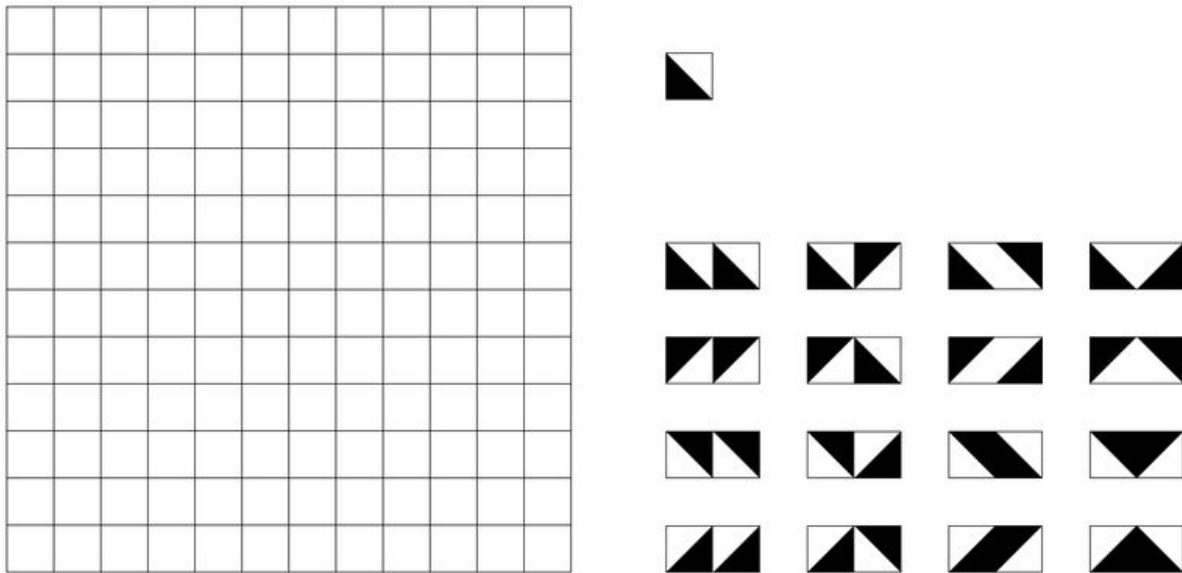
A composition made with the nodes of Figure 2 by the author of the paper

**Tricking our imagination**

Umberto Eco defines Creativity as a new combination of existing elements<sup>4</sup> and the Truchet's study relies on this: through the generation of nodes, he highlights the expressive potential of the modules.

For instance, if we were asked to create sixty designs in a 12x12 grid starting from a single tile, it would seem like a daunting challenge.

However, if we were asked to do the same but were also given an ordered catalog of 16 nodes to work with, the task would seem easier.



**Figure 5**  
Tricking our imagination with combinatorics

Despite the initial conditions remaining unchanged (we are still composing using the same tile), the second task appears much simpler.

Eco also writes:

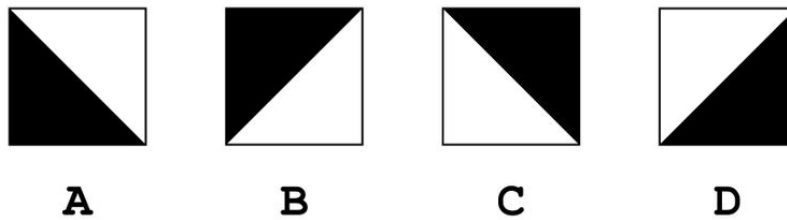
*That creativity is based on combinatorics seems obvious to me, and I have tried to show this in the course of my conversation. But the reasons for the final choice, for the repudiation of unsatisfactory solutions, to stop at the only one that seems perfect, is not yet clear to us.*<sup>5</sup>

A preliminary simple combination of tiles helps us explore new possibilities, but we still need to choose and arrange them to create a final composition.

## Douat Notation

While Truchet is widely celebrated for his idea to apply combinatorics to decoration, there is another priest whose work is less known: Dominique Douat.

Dominique Douat examines *how many* and *which* compositions can be made with the Truchet tile.



**Figure 6**

Douat notation: each letter represents a module

He sets a new combinatorial method that uses a type notation for both combining tiles and creating compositions, and he also calculates [all the possible compositions that can be made by taking the tiles n by n.](#)<sup>6</sup>

$$P = n^k$$

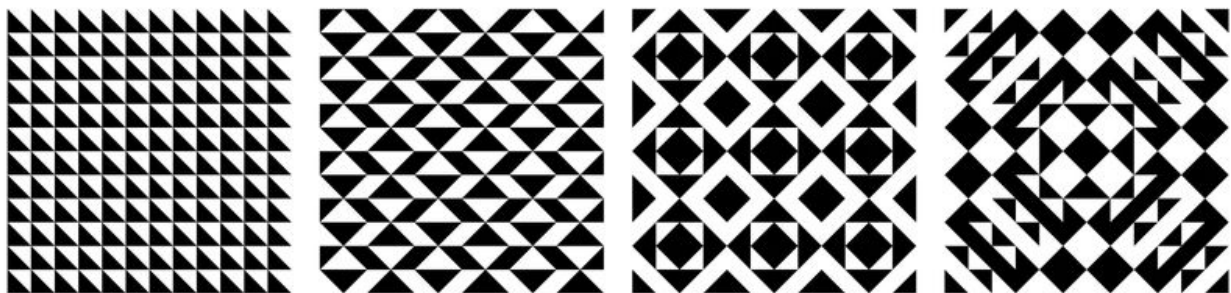
$P$  = number of permutations with repetitions

$n$  = numbers of modules

$k$  = class of the combination (number of total tiles)

Douat's notation makes Truchet's calculations seem obsolete, and his estimation of possible compositions also helps the decorator in terms of predictability of the final output.

Furthermore, he describes [four generative rules](#) for the final compositions, based on strings of four characters.



**Figure 7**

Four different outputs of four different generative rules of Dominique Douat.

**Simple:** composition 1 by Sebastien Truchet

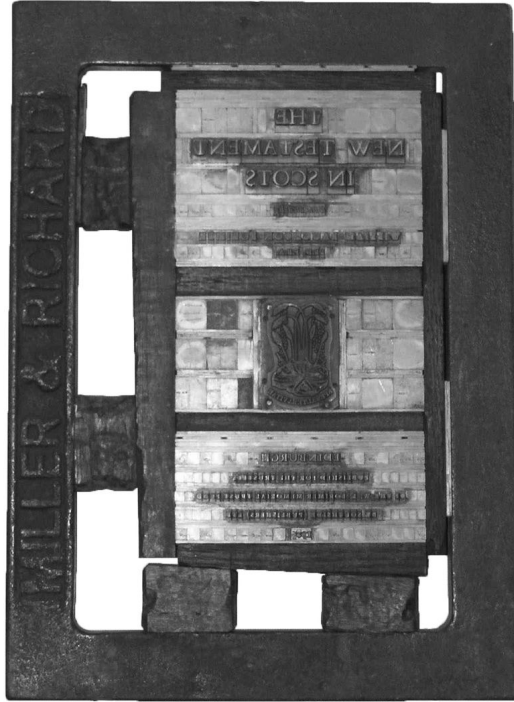
**Less simple:** composition 1 by Dominique Douat

**Composed:** composition 8 by Dominique Douat

**More composed:** composition 14 by Dominique Douat

## Tiling in a Typographic Chase

The notation introduced by Douat allows the decorator to compose tilings as a typographer composes his chase.



**Figure 8**  
The front page on the New Testament  
of the Christian Bible.

The chase is an essential component of the letterpress printing process, it is a frame that holds the type characters in place, and serves as a tool both for composing and aligning.

We can relate the motif of a square tile to the letter of a monospaced unicase typeface:

- In a **unicase** typeface, uppercase and lowercase letters have the same height, and there are no ascenders or descenders.

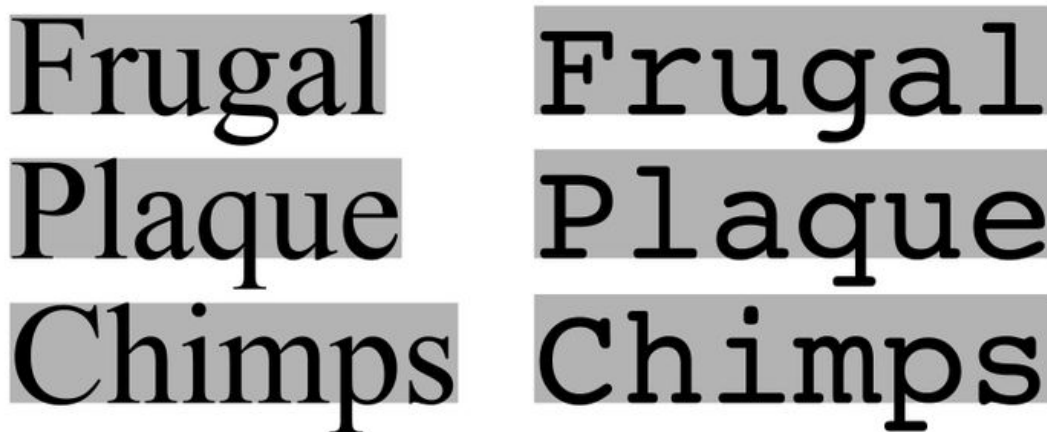


**Figure 9**

A case comparison between the Times New Roman and a Delius Unicase by Natalia Raices.

In the Delius cap-height = ascenders = x-height, descenders = baseline

- In a **monospaced** typeface each character takes up the same horizontal space. This uniform character spacing is commonly used in coding, typewriters, and other applications where precise alignment is essential.



**Figure 10**

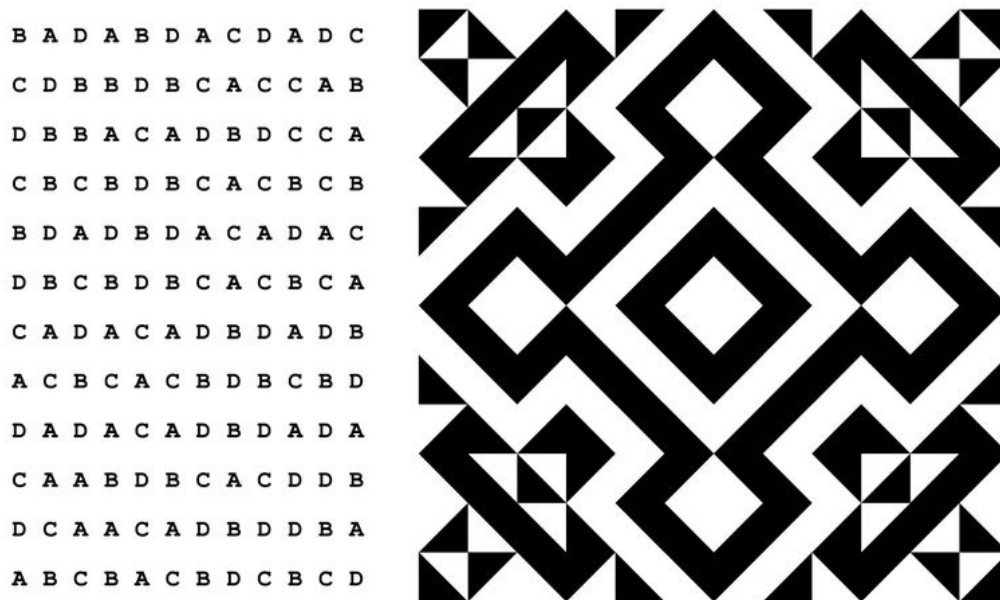
Comparison between Times New Roman and Courier (monospaced) in terms of horizontal space

### **Another font, another floor**

Significant advancements have occurred since Douat authored his book, and computers can process strings efficiently nowadays. Douat notation can be easily computed, facilitating both calculations and shape variations.



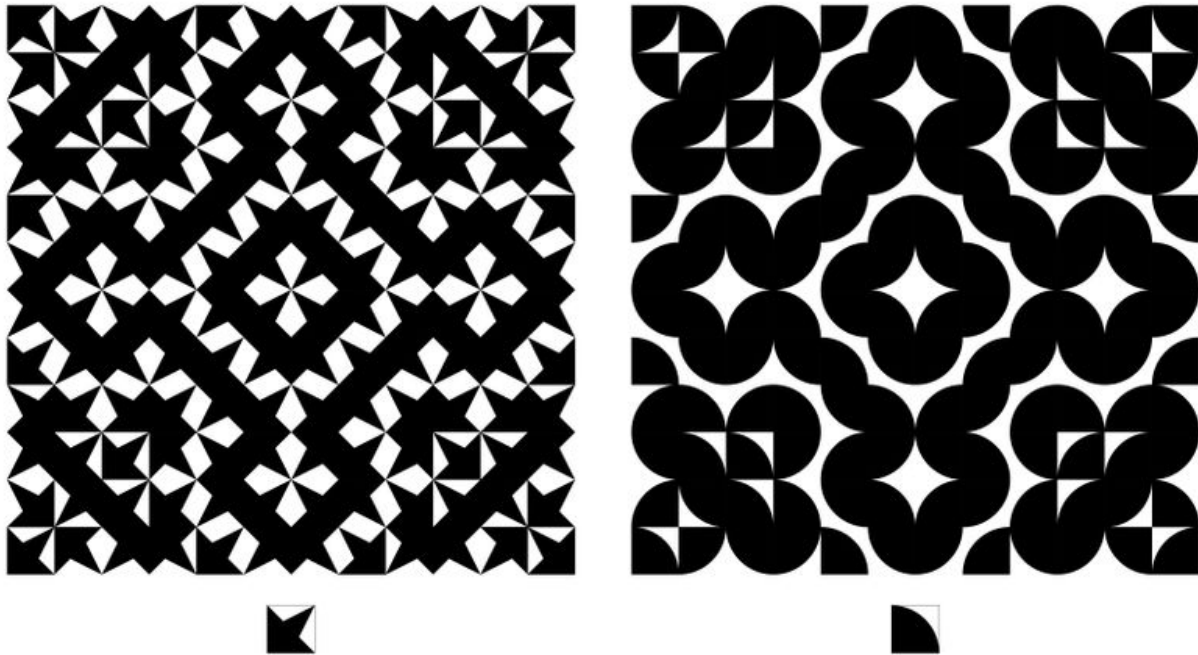
Any composition that Douat has written in the 18th century can now be typed on a computer, and with the appropriate font his work comes back to life as a vector<sup>7</sup>.



**Figure 11**

Table 52 of Dominique Douat and its notation

Moreover, it's really easy to obtain variations in any composition by simply changing the shape of the font, keeping in mind that the decorator still needs to study the geometrical properties of his variation in order to obtain a coherent result.



**Figure 12**

The general appearance of the composition does not change since the new modules have symmetries similar to that of the Truchet tile, and are also similarly oriented. However, other properties change, such as the colour balance. (Font variations of the Table 52 by the author of the paper)

## Conclusions

We have exposed Douat notation and how to apply his method to computers. This process has different advantages, such as:

- efficiency: the process runs really efficiently on the computer
- alignment: the tiles result perfectly aligned
- file weight: the text files are lighter than a vector file
- vectorisation: texts can be easily vectorised with alignment preservation
- flexibility: it is really easy to make variation of the tilings

This new approach also opens a new series of questions:

1. How do we analyse a module's geometric properties?
2. How do we manage the complexity of a large numbers of combinations?
3. By which criteria can we catalogue our nodes?
4. How do we choose the nodes to compose?
5. Which generative rules can we use to create pleasant tilings?

For those interested in such questions, some studies can be found in the master thesis *Un'infinità di disegni*<sup>8</sup> (An infinity of Compositions). In this work the combinatorial method has been studied using a binary system (with only two modules: 0, 1), and a new system for cataloguing nodes is established. Furthermore, a higher-level notation is introduced, based on the generating strings through the conversion of a decimal number into a base- $n$  number, where  $n$  represents the number of modules.

This notation was applied in the [Blauer Schnipsel](#) project, with the objective of designing textile compositions using industrial waste. For this project, a new cataloguing system was introduced, based on both aesthetics and ecological constraints<sup>9</sup>.

The string notation has practical application in type design, which is exemplified by its use in the [GTL](#). Thanks to this tool numerous fonts were created during workshops conducted by the [Scuola Open Source](#) of Bari.

## **A tribute to the master**

Finally, as a tribute to Dominique Douat we present [256 nodes](#) that he has written but never visually represented. These nodes can be useful to find the centre of orthogonal compositions<sup>10</sup> (Fig. 13).

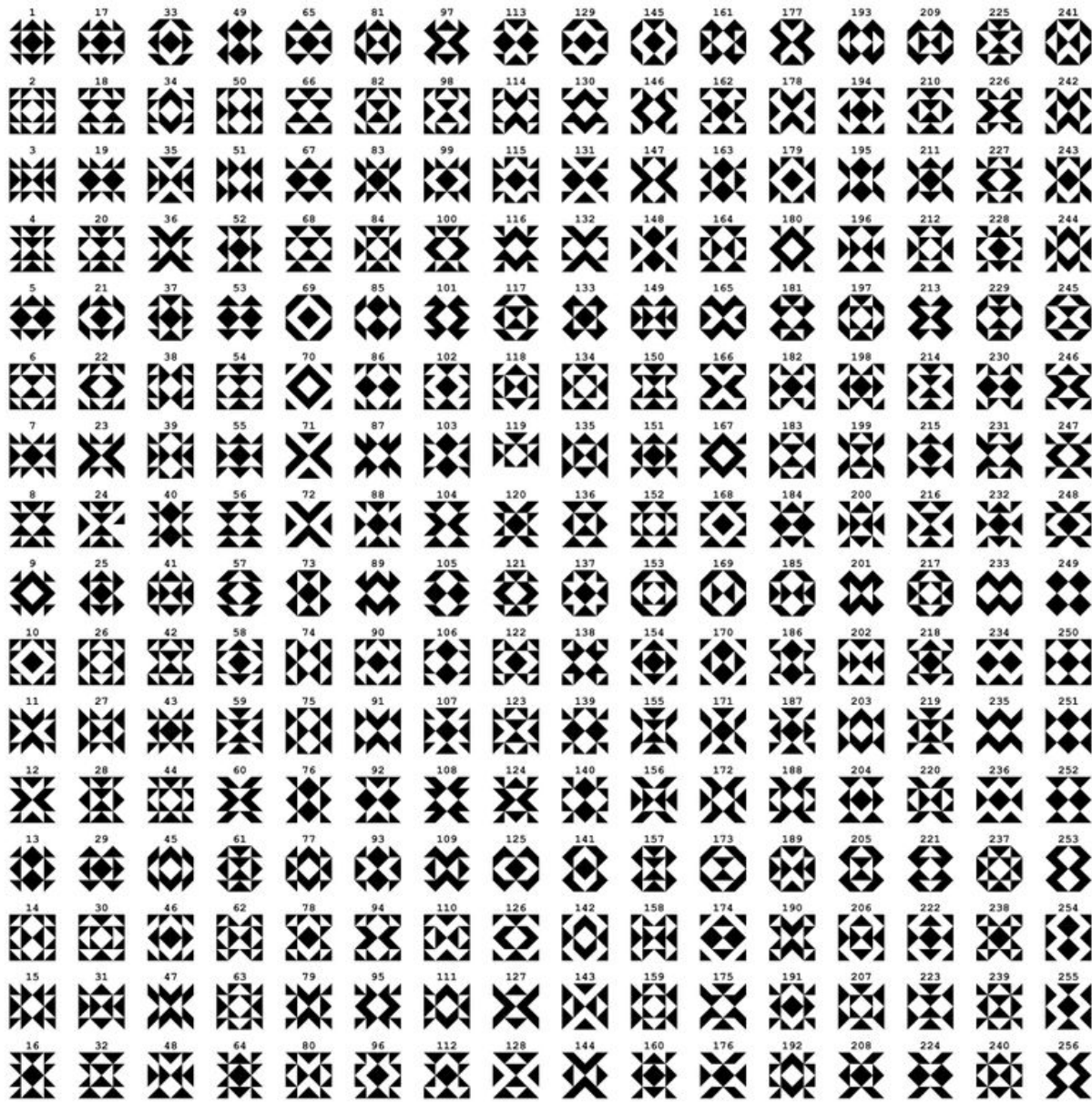


Figure 13  
 Visual representation of 256 Nodes by written by Dominique Douat

**Bibliography**

- Cyril Stanley Smith and Pauline Boucher; *The tiling Patterns of Sebastien Truchet and the Topology of structural Hierarchy*. Leonardo, 20(4):373-385, 1987.
- Sebastien Truchet, *Memoire sur les combinations*. Memoires de l'Academie Royale des sciences, Paris, 1704.
- Umberto Eco, *Combinatoria della creativita*, 2004

- Dominique Douat, *Méthode pour faire une infinité de desseins différents avec des carreaux mi-partis de deux couleurs par une ligne diagonale : ou observations du Père Dominique Douat, Religieux Carme de la Province de Toulouse, sur un mémoire inséré dans l’Histoire de l’Académie Royale des Sciences de Paris l’année 1704, présenté par le Révérend Père Sébastien Truchet, religieux du même ordre, Académicien honoraire*; Printed by Jacques Quillau, Paris, 1722.
- Rocco Lorenzo Modugno, *Un’infinità di disegni*, ISIA Faenza, a.a. 2019-2020.
- Adele Buffa, Rocco Modugno, Andrea Righetto; *Blauer Schnipsel, co-generating a social fabric*, Franzlab, Bolzano 2023.
- <https://gallica.bnf.fr/>
- [https://en.wikipedia.org/wiki/Chase\\_\(printing\)](https://en.wikipedia.org/wiki/Chase_(printing))

## Footnotes

1.

Translation of the original text by Pauline Boucher.

Cyril Stanley Smith and Pauline Boucher, The tiling Patterns of Sebastien Truchet and the Topology of structural Hierarchy. *Leonardo*, 20(4):373-385, 1987. [↵](#)

2. Sebastien Truchet, Memoire sur les combinaisons. *Memoires de l’Academie Royale des sciences*, Paris 1704. [↵](#)

3. This nomenclature was defined with Amedeo Bonini at the Free University of Bozen in 2022. [↵](#)

4.

Umberto Eco, *Combinatoria della creatività*, 2004  
page 5

From the personal website of Umberto Eco

<http://www.umbertoeco.it/CV/Combinatoria%20della%20creativita.pdf> [↵](#)

5.

Umberto Eco, *Combinatoria della creatività*, 2004

page 15

Original text: “*Che la creatività si basi su una combinatoria mi pare evidente, e ho cercato di mostrarlo nel corso della mia conversazione. Ma le ragioni della scelta finale, del ripudio delle soluzioni insoddisfacenti, per arrestarsi alla sola che pare perfetta, non ci è ancora chiara.*” [↵](#)

6. Dominique Douat, *Méthode pour faire une infinité de desseins différents avec des carreaux mi-partis de deux couleurs par une ligne diagonale : ou observations du Père Dominique Doüat, Religieux Carme de la Province de Toulouse, sur un mémoire inséré dans l'Histoire de l'Académie Royale des Sciences de Paris l'année 1704, présenté par le Révérend Père Sébastien Truchet, religieux du même ordre, Académicien honoraire*; Printed by Jacques Qquillau, Paris, 1722. [↵](#)

7.

In order to compose without any blank horizontal space, every glyph must not have any spacing or kerning in the font editor.

To compose without any blank vertical space between the modules, the font size and the line spacing must have the same value. [↵](#)

8. Rocco Lorenzo Modugno, *Un'infinità di disegni*, ISIA Faenza, a.a. 2019-2020 [↵](#)

9.

Adele Buffa, Rocco Modugno, Andrea Righetto; *Blauer Schnipsel, co-generating the social fabric*, Franzlab, Bolzano 2023.

NB: Due to an editorial error only 36 of the 72 element presented have the characteristics described by the author. [↵](#)

10. Dominique Douat, *Méthode pour faire une infinité de desseins différents avec des carreaux mi-partis de deux couleurs par une ligne diagonale : ou observations du Père Dominique Doüat, Religieux Carme de la Province de Toulouse, sur un mémoire inséré dans l'Histoire de l'Académie Royale des Sciences de Paris l'année 1704, présenté par le Révérend Père Sébastien Truchet, religieux du même ordre, Académicien honoraire*; Printed by Jacques Quillau, Paris, 1722. [↵](#)