COMPUTERIZED CREATION OF NOVELTY WEAVES

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Abstract: *Traditional weaving textbooks usually present a classification of basic weaves, combined with methods for creation of new weaves. We present new methods of algorithmic creation of weaves, which are nowadays possible thanks to the use of CAD software. We explain these methods as implemented in ArahPaint jacquard drawing program and ArahWeave jacquard weaving CAD. The created weaves vary in use by satisfying specific technical properties, for example crepe weave with desired float length. We also want the weaves to repeat nicely, and be visually regular, free of unwanted stripes.*

Keywords: *weaving jacquard CAD parametric generation*

1. INTRODUCTION

Textile schoolbooks have a long tradition and they all present their own weave classification, accompanied by some step by step instructions for creation of new weaves, by combining the existing ones (Brickett 1934, Giudici 1943, Holyoke 2013, Kienbaum 2016, Rodón i Amigó 1930). This can be done simply by using a basic weave block and rotating it by 90/180/270 degrees, by placing rotated blocks arranged in a regular pattern, by superimposing weaves, by interlacing them, by adding points to existing weave using some rules, etc. In a modern terminology, we would call these instructions algorithms for weave constructions.
We will concentrate on single layer weaves, as multiple layer weaves are usually created on the fly by the designer based on a specific construction need.
Most textile CAD software offers tools to automate these processes. But some push the boundaries even further, and provide additional tools with more complex algorithms, which the old masters could not envision. We will explain some functions, which have been implemented in software packages ArahPaint (Gregorčič 2025) and in ArahWeave (Gregorčič 2025).
Usually we construct a weave with the aim to achieve certain surface effect, while respecting some technical production limitations, like maximum length of floats, weave repeat size (for divisibility), visual appeal (must be balanced without unwanted lines in any direction). One classical example of such a weave construction is crepe weave. It is quite difficult to do for shaft weaving, so even today in the industry they always use the same 3-4 good crepe weaves. For jacquard, we are free to make much larger weaves, so we present an algorithm for creation of crepe weave of any repeat size, intensity level (warp to weft effect) or length of maximum float.

2. MAKING NOVELTY WEAVES BY CAD

2.1 Crepe weaves by random weave mirroring

One approach we use in ArahPaint is to chose a suitable starting motif, then we call the function to create random mirroring layout of the motif, and finally we create the new weave. The advantage of this approach is that we can easily make very large weaves, which match the number of hooks on our jacquard. The bigger the weave, the more regular it will look. Since our base weave was carefully chosen, we do not have any long floats.

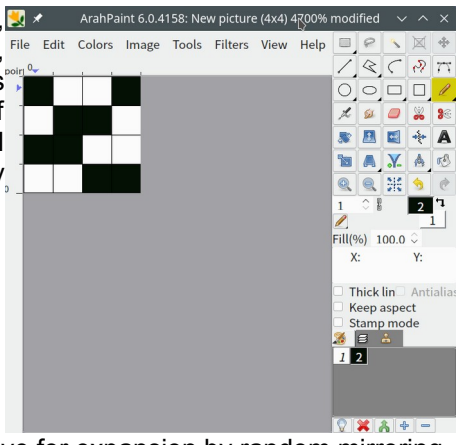

Figure 1: Base weave for expansion by random mirroring

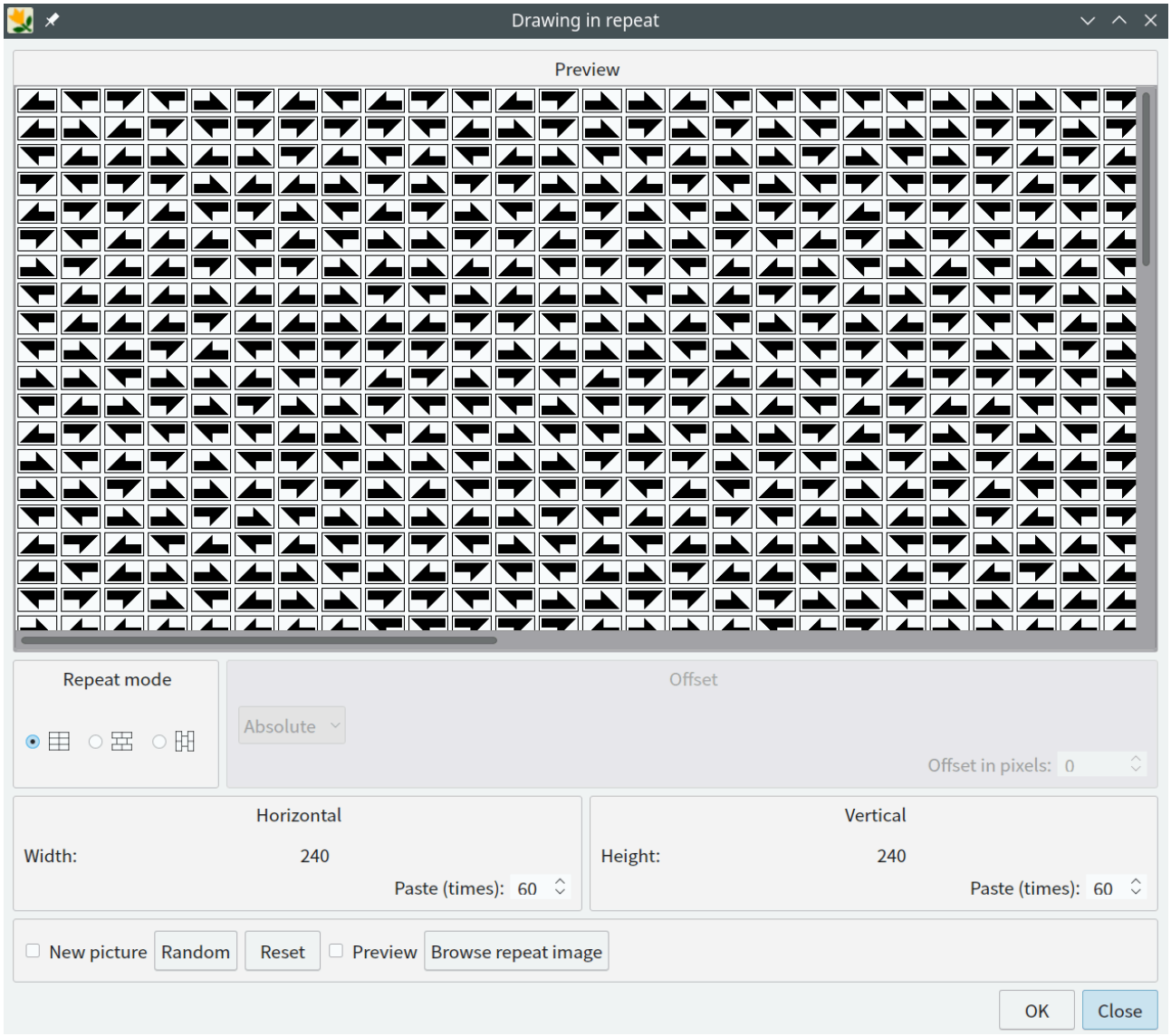

Figure 2: Setting the layout for expansion by random mirroring

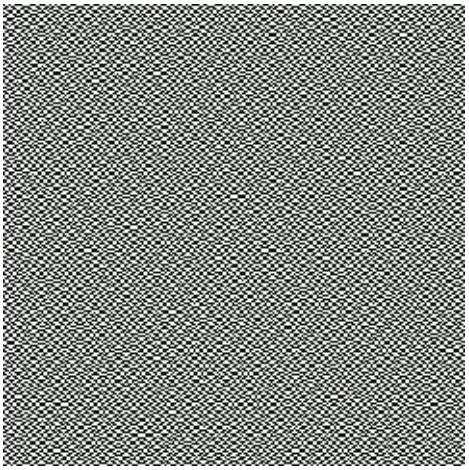

Figure 3: The resulting crepe weave of size 240x240

2.2 Simulating flame yarns by randomly inverting weave areas

Weavers always try to achieve maximum effect using minimal tools. For example, flame yarn is more expensive than regular yarn, and we try to get the effect of flame yarn look just by using special weave. We start with plain weave, and then we use the software to randomly invert sections of single warp and single weft. The starting position is random, and length is also random, but parametric. In areas where the weave was inverted, the yarns weave in the same way, so they are grouped together. As a result, you will get a view of irregular yarn in the fabric. Since the algorithm to place the invert operation works in repeat, there will be no visible defect on the border. Once again, we can easily use this approach to make weaves of any size, so we are sure to use the whole capacity of the jacquard at hand, and we made a design which is hard to copy.

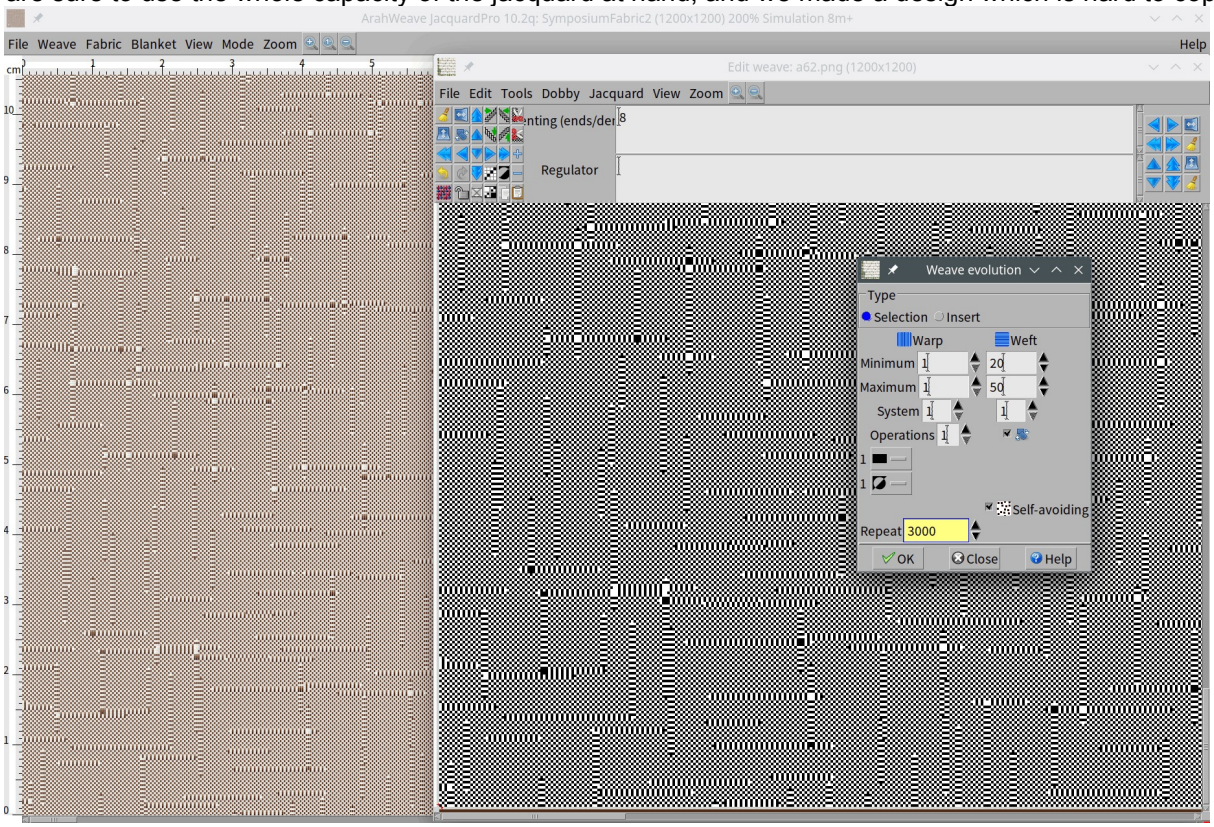

Figure 4: The resulting crepe weave of size 240x240

2.3 Creating irregular crepe by randomly inverting weave areas

In upholstery fabrics, we often wish to create an irregular texture, and generally it is difficult to create a weave or pattern that is free of visual stripes across the repeat. We want the repeat to be invisible to the viewer, but also to have he right amount of irregularity, so that the design is not dull. Once again, we are using the random invert function on plain weave. This time we create 10000 inverted filled rectangles, randomly placed, and with random size between 10 and 200 weave points. Since some junction areas are unpredictable because of the overlapping random operations, we could have areas of long floats. So we also call the function to correct the long float with maximum permitted float of 6 points.

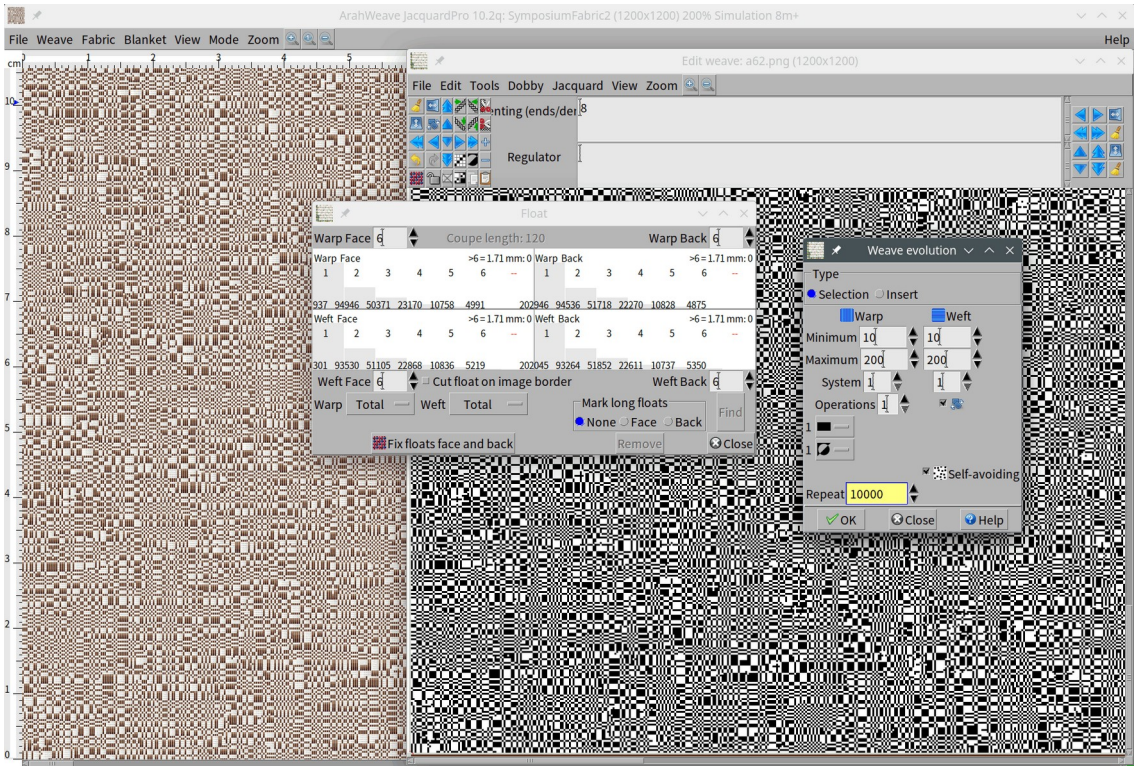

Figure 5: Irregular crepe for upholstery

2.4 Creating crepe weave by random using variable intensity

Another way of creating crepe weaves is to simply define the desired weave size, for example 1200x1200, and warp/weft intensity ratio. In ArahWeave, we define the intensity between 0 and 255, so for mid level crepe, we should use the intensity of 128. Program simply creates a random mix of black and white points with given intensity. In order to use it as a weave, we also define the maximum number of allowed long floats. The value depends on the intended fabric usage and weaving density, in this case we use 3.

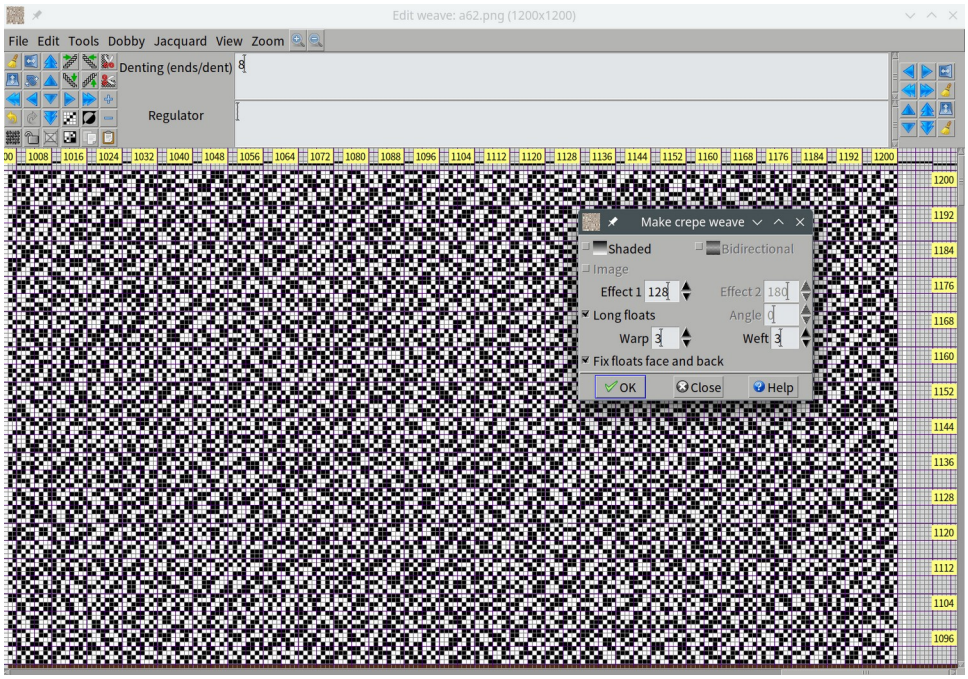

Figure 6: Random crepe weave 1200x1200 with maximum float of 3

Since we have full freedom of setting the intensity of the warp to weft effect, we can push it a little further and directly create gradient effect with the crepe weave, by setting the minimum and maximum effects, we can even make it bidirectional or use an angle. This kind of weave are very appreciated by designers of curtains or shawls, since they can make a weave with the size that matches their design requirements.

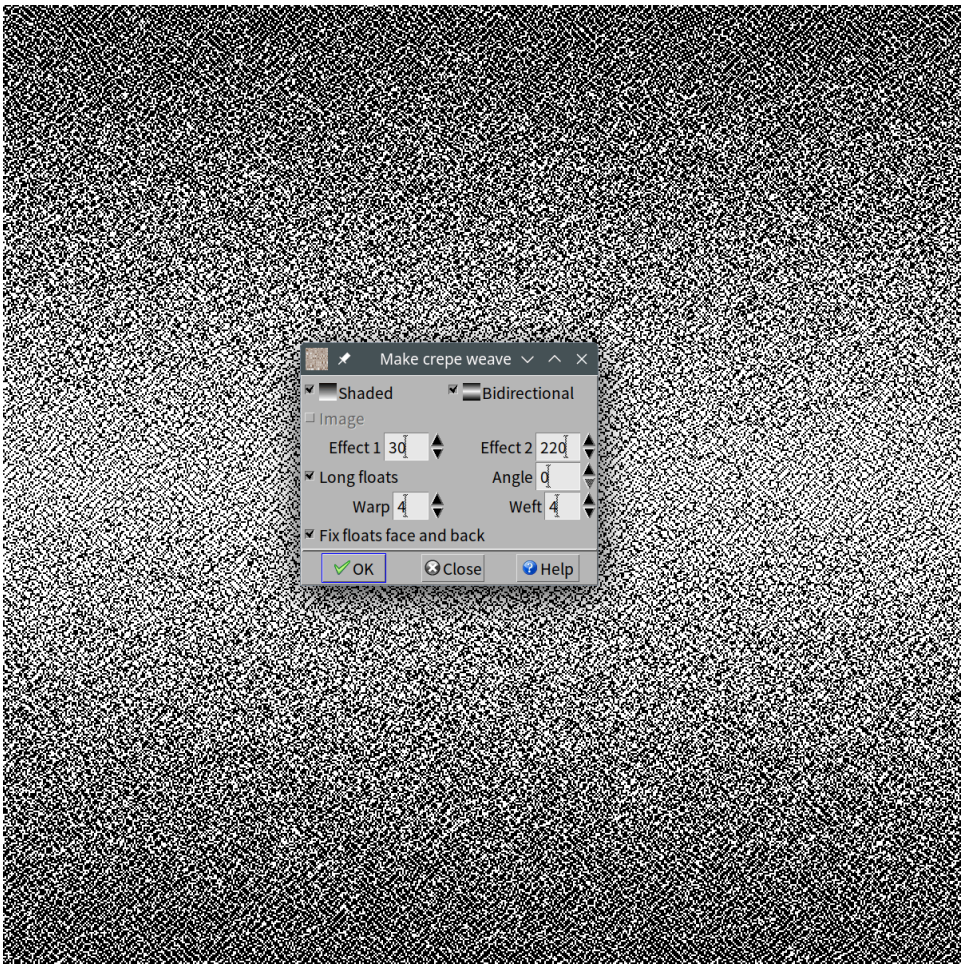

Figure 7: Random shaded crepe weave 600x600 with maximum float of 4

2.5 Creating weaves by motif rotation and zoom

The discovery of this method was a result of our research motif rotation in repeat. Very often, we have a base motif which is in block repeat, and we wish to rotate it by a certain angle, while keeping the repeat property and not deforming the design. Usually we do it by 45 degrees in order to get diamond repeat. Some famous brands like Burberry use a complex interlaced rotated design as a way of protection of their brand and intellectual property. Intuitively we would think that we can rotate the existing repeating image by any angle, but in reality it is only possible for certain well defined angles for square designs. We have programmed this capability in ArahWeave. But we went even a step further, and allowed motif rotation and resize within the ArahPaint drawing program. Using even extremely simple core pattern like plain weave (repeat 2x2), we get a whole group of patterns defined by their angle and rotation. The operation is extremely sensitive, so we can use the decimal points of the parameters to gradually change the pattern appearance. Since the core pattern is so small, we do not get long floats in the resulting image. Surprisingly enough, many of the resulting designs have satin counterpoints placed correctly, as if they were drawn by an actual designer. We said before that arbitrary motif rotation in repeat is not possible, so how can can we use the non-repeating result in weaving? We can repeat it several times and use ArahPaint's function for automatic repeat detection. In many cases the repeat will not be perfect, but it will be close enough to be visually convincing and usable.

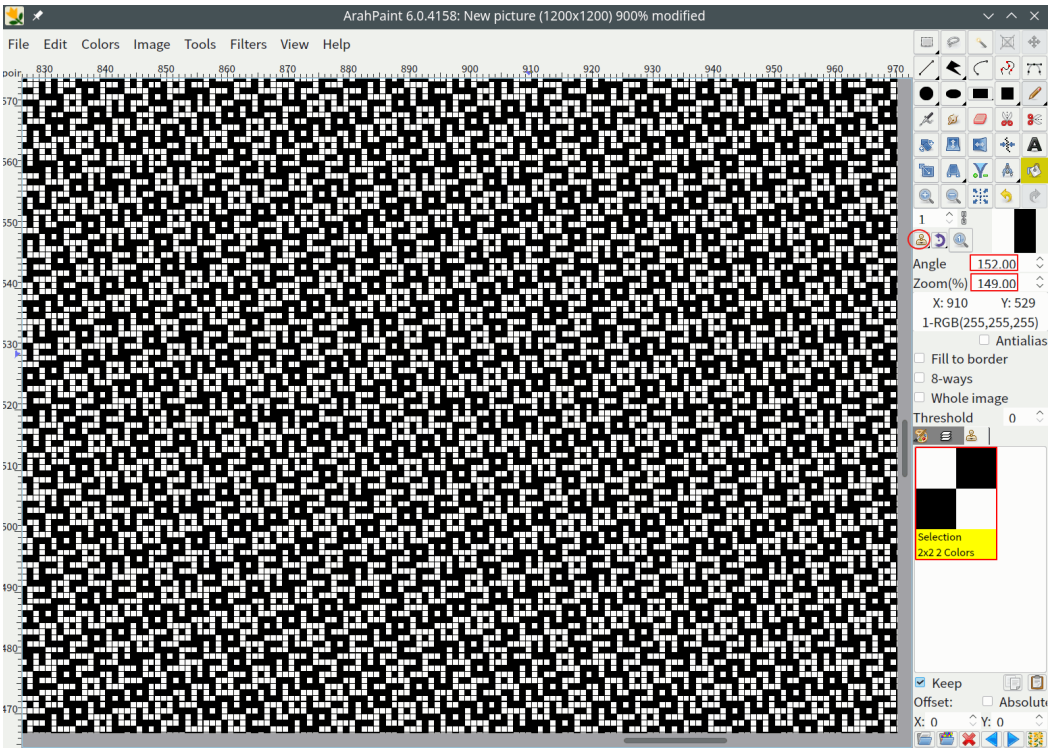

Figure 8: Plain weave rotated by angle 152º and zoomed at 149% generates this pattern

How can simple rotation and zoom create such a rich set of patterns? We are familiar with aliasing problem, where we have to approximate a line of a circle with a limited resolution, and we get jaggies when the line skips the point edge. This pixelization is normally a defect which we can not avoid. But in this case, we use the distribution of these digital errors as design tool, and it creates whole group of pleasing patterns.

ArahWeave is free for download from Arahne's web site, and anyone can play with the angle and zoom to get interesting weaves. Since the space is limited, we can't show more of them, here are some pairs of angle and zoom to try with plain weave: (52º, 149%) (20º, 110%) (19º, 107%) (23º, 0.3%) (29.8º, 124%).

3. CONCLUSION

Graphics designers have fully embraced digital design. They use vector tools, filters, some even write scripts or shaders to get the effect that they want. Many woven designers still work in traditional way, despite working with computer on CAD. Because CAD only mirrors and automates the traditional manual way of image coloring and color to weave substitution. Woven designers can raise their art to the next level, if they start embracing digital generative methods of design and weave creation. Appropriate software can help a lot, since it can take care of long floats and repeat correctness already at level of creation, not as a post-processing step.

References:

Book
Brickett, C.J. (1934) Textile Designing. Scranton, PA.: International Textbook Company
Giudici, O., (1943) Tessuti di Lana e di Cotone: Analisi e Fabbricazione, Milano: Ulrico Hoepli
Holyoke J. (2013) Digital Jacquard Design. London, New Delhi, New York, Sydney: Bloomsbury
Kienbaum M. B (2016) Binding Technology of Fabrics: Book 1: Single surface fabrics. Goldkronach: CH-Consulting
Rodón i Amigó P. (1930) Ligamentos Crepes, Badalona: Cataluña Textil

Online
Gregorčič, A., Peterc D. (2025) ArahWeave User's Manual. Available at: https://www.arahne.eu/pdf/aweave-EN.pdf (Accessed: 1.March.2025).
Gregorčič, A. (2025) ArahPaint User's Manual. Available at: https://www.arahne.eu/pdf/apaint6-EN.pdf (Accessed: 1.March.2025).

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