



ADVANCED SHADING TECHNIQUES IN ARAHWEAVE

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Abstract: *In the dynamic world of textile design, where digital tools have revolutionized the process of creating patterns, ARAHNE software programs, ArahPaint, ArahWeave, ArahDrape and ArahView 3D, are recognized as leading CAD/CAM software tailored for professionals. ArahPaint is a software designed for instant drawing in seamless repeats, enabling users to easily view and generate repetitions of their pattern. Specifically optimized for designing and weaving Dobby and Jacquard woven fabrics, ArahWeave software exemplifies how digital technology is reshaping the creative process in the textile industry. The advanced simulation tools of ArahWeave facilitate a highly realistic preview of how seamless pattern will appear when woven into fabric. Users can adjust structural parameters including thread patterns, yarn characteristics, colour schemes, fabric density, and weaves to achieve their desired aesthetic and structural appearance in woven fabric and present a 3D model simulation of their fabric in ArahView 3D. ArahDrape is a texture mapping software designed to help weavers, designers, and retailers enhance the presentation of their fabrics. Like mastering any other skill, using ARAHNE software programs requires dedicating time to learn and practice creating various textile patterns suitable for a range of textile applications. Additionally, users' artistic skills empower them to enhance both the quality and uniqueness of their textile designs. This paper explores the advanced shading techniques of Jacquard woven fabrics, simulated in ArahWeave software. The aim is specifically focusing on the process from inspiration to creating seamless patterns suitable for various Jacquard fabric types, providing solutions to users who wish to transcend the confines of traditional textile design.*

Key words: *seamless repeat, textile pattern, Jacquard woven fabric, ARAHNE, digital technology*

1. INTRODUCTION

The Jacquard weaving in textile design is more than just a weaving technique; it represents a convergence of artistic expression and technological innovation, which facilitates the creation of complex patterns ranging from basic geometric shapes to elaborate motifs and images. It is a technique that enables customization for various design applications in industries such as fashion and interior design (home decore, upholstery, etc.). Named after its inventor Joseph Marie Jacquard, Jacquard weaving emerged in the early 19th century as a groundbreaking innovation in textile production. Prior to its development, obtaining intricate seamless patterns through weaving required laborious manual processes. The Jacquard loom introduced a revolutionary mechanism controlled by punched cards, opening up new possibilities for textile pattern design.

In the present, textile patterns can be created with remarkable details thanks to advancements in electronic Jacquard technique. This technology has been further complemented by digital tools, which have revolutionized the process of creating seamless repeats.



One notable software in this realm is ARAHNE, recognized as a leading CAD/CAM software optimized for designing and weaving Dobby and Jacquard woven fabrics. With its user-friendly interface and powerful software programs such as ArahPaint, ArahWeave, ArahDrape and ArahView 3D, ARAHNE provides sophisticated features specifically designed for electronic weaving methods.

ArahPaint is a free software that facilitates the easy application of design elements and principles. It is a powerful software designed to generate intricate motifs and seamless repeats using drawing tools, color management, shading algorithms, filters, resolution considerations, and many others. With seamless integration with structural parameters, users can refine patterns to ensure a smooth transition to the final woven fabric.

The advanced simulation tools of ArahWeave facilitate an ultra-realistic preview of how the seamless pattern will appear when woven into fabric. Users can adjust all structural parameters, including thread patterns, yarn characteristics, color schemes, fabric density, and weaves, to achieve their desired structure and appearance characteristics, and present a 3D model simulation of their fabric in ArahView 3D.

ArahDrape is a texture mapping software designed to help weavers, designers, and retailers enhance the presentation of their fabrics. With its 3D Grid and Shading tools, users can realistically apply the textures designed in ArahWeave to a final product that has been vectorized within a photographed image. Undoubtedly, all these tools of the programs cannot substitute for the skills, knowledge, and experience of a professional woven fabric designer.

2. FROM INSPIRATION TO SEAMLESS REPEATS

Creating your own seamless repeat can be a rewarding process that begins with discovering a source of inspiration with which you identify and has the potential to be translated into an original design. In this paper, I drew inspiration from a photographic image by Violeta Radu, a renowned visual artist known for exploring various themes, including the cross sign (Fig. 1).

This symbol exists in every construction, in every object; it serves as a durable source for splicing, weaving, and braiding. The photographic image displays a church tower cross visible in the background through a crack in a wooden fence [1].

This shape, resembling the cross sign, captured the essence of my inspiration. I translated it into vector graphics using Adobe Illustrator, creating two seamless repeats, which I named “The Cross Man” (Fig. 2) and “The Pair of the Cross Man” (Fig. 3).

These seamless repeats reflect my unique artistic vision, expressed through the language of design, and demonstrate their adaptability for diverse applications such as woven or printed fabrics, wallpapers, or digital artworks [2], [3].



Fig. 1: Source of inspiration

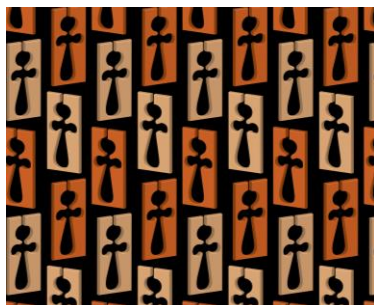


Fig. 2: “The Cross Man”



Fig. 3: “The Pair of the Cross Man”

3. EXPLORING SHADING TECHNIQUES IN ARAHWEAVE

The term “shading effects” refers to techniques used in visual arts to create the illusion of depth, volume, and texture through variations between light and dark areas. The term itself can also be applied in weaving. It refers to the transition unidirectional or bidirectional of weave effects from warp to weft, changes in the density and fineness of thread systems, non-uniform denting, and the utilization of gradient thread colors. The Jacquard shading technique provided by ArahWeave software enhances the structure and appearance characteristics of woven fabrics, making them highly desirable for both aesthetic and functional purposes. The advancements in digital technology have allowed for even more complex and detailed Jacquard patterns, further expanding the creative possibilities for textile designers and manufacturers. ArahWeave software has its “limitations”, which are driven by deeper technical aspects of weaving. It is known that the number of warp threads in Jacquard weave size is determined by the number of hooks. For example, the Stäubli electronic Jacquard machine, LXL V model, offers a configuration up to 14,336 hooks, and the maximum weave size is 65,520 by 65,520 threads for ArahWeave Pro and 262,080 by 262,080 threads for ArahWeave Pro XL, much more than what is possible to achieve in practice [4].

Once an image or seamless repeat is loaded into the Jacquard conversion window, the user can choose the desired Jacquard conversion method. In addition to the Normal type of Jacquard conversion, where the user manually selects a weave for each color, ArahWeave software provides alternative types of Jacquard conversion such as Shading [5], Extra wefts [6], Fil coupé, and Blanket. Using the same seamless repeat in Shading mode, two Jacquard weaves were simulated: one as a simple Jacquard weave with a warp thread system and a weft thread system (Fig. 4a), and the other a compound Jacquard weave simulated with five warp thread systems and three weft thread systems (Fig. 4b). In simulating Jacquard woven fabrics, warp and weft threads with identical structural characteristics were used, along with the same 40 by 40 cm repeat dimensions and an equal number of threads in both warp and weft directions, totaling 2400 by 2400.

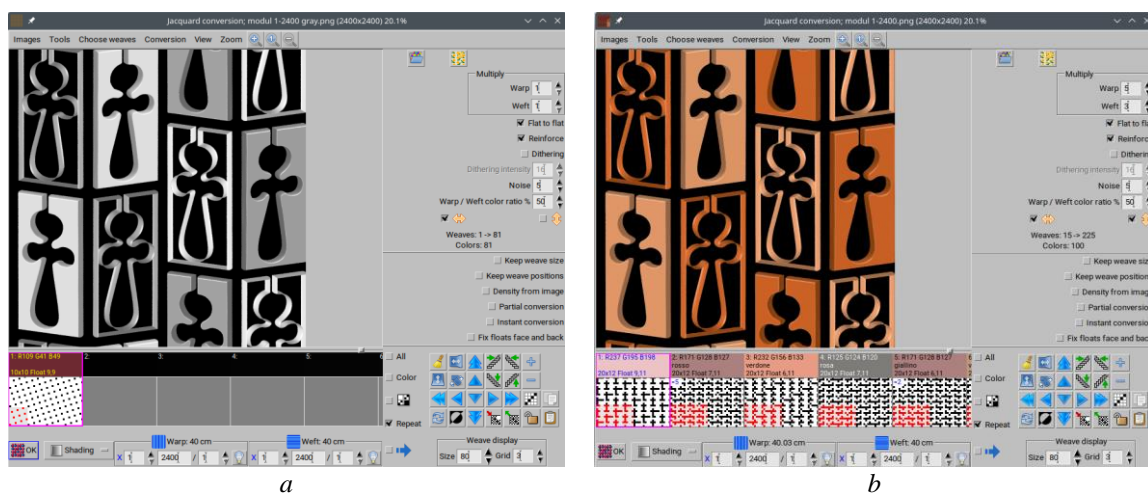


Fig. 4: ArahWeave - Jacquard conversion window

In the Fabric menu, users can select thread patterns, colors (Fig. 5), and yarns (Fig. 6), and adjust the thread density in both the warp and weft directions to simulate various types of fabrics with different characteristics and appearances. The Consumption window from the Fabric menu provides users easy access to all technical data and facilitates the calculation of the fabric production parameters

(Fig. 7). This helps to optimize woven fabric simulation and production planning by providing necessary information about the yarn consumption and the finished price.



Fig. 5: ArahWeave - Edit colors

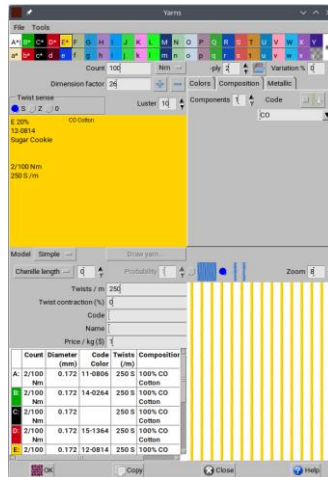


Fig. 6: ArahWeave - Yarns

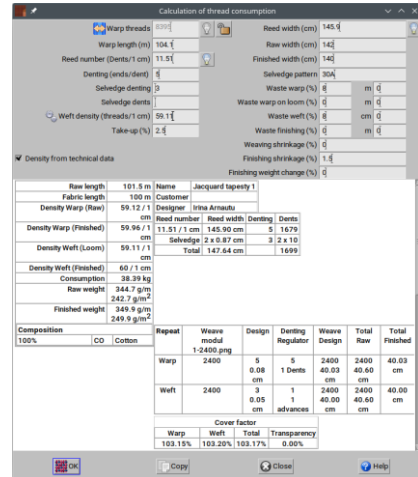


Fig. 7: ArahWeave - Consumption

The zoom level of woven simulation ranges from a minimum of 5% (twenty times smaller) to a maximum of 2000% (twenty times bigger), allowing the user to observe and analyze all structural details with more precision. ArahWeave software offers four possible view modes, available from the View menu: Weave, Integer, Shaded Integer, and Simulation. Simulation mode offers various quality levels ranging from 1 to 9, where higher numbers signify a more accurate and higher quality of simulation. In figure 8 is presented the simulation of “The Pair of the Cross Man” seamless repeat as a simple Jacquard weave, and in figure 9 as a compound Jacquard weave. If in the case of simple Jacquard weave, the reverse is its inverted face, in the compound Jacquard weave, the difference between face and reverse is more pronounced. The selection of warp and weft thread colors aimed to closely match the chromatics of the seamless repeat and accentuate its shading effects. While the shading is more accurate in simple Jacquard weave, it's restricted to colored gray tones. Achieving a closer match to the chromatics of the seamless repeat requires the optical blending of various thread colors, an appearance characteristic of compound Jacquard weave.

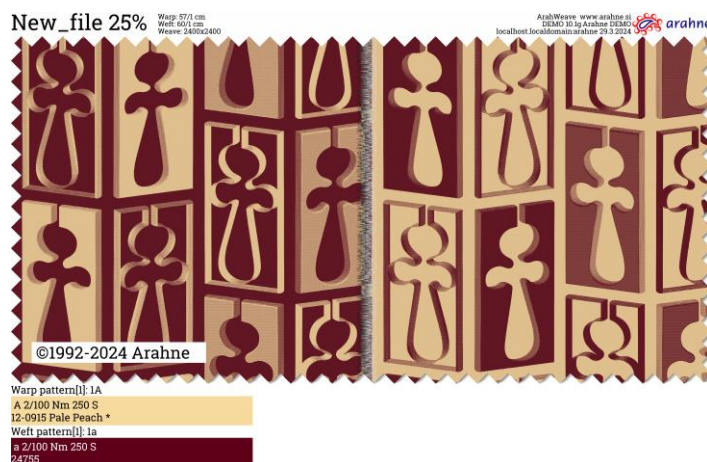


Fig. 8: ArahWeave - simple Jacquard woven fabric, simulation 8, 25% zoom level, face and reverse



Fig. 9: ArahWeave - compound Jacquard woven fabric, simulation 8, 25% zoom level, face and reverse

Figure 10 shows the 3D simulation of compound Jacquard woven fabric on different final products in actual 1:1 size, using ArahDrape software. The 3D simulation assists designers in determining the structural and appearance characteristics of woven fabric, and enabling customers to express their approval or disapproval of the textile pattern design.



Fig. 10: ArahDrape - 3D simulation of texture on final products, in real 1:1 size



5. CONCLUSIONS

Jacquard weaving represents a fusion of artistry and technology, fueled by innovation and experimentation. The creative process begins with a source of inspiration and moves towards its conceptualization. ArahWeave software serves as a versatile “canvas” for translating the concepts into simulations and, ultimately, into practical weaving applications.

The possibilities for creating shading effects within Jacquard woven fabrics are limitless. The advanced tools provided by ArahWeave software enable the exploration of shading techniques in a virtual environment, far surpassing the boundaries of traditional textile design.

Through iterative refinement and visualization, the users can preview the effects of shading in Jacquard woven fabrics before actual weaving, simulating their application on final products in ArahView 3D and ArahDrape software.

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