

# JACQUARD FABRIC SIMULATION WITH EXTRA WEFTS IN ARAHWEAVE

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**Abstract:** The ARAHNE integrated CAD/CAM software (ArahPaint, ArahWeave, ArahDrape and ArahView3D) is a top-performing solution in the market that facilitates the design and weaving of Dobby and Jacquard fabrics. It offers end-to-end support for the entire production process, starting from the Computer-Aided Design (CAD) phase all the way through to Computer-Aided Manufacturing (CAM) for production.

In this paper are explored the advantages of using ArahWeave software with a focus on Jacquard fabrics with extra threads. To this purpose were applied the principles and elements of textile design that produce more pronounced decorative effects. ArahDrape, a texture mapping software, enhances 3D presentations of fabrics by offering ultra-realistic simulations of woven fabrics on final products.

**Key words:** computer-aided design, Jacquard fabric, extra wefts, ArahWeave, ArahDrape

## 1. INTRODUCTION

The preconceived idea about textile design is linked to the image of the sensitive artist with a pencil in hand, obsessively bent over his own creation, striving to give rein to his rich imagination. Indeed, this is the goal, only if the aesthetic design is harmonized with the engineering design. The aesthetic design is the process of creating a woven fabric that is visually pleasing aesthetic and structural and meets its functional requirements. It involves the use of fundamental concepts of textile design and helps to create a sense of identity and brand recognition. The engineering design requires the integration of all technical, economic and aesthetic characteristics, after identification of the desired performance requirements. Therefore, the using of digital technologies in woven fabrics design can help to streamline the design process, reduce costs by adjusting of digital designs before creating physical products, and create more detailed and intricate textile patterns than would be possible manually. Furthermore, the use of visualization can allow designers to collaborate more easily with other members of the team, such as manufacturers and traders, since everyone can see the digital designs and make changes or suggestions in real-time.

ARAHNE is a global leader in CAD/CAM software optimized for Dobby and Jacquard fabric design and weaving. The ARAHNE CAD/CAM package comprises the software programs ArahPaint® 5/6 to draw seamless patterns with fabric density, ArahWeave® 9 to design woven fabrics simulation in real size and send the fabric technical data to a Dobby or Jacquard loom, ArahDrape® 3.0 to create simulation on the final product and ArahView3D to show the fabric on the 3D model.

ARAHNE software for weaving is available in 18 different languages and is utilized across various industries such as weaving mills, design studios, online stores, web design companies, design schools, as well as by individual hand weavers.

Additionally, the software contains a generous database necessary for all types of editing, such as 41,000 weaves, 5,000 simulated woven fabrics, 500 ArahPaint designs, Pantone color palettes, different thread structures, projects in ArahDrape and ArahView3D etc. The ArahWeave software supports all image formats, CAM formats for a wide range of Jacquard and Dobby looms, CAM formats for drawing-in machines and few warpers. It saves relevant technical data in HTML format, imports and exports in XML formats for ERP integration [1]. Technical data, costs at various technological stages and fabric price are calculated for both the raw and finished fabric.

Our Engineering and Design of Textile Products Department holds licenses of ARAHNE CAD/CAM software and for more than 15 years, the students are trained to use its general concepts to create projects related to textile and fashion design.

In this work are presented special functions of ArahWeave software that enable the simulation of Jacquard woven fabrics using both Normal and Extra weft modes. To this purpose were applied the principles and elements of textile design that produce more pronounced decorative effects.

## **2. JACQUARD CONVERSION IN ARAHWEAVE**

While designing and simulating a Jacquard fabric in ArahWeave may be easy for experts, it still requires a deep understanding of the process, as well as of the weaving technology. The „key” to mastering this art is to understand how to effectively combine various structural elements such as weaves, densities of weaving, different thread counts, structures, and colors, in an effective manner.

ArahWeave stands out from competitors with a multi-tasking platform that allows an interactive work with special functions of editing, simultaneously in multiple windows. In this way, the user has a coherent and comprehensive real-time view of the data modified in any of the program's windows.

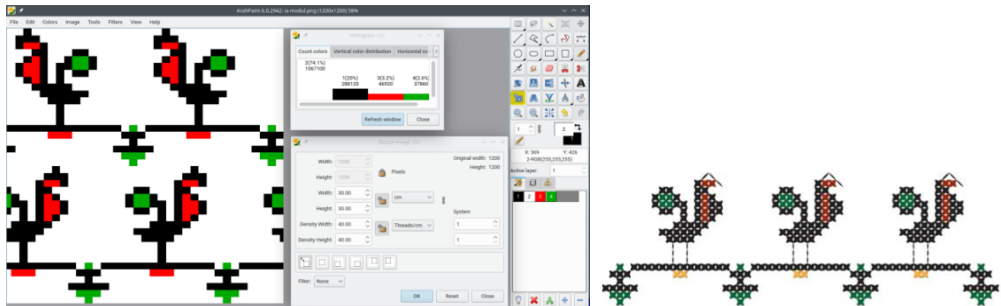
The so-called „limitations” of the ArahWeave software are determined by strict technological limitations. Just as examples, ArahWeave is capable of simulating a woven fabric with a maximum of 16 warp and 16 weft thread systems and provides the maximum size of repeating pattern of 65,520×65,520 threads in ArahWeave Pro and 262,080×262,080 threads in ArahWeave Pro XL. These sizes cannot be achieved in practice due to technological constraints, even in the case of the most advanced electronic Jacquard mechanisms. ArahWeave's powerful tools and fabric simulation view modes are designed to assist user in understanding how different combinations of thread colors can produce visual textures in both single-colored and multi-colored Jacquard fabrics [2].

In order to simulate a Jacquard woven fabric in ArahWeave, it is necessary to use ArahPaint software. ArahPaint is an open source software developed by ARAHNE that allows to draw repeating patterns and adjust fabric density, among other huge tools.

A repeating pattern is a decorative composition made up of a repetitive module, which is repeated to create the overall pattern. The module can be a simple shape or a more complex design, and its repetition can be unit- or bidirectional [3].

ArahPaint software has a range of advanced graphic options to create repeating patterns, including the ability to multiply motifs either in a regular or randomized manner, as well as to displace them in the in horizontal or vertical direction, apply mirror reflections, rotations, add borders and more. These tools enable users to create intricate and varied repeating patterns with ease.

The color histogram of ArahPaint is an important tool that shows the distribution of colors in the design and to make adjustments as needed between the background and motifs areas. The number of colors in repeating pattern corresponds with the number of weaves in the Jacquard fabric (Figure 1).

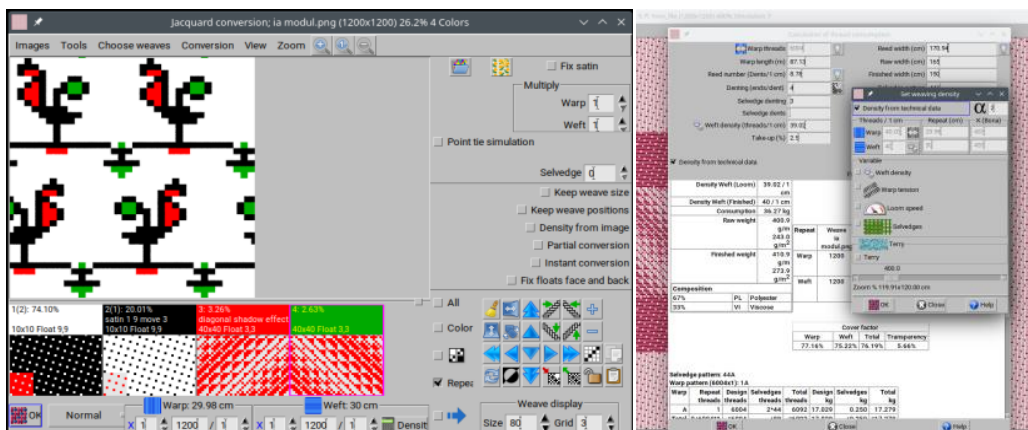


**Figure 1:** ArahPaint - inspiration source, histogram and resize image windows

This structural aspect is important for ensuring the dimensional stability of Jacquard fabrics. A well-designed Jacquard fabric has balanced tension throughout the weave, which helps it maintain its shape and size after weaving [4].

Simulating Jacquard fabrics in ArahWeave involves the following steps:

1. Using the Jacquard conversion window by selecting Weave > Jacquard conversion from the main ArahWeave window. For a simple Jacquard fabric with one warp and one weft system, it is used the default Normal Jacquard conversion (Figure 2).
2. Combining weaves with different threads as structure and color (Figure 3).
3. Optimizing structurally by eliminating large floats.
4. Performing technical calculations for both the raw and finished fabric (Figure 2).
5. Viewing the simulated fabric on both sides, with different levels of magnification and rotating it by 90 degrees if necessary.



**Figure 2:** ArahWeave - Jacquard conversion, calculation of thread consumption and set weaving density windows

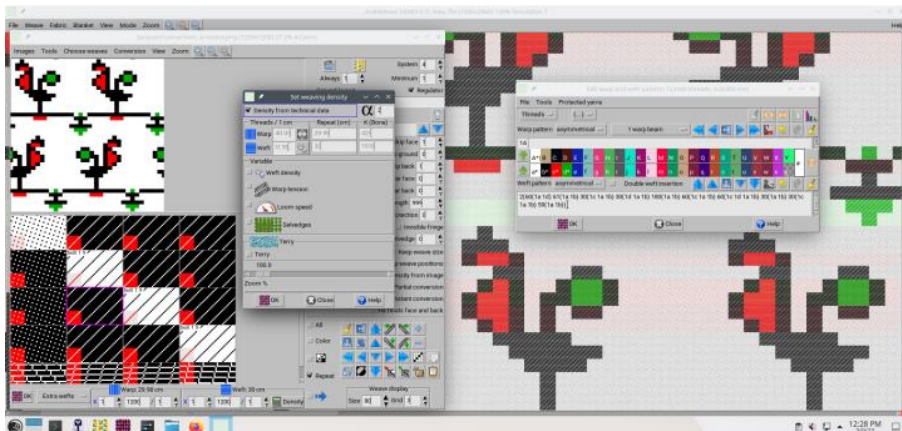


**Figure 3:** ArahWeave - yarns and edit colors windows

### 3. JACQUARD FABRIC WITH EXTRA WEFTS

The inspiration source I have chosen can be utilized into a Dobby or Jacquard fabric with extra wefts. Each fabric structure has its unique set of weaving limitations [5]. When using a single warp and weft in Jacquard fabric, often in contrasting tones, the result can lead to a monochromatic harmony that is less attractive. Using one ground weft and warp system threads, along with intermittently added extra wefts, creates greater visual interest on the fabric surface. ArahWeave's Jacquard conversion tool provides a distinct mode for designing Jacquard fabrics with extra wefts. This mode can be accessed by selecting the Extra Wefts conversion option. In addition to the default Normal and Extra Wefts modes, the Jacquard conversion also includes Shading, Fil Coupé, Weave Blanket and Print options.

The figure 4 shows the Jacquard conversion window with four extra weft weaves, as there is one weave for every weft for each color in the repeat pattern. The resulting extra weft weave per color is a combination of all four weaves.



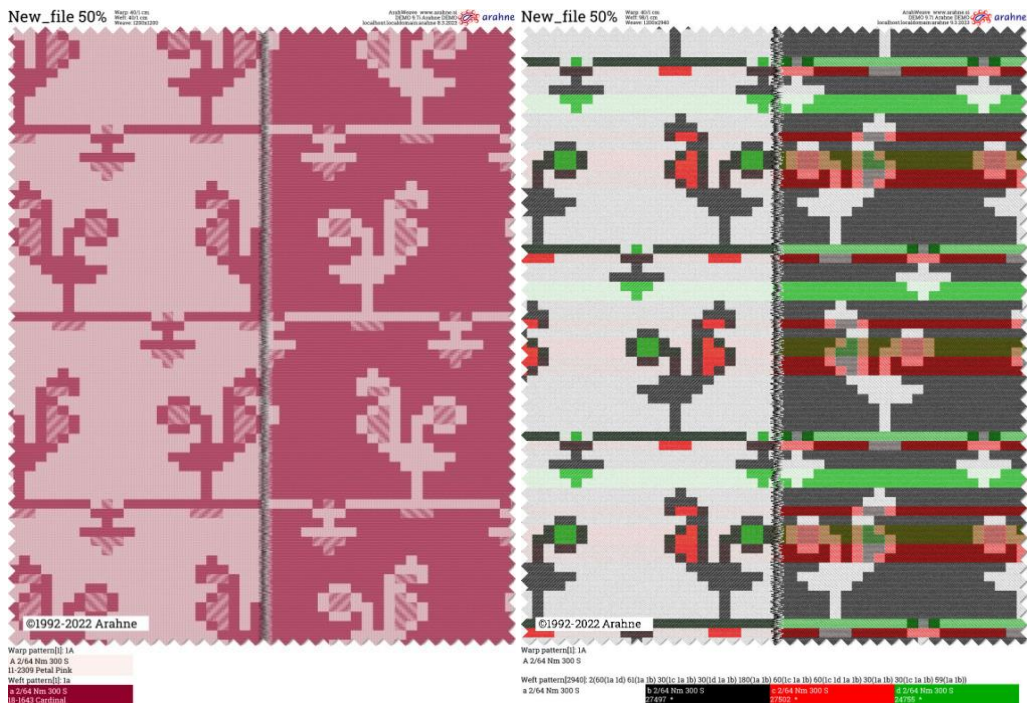
**Figure 4:** Jacquard conversion and edit warp and weft pattern windows



The ArahWeave software automatically generates the weft pattern based on the color arrangement in the Jacquard fabric. The letter „a” is assigned to the ground weft, „b” is assigned to the first extra weft, „c” to the second extra weft and so on.

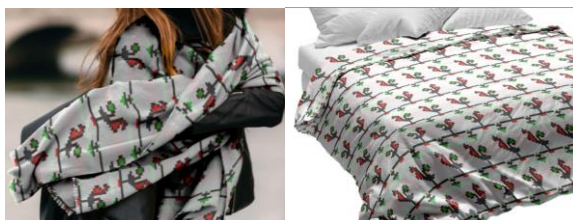
Both the Normal and Extra wefts mode simulations of the Jacquard fabric utilized the same structural characteristics for the warp and weft threads. Furthermore, the repeat pattern size remained constant at 30×30 cm (1200 warps×1200 wefts).

Various print properties for the simulated Jacquard fabric can be set in the Print Fabric to printer window. In Figure 5, a comparison is presented between the front and reverse simulations of Jacquard fabrics generated in both Normal mode with one warp and one weft, and Extra wefts mode.



**Figure 5:** ArahWeave - Jacquard fabric simulation, face and reverse, zoom 50 %, Normal and Extra wefts mode

ArahDrape software provides working tools that enable the creation of 3D models by mapping from 2D images or photos (minimum resolution of 300 dpi). The Grid and 3D shading tools can be used to adjust and shade the applied textures, resulting in an ultra-realistic draping effect with high-quality graphics. The correct understanding of the structural and visual characteristics of the fabric, as elements that determine the flexibility of the shape and color expression in representing draped products, proves to be useful both for the designer throughout the design process and for clients in triggering a manifestation of approval or rejection from them. The figure 6 shows the draping effect of designed texture on final products, in ArahDrape software.



**Figure 6:** ArahDrape - texture on final product, in real 1:1 size

With ArahView3D software, the customer can easily change the textures on a selected 3D model. Interactive websites or online catalogs can be created using the ArahView3D software to improve the presentation of woven fabrics.

#### 4. CONCLUSIONS

The simulation of woven fabrics in ARAHNE CAD/CAM is a powerful tool for textile and fashion designers, as well as hand weavers and manufacturers, since it enables them to enhance the performance of their products, while simultaneously decreasing development time and costs.

The ArahWeave software offers unlimited possibilities for diversifying simple and compound Dobby and Jacquard fabrics, encompassing the entire design process from creation to production. Simulating Jacquard fabrics with extra wefts creates distinctive surface effects and eye-catching appearance.

#### 5. References

1. Dušan, P., Gregorčič, A., *ArahWeave® 9, User's manual*, Arahne, d.o.o. 1992-2023, Ljubljana, Slovenia, 2023.
2. Arnăutu, I., *What is your source of inspiration?*, Proceedings of the 16th International Scientific Conference "eLearning and Software for Education" Bucharest, April 30 - May 1, 2020, Volume 3, pp. 277-284, DOI: 10.12753/2066-026X-20-207. Disponibil: [Arahne CAD/CAM for weaving | "What is your source of inspiration?" – an article by Irina ARNĂUTU](#)
3. Arnăutu, I., *Bazele designului textil*, Editura Performantica, Iași, 2010.
4. Cioară, L., *CAD-Țesături*, Editura Performatica, Iași, 2013.
5. Arnăutu, I., *Digital weaving design with extra threads based on ArahWeave software*, Proceedings of the 18th Romanian Textiles and Leather Conference, 17-19 November, 2022, Iasi, Romania, pp. 223-228, DOI: <https://doi.org/10.2478/9788367405133-035>. Disponibil: <https://sciendo.com/chapter/9788367405133/10.2478/9788367405133-035>