

# DESIGN OF LARGE SIZE REPEATS FOR DOBBY FABRICS IN ARAHWEAVE

Lecturer PhD. Eng. **Irina ARNĂUTU**

„Gheorghe Asachi” Technical University of Iași, România

**REZUMAT:** Proprietățile estetice ale țesăturilor sunt un atribut structural important care necesită o înțelegere completă a interacțiunii dintre firele de urzeală și de bățatură. Acest studiu nu își propune o schimbare de paradigmă dintre proprietățile funcționale ale țesăturilor și atractivitatea lor estetică, ci pune mai mult accent pe importanța designului estetic al acestora. O simplă exploatare a posibilităților oferite de mașinile de țesut cu ratieră electronică are ca rezultat obținerea de structuri care răspund doar parțial unei piețe competitive. Din acest motiv, conceptul de calitate a țesăturilor trebuie să includă și aspectele estetice, care pot fi dezvoltate doar în cadrul unui proces complex de design. În această abordare s-a utilizat programul ArahWeave de proiectare și obținere a țesăturilor pe mașini de țesut cu ratieră și Jacquard, precum și configuratorul online Arahne de simulare 3D a texturilor pe produse finale.

**Cuvinte cheie:** design estetic, legătură, ArahWeave, simulare 3D, configurator online

**ABSTRACT:** The aesthetic properties of woven fabrics are considered an important structural attribute which requires a complete understanding of the interaction between warp and bead threads. This study does not propose a paradigm shift between the functional properties of fabrics and their aesthetic attractiveness, but puts more emphasis on the importance of their aesthetic design. A simple exploitation of the possibilities offered by electronic dobby looms leads to weaves that respond only partially to a competitive market. For this reason, the concept of product quality of dobby fabrics must also include the aesthetic aspects that can only be developed within a complex design process. In this approach was used ArahWeave textile software for dobby and Jacquard fabric design and weaving, as well as Arahne online configurator for 3D virtual fabric simulation on final products.

**Keywords:** aesthetic design, dobby fabric, large size repeat, ArahWeave, 3D simulation, online configurator

## 1. INTRODUCTION

Weaving is considered to be the oldest method of textile surface technology. The resulting fabric has orderly warp and weft threads at an angle of  $90^\circ$  interlaced with each other [1].

The longitudinal threads are called warp and the transversal threads weft. A single layer fabric is referred to as 1-warp and 1-weft structure, where each warp and weft thread system interlaces in many different ways, thus obtaining a wide variety of weaves.

The weave influences the functional properties of woven fabric (e.g. strength, abrasion behaviour, stability etc.), as well as their aesthetic attributes and decorative characteristics, which are according to the design and manufacturing process and last, but not least, to the economic aspects.

Weave structure is the design by which fabric is produced. Whether simple or complicated, weaves are produced with dobby or Jacquard looms, which are usually controlled by CAM systems.

## 2. DESIGNING IN ARAHWEAVE

### 2.1. An overview of design tools

In this approach was used ArahWeave CAD/CAM a textile software for dobby and Jacquard fabric design and weaving, includes in the ARAHNE software package, together with softwares ArahPaint, for drawing and image editing, ArahDrape, for texture mapping and ArahView3D a software to present fabric on the 3D model.

For experts only is relatively easy to construct a woven fabric in ArahWeave. The „key” of the whole art is to know how to combine better these elements:

- weave;
- warp and weft sequences;
- yarn, count and structure;
- colours;
- density of weaving [2].

But the main point in this démarche is the imagination.

George Bernard Shaw once said, „Imagination is the beginning of creation”. It is one of the best quotes, which summarizes perfectly how significant imagination is in a complete design process.

ArahWeave is a very powerful program, but it has its „limitations”, motivated by deeper technical reasons. Some of these „limitations” were science-fiction 30 years ago are now became realities, e.g.:

- maximum weave size: in ArahWeave Pro 65520 by 65520 threads and in ArahWeave Pro XL 262080 by 262080 threads;
- maximum number of shafts: 99;
- maximum weave system: 16 warps and 16 wefts;
- number of different threads in warp or in weft 25;
- maximum number of colours in a colour database: 65520;
- maximum number of different colour components within one effect thread (for mélange, moulinè, space dyed): 6;
- reed number: minimum 1 (dent/cm); maximum 1000 (dents/cm); 2 decimal points;
- maximum number of threads in one dent: 125 etc., are only a „few” of these „limitations”, which fully convince to use this software.

The standard ArahWeave installation includes a large database of weaves (35.000), fabrics, images, fast patterns, yarns, warp and weft patterns, drafts, cards etc. All can be selected with quick filters from browsers, according to desired features.

ArahWeave enables editing of weave, including multilayer weave construction (simulates composed weaves until 16 warps and 16 wefts), editing of warp and weft thread patterns, yarns, colours, regulator, denting, variable density etc.

In figure 2.1 is presented the *Edit weave* window for dobby fabrics with complete programming scheme of weave construction, denting, threading, tie-up of harness, dobby cart, regulator and other variable weft control functions.

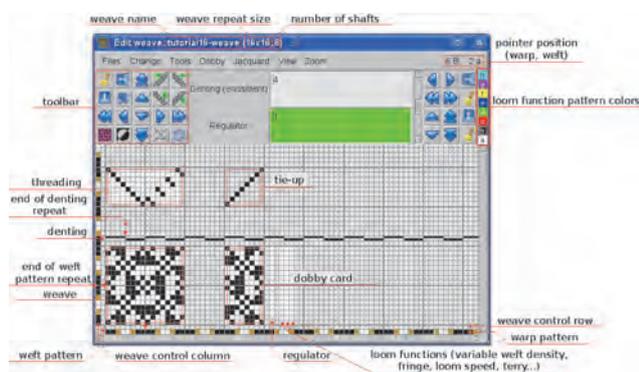


Fig. 2.1. Weave editor.

By using the tools from toolbar, can be applied any changes in weave, as well as horizontal/vertical

mirror, rotate 90 degrees, shift left/right/up/down by 1 and 8 steps, remove/add warp points, transforms vertical line to right/left diagonal, undo and redo, edit decomposed etc.

By applying weave to fabric tool, the result will be immediately visible on fabric in the main window, in selected mode of view (weave, integer, shaded integer or simulation view), and appeared at the desired zoom level.

The *Double weave size in warp* (or weft) function is an important way to increase the size of the repeat by using creative „strategies”. The size of repeat will double the previous value on selected direction by duplicate, mirrors with alternation of positions, invert or rotation, as can be seen in figure 2.2.

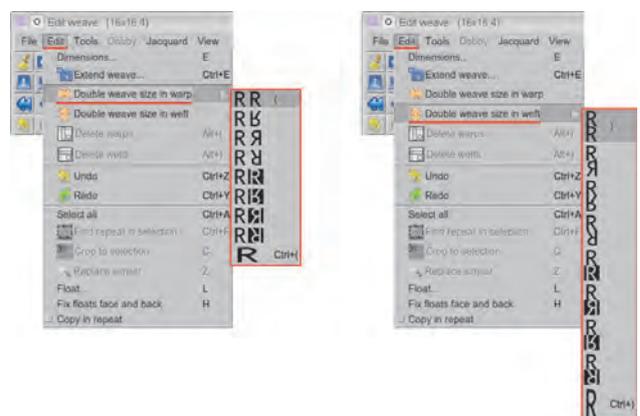


Fig. 2.2. Double weave size in warp and weft.

The huge design tools of weave editor can be used very easily, especially in case of the complicated dobby fabrics with large size repeats.

In the *Fabric* menu, the yarn editor, warp and weft pattern editor, colour editor, set weaving density, technical data and calculation of yarns consumption, accessible from Consumption menu, are important for both fabric production parameters and simulation.

## 2.2. Method of designing

In this work, the research is based on the design of single layer weave for dobby fabrics with large size repeats.

Starting from multiple twill weave templates, were developed other derivations and twill reordering with diagonal shadow-like or Jacquard-like, which can respond functional and aesthetical purposes.

A twill weave is characterized by diagonal ribs (twill lines) both on face and reverse of fabric.

Twill weaves can be classified from three points of view:

- a) according to the direction of the twill lines:
  - Z-twill: upward displacement of the interlacing points;

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- S-twill: down displacement of the interlacing points.
- b) according to the face thread (warp or weft):
  - warp-twill: predominance of warp on the face of fabric;
  - weft-twill: predominance of weft on the face of fabric.
- c) according to the nature of twill lines:
  - simple warp or weft twills: each warp and weft is raised over or lowered under only one pick in the repeat;
  - expanded twills: each warp and weft is raised over or lowered under more than adjacent pick in the repeat; if the warp and weft twill lines are of equal width, the fabric is double-faced;
  - multiple twills: in each repeat, there are at least two warp lines or two weft lines of different width [3].

The twill weaves are designed in wide varieties generate through some changes, e.g. by:

- reordering of individual warp or/and weft threads;
- reordering of groups of threads in warp or/and weft;
- changing the grade direction or angle;
- shifting with constant step or multiple steps;
- combinations of the above [4].

As a result of these huge variants, in this work, the author had a difficulty to focus on those variants which could present, as best as possible, „no limits” possibilities offered by ArahWeave.

### 3. RESULTS AND DISCUSSION

To solve specified design of large size repeats for doobby fabrics, the concept development was based on distinction between:

- homogeneous and inhomogeneous developments;
- regular and irregular balances;
- equal and unequal steps;
- symmetrical and asymmetrical appearance;
- diagonal shadow-like and Jacquard-like by interlacing warp and weft threads in weaving;
- simple colour effect (monochrome harmony ) and very attractive colour effects (contrasting harmony) by interlacing colour patterning in weft or/and weft.

The figures 3.1, 3.2, 3.3 and 3.4 show the development of twill reordering for three twill templates,  $\frac{1\ 3\ 2}{3\ 1\ 2}$ ,  $\frac{1\ 1}{3\ 3}$  and  $\frac{2\ 1\ 2}{3\ 2\ 2}$ , using equal and unequal steps, different weft and warp groups, rotation and inversion of a weave area etc.

In Edit weave window, the user can apply these changes in several ways, depending on his imagination and professional experience to give a visual expression of the weave.

The complicated harness frame drawing-in can be obtained using the numeric drafting function.

The large size repeats for doobby fabrics can become inspirational for Jacquard fabrics.

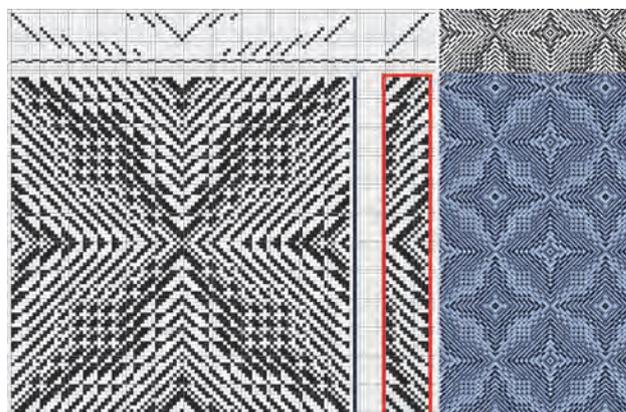


Fig. 3.1. Weave with biaxial symmetry.

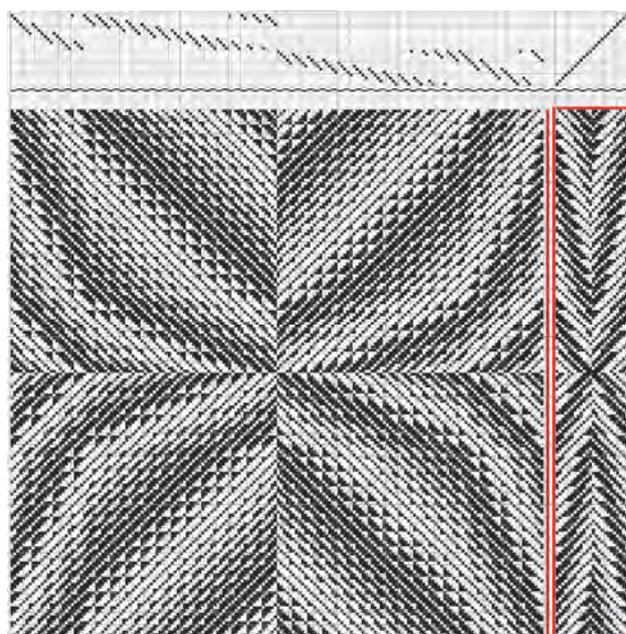


Fig. 3.2. Rotation and inversion of a weave area.

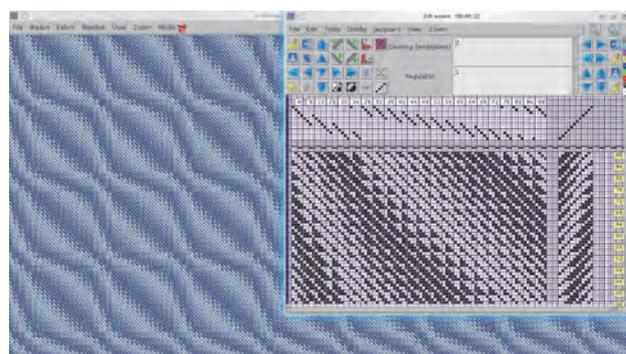


Fig. 3.3. Weave with volume appearance.

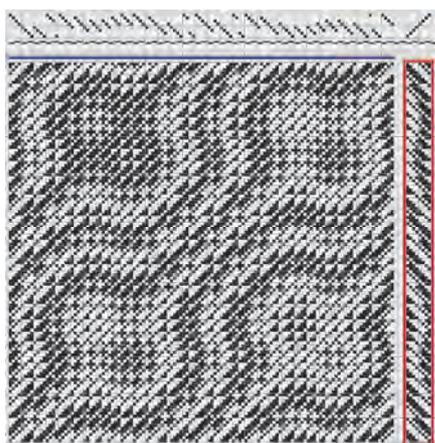


Fig. 3.5. Ties simulate in Arahne configurator.



Fig. 3.4. Weave and colour effects.  
Edit weave and Print weave.



Fig. 3.6. Scafs simulate in Arahne configurator.



Fig. 3.7. Trousers simulate in Arahne configurator.

The Arahne program to see the 3D virtual fabric simulation on final products was used the Arahne online configurator [5].

- Drape in visual image of any kind of final product (upholstery, clothes, curtains etc.), with any kind of texture in an instant, can be make using ArahDrape and ArahView3D softwares too.
- This is an easy solution for textile designers, who want to see their design on the final product, and web designers, retailers for presenting and selling their products online [6].
- In this way can be saved costs and developed the higher value-added goods in more response to consumer demand.

Some designed weaves in ArahWeave were simulated on final products in Arahne online configurator are presented in figures 3.5, 3.6 and 3.7.

## 4. CONCLUSIONS

Everybody talks about weave design, uses the word CAD, but only a few understand what it means in fact. Even fewer have own practices in designing with a specialized textile software as CAD/CAM ARAHNE.

ArahWeave offers a wide range of tools to design complicated weaves for dobby and Jacquard looms, manages all the technical data needed to produce

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designs, and the files CAM needed to communicate to the loom.

The hyper realistic fabric simulations in ArahDrape, ArahView3D or Arahne online configurator, mean cost and time saving for the companies and play a major role in determining the buying and selling of the fabrics.

Finally, it can be concluded that, the textile designers should concentrate on need to know to get the best design solutions for their creative works.

### REFERENCES

[1] Kienbaum, M., *Bindungstechnik der Gewebe. Band 1: Einflächiger Schaftgewebe*, WeaveStruct Verlag, Goldkronach, Germania, 2016.

[2] Peterc, D., Gregorčič, A., *ArahWeave 8<sup>®</sup>, User's manual*, Arahne, d.o.o. 1992-2019, Ljubljana, Slovenia, 2019.

[3] Kipp, H. W., *Narrow fabric weaving*, Aarau, Frankfurt, Salzburg, Sauerländer Verlag, Germania 1989.

[4] Cioară, L., *Structura țesăturilor*, Editura Performatica, Iași, 2001.

[5] <https://www.arahne.si/configurator/>

[6] <https://www.arahne.si/>

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### About the author

Lecturer PhD. Eng. **Irina ARNĂUTU**  
„Gheorghe Asachi” Technical University of Iași, România

Graduate of the „Gheorghe Asachi” Technical University of Iași, Faculty of Industrial Design and Business Management (1982-1987); since 2009 doctor engineer in the field of Industrial Engineering; in present, lecturer to the same faculty within the Department of Engineering and Design of Textile Products.

Domains of competence: the characterization of physical and mechanical properties of fibers, yarns and woven fabrics; the visual lecture of textile surfaces with the identification and interpretation of the design elements and principles; seamless repeating patterns for textile surfaces in traditional and digital techniques; ARAHNE CAD/CAM software for dobby and Jacquard weaving; digital simulation of archaeological woven fabrics.