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Replica of Folk Cloth on a Contemporary Loom

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Abstract
The principle of making a woven fabric with an ethnic motif according to a costume design from Posavina, Croatia, is described. The specificities and complexities of making these fabrics on weaving looms are described. One way of replicating the patterns of old fabrics as well as the manufacturing problems and technological process are presented. The results led to the conclusion that the possibilities of fabric patterning on looms are numerous, and the replication of some motifs on looms is possible in a shorter time than on hand looms. However, industrial production is still recognisable, and it is impossible to get a characteristic tinge provided by hand weaving. In this sense, the aim of this paper is to investigate and compare the advantages and disadvantages of the industrial production of patterns with ethnic motifs for manufacturing national costumes, which could prove satisfactory when replacing original patterns.

Key words: *national costume, folk cloth, original ethnic motifs, ethnic motif industrial production, pattern replication.*

Introduction

According to many preserved textile items and records, Croatia is known for its extremely rich and varied weaving techniques, patterns and national costumes. The beauty of certain garments that were once in everyday use is stunning and incredible. The diversity in materials, shapes, designs, colours and embellishments of folk costumes makes the Croatian culture truly unique in the world [1].

Interestingly the oldest sample of woollen fabric in Europe was found in Bosnia and Herzegovina, near Livno (Pustopolje, an area traditionally inhabited by Croats) in 1983. It was a mantle (burial shroud) used to wrap a dead body. The mantle was found in a prehistoric earthen tumulus (grave) and its estimated age is about 3500 years (1400 - 1550 years BC) [1 - 3].

Making fabric using various techniques, valuable skills and knowledge has been passed down within families, with a certain secrecy. Traditional (folk) costumes have almost disappeared from everyday use, and can often be found in ethnographic museums and in rare private collections. Losing their original functions, costumes have begun to disappear mainly due to the impact of urban centres and industrialisation, which has slowly and irrevocably changed the way of life in the city and countryside. In the late 19th century men ceased to wear traditional costumes in most regions. However, it is interesting that today, on the threshold of the 21st century, there are women wearing old costumes modified and adapted to the present living conditions. Some simple but distinctive ethnic motifs pertaining to particular Croatian regions can easily be identified. These ethnographic regions in Croatia can be roughly divided into the Pannonian, Dinaric and Adriatic. The difference between costumes in each region can be identified by the diversity of clothing accessories, the amount of components, the cut, ways of covering the head, designs on aprons or by the material itself. Women's costumes differ from men's in plenty of ways. For example women's costumes are richer in motifs, and the manufacturing process is often finer and more complex. The specific way of fabric manufacturing and the colour of cloth reveal the marital status of a person, place of origin, the person's religion etc. [4, 5].

The development of society, changes in climate and other conditions have led to irreversible changes in the cultivation of plants and animals that provide the basic raw material.

In addition, the skills of manual labour in the manufacturing of fabric is disappearing with the aging and dying population who have the practical knowledge.

The extremely complex process of fabric production, from understanding fibres to the production of the final product, is very demanding. It is almost impossible to find a single person who has knowledge of every step of the process, especially today, where handwork is rarely done. In order to preserve ethnic heritage for the next generation, it is advisable not to use the original patterns. Despite the fact that the original patterns were made

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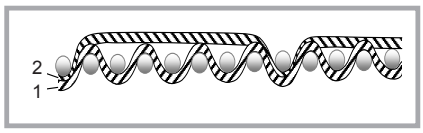

Figure 1. *Weave with one patterning weft; 1 - main weft, 2 - patterning weft [1].*

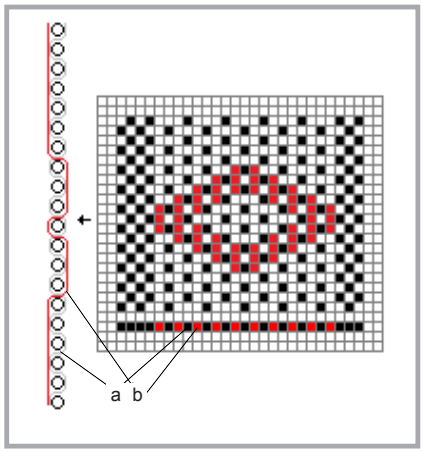

Figure 2. *Weave with two patterning wefts; 1, 2 - patterning wefts that change the effect on the fabric's face (I, II).*

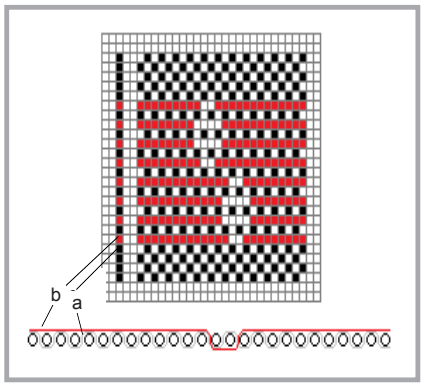

Figure 3. *Warp patterned fabric; a - main warp, b - patterning warp.*

on a hand loom, their complexity and often extreme properties (a large number of multicolored wefts, large weave units, high warp and weft density, different weft fineness and raw materials, different techniques of weaving in one pattern etc) frequently require very complex looms with additional devices to achieve the above-mentioned properties of fabrics [6 - 9].

Weaves for making motifs

The waves applied in the main fabric are often simple: plain weave, twill weave or their derivatives with smaller weave units.

Weft often create a motif in different weaves such as a plain weave, rep weave, crepe, honeycomb, broken, tie-up, diamond and other twill weaves, satin weave, etc. [10]. Different hand weaving techniques were used on hand looms.

Threads for creating a pattern on the fabric are mostly multicoloured and coarser than the main ones. The pattern can cover the whole width of fabric constructed of main warp and weft threads, forming the main part of the fabric, with one patterning weft thread (extra floating weft thread) or several patterning weft threads creating a pattern (***Figures 1 - 4***).

These motifs can be replicated by using automatic weaving looms. If patterning is performed with a patterning warp, the loom should be equipped with two or more warp beams, but if patterning is performed with a patterning weft, then the loom should be prepared to make weft patterned fabric [10, 11].

It is also possible to create patterns on fabrics using a brocaded weft yarn which appears only in certain sections across the fabric width, i.e. only where a pattern is created on the fabric's face.

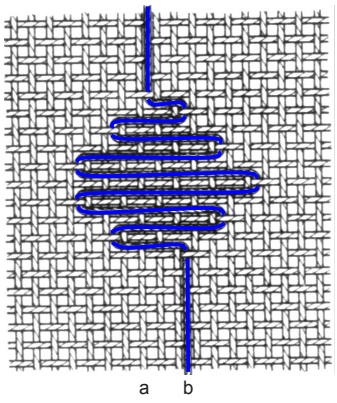

Figure 4. *Weft patterned fabric; a - main weft, b - patterning weft.*

It is possible to produce weaving motifs with brocaded weft threads on automatic weaving looms, but only in the part of the fabric where the brocaded weft does not interlace with the warp, staying loose on the fabric's reverse side, i.e. it floats (***Figure 3***). Occasionally after the weav-

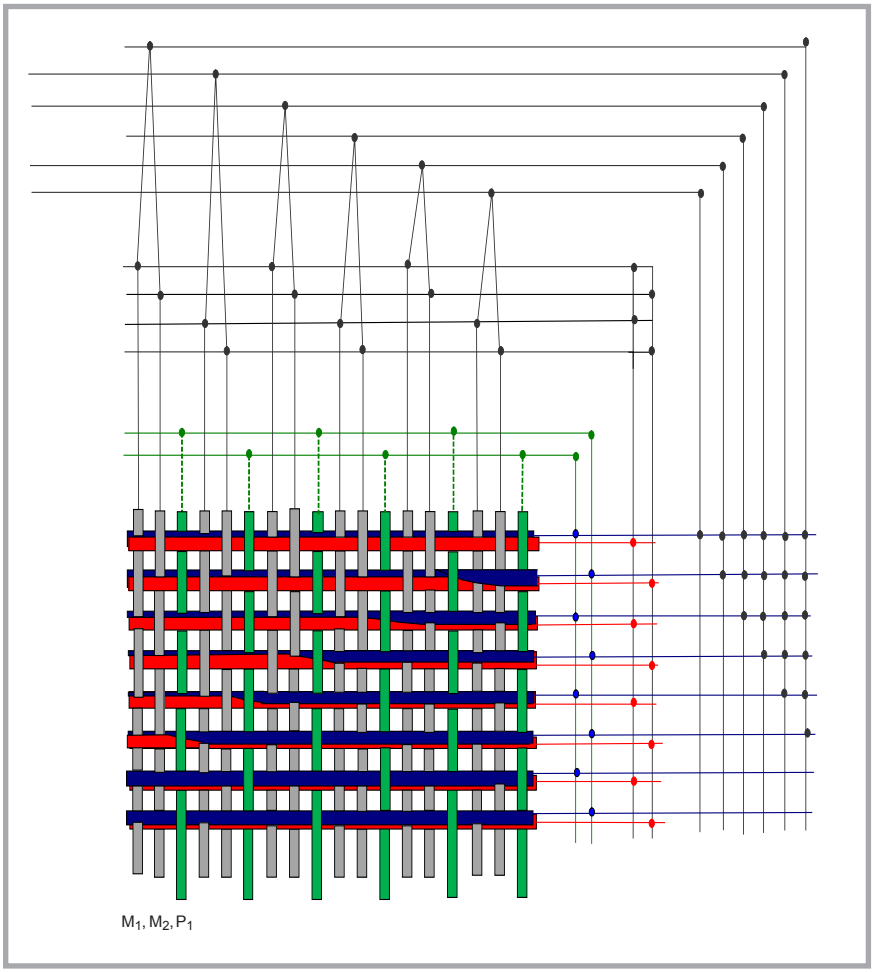

Figure 5. *Taqueté fabric; M – main warp, P – patterning warp.*

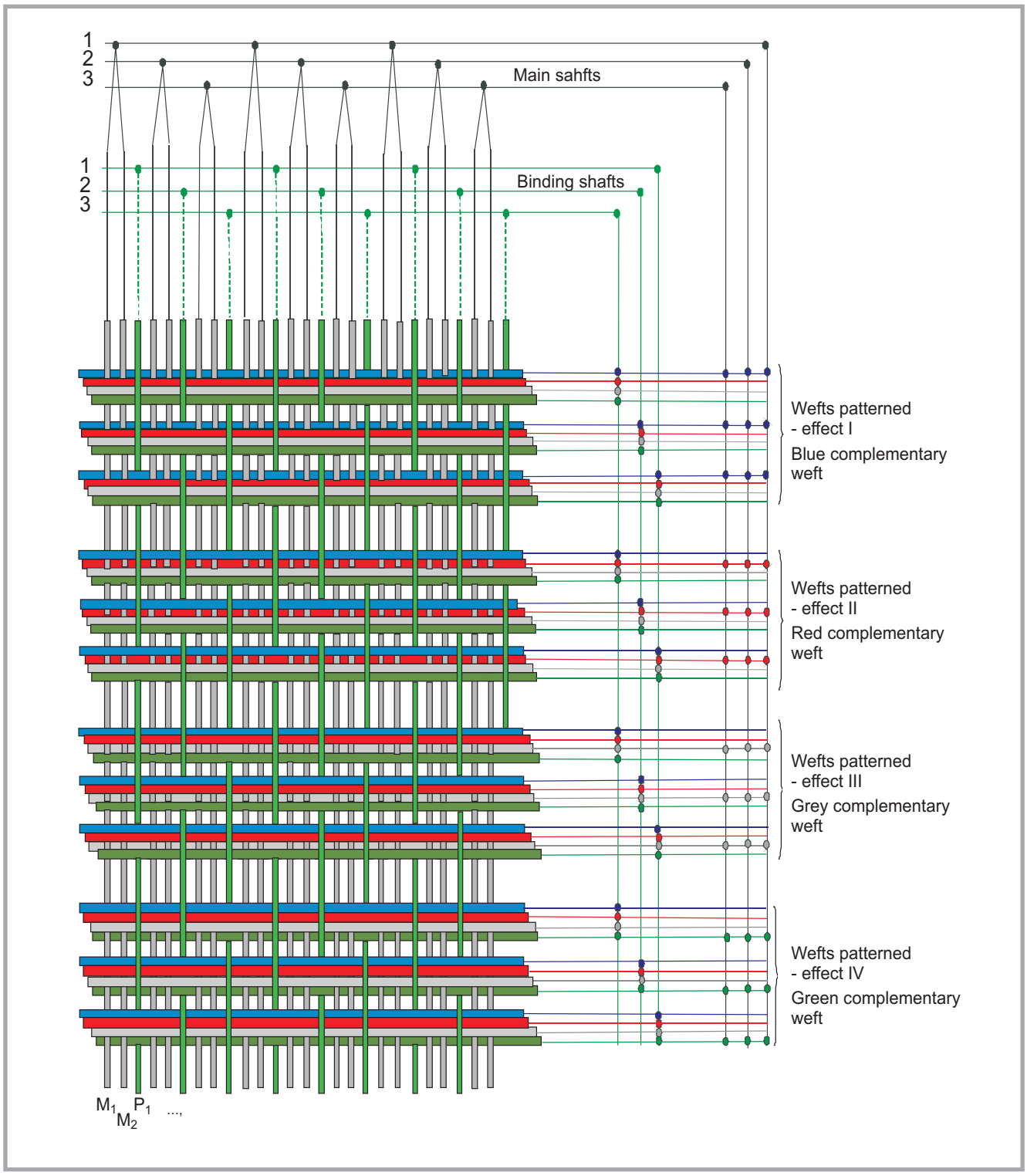

Figure 6. *Samite fabric.*

ing process is finished, loose threads need to be cut off in places where the floating is increased. That way the tightening of threads and consequent distortion of the appearance of the motif is avoided. However, cutting weft threads on the fabric's reverse side may cause a negative effect, i.e. threads may be pulled out and damage the motif at the edges. This can be prevented in a way that the patterning threads interlace in a plain weave at the end of the pattern.

Main threads can sometimes create a motif (pattern, effect), but if multicoloured threads are used that are finer and denser, the warp preparation will be more complex and slower. However, these motifs will be extraordinarily beautiful, with sharp contours and details. Creating motives with several warp and/or weft provide greater possibilities for combining effects for more expressive and beautiful motifs and a relief appearance of fabric. Some of the fabrics that fall into this category are **Taqueté, Samite** & **Lampas** (***Figures 5 - 7***) [12 - 16].

Taqueté and Samite are types of woven structure that belong to a category

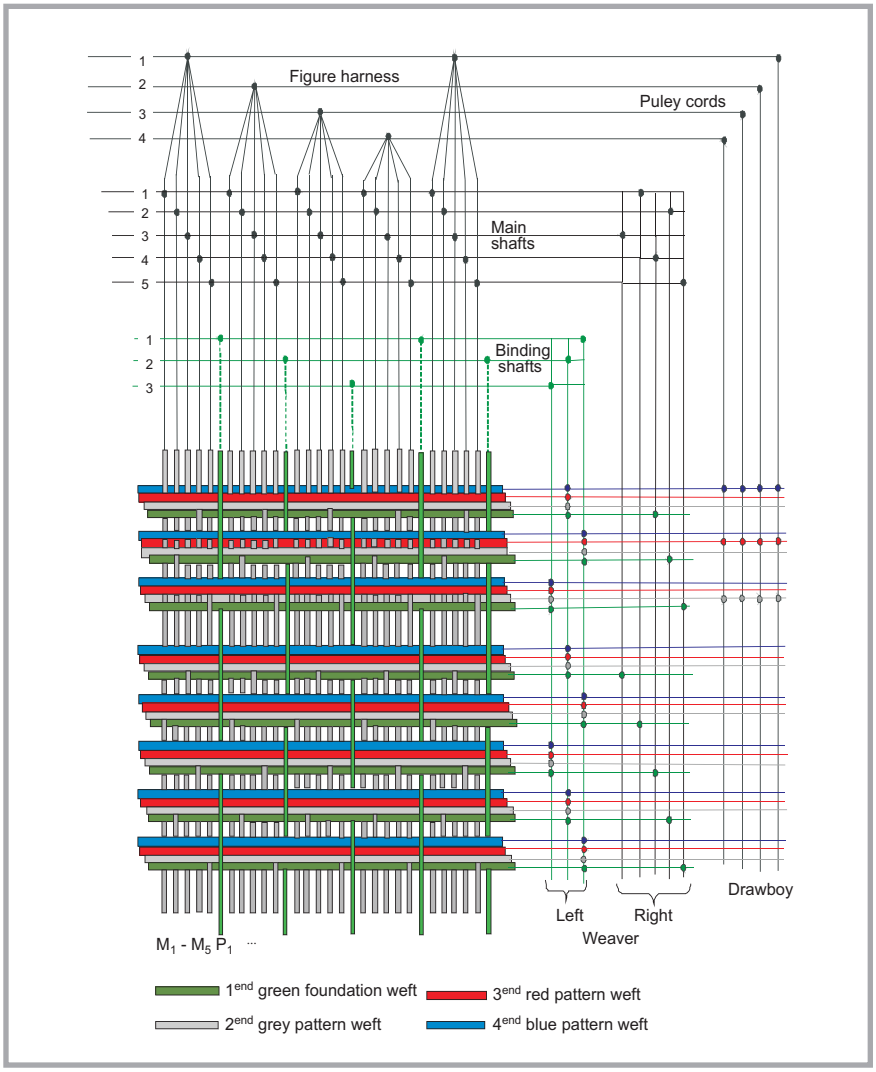

Figure 7. *Lampas, warp-faced 5-end satin foundation weave, 3 pattern wefts bound in ½ S twill order, woven face down; M – main warps, B – binding warps.*

of fabrics called compound weaves, i.e. a type of weave that has more than two elements (wefts or warps).

Taqueté is a weft-faced compound tab-by-pattern weave woven on a threading system that exchanges binding ends with pattern ends. The main feature of this structure is that it produces only a weft effect on the outcome and no warp effect. This type of structure uses main warp, binding warp, and a complementary weft composed of a minimum of two threads. Weft threads produce a weft pick on the face of the fabric, while others are kept in a reverse manner. This way only weft threads are visible on the face of the fabric. The main fabric and the pattern are created as the ends of the binding warp bind the weft in passes.

Samite (samit, samitum) is a weft-faced compound twill-pattern weave that, like Taqueté, produces only a weft effect on the outcome and no warp effect. It also uses main and binding warp, and a weft of a minimum of two threads that produce a weft pick on the face, thus the fabric looks like a weft-dominant twill weave. The main fabric and the pattern is created as the ends of the binding warp bind the weft in passes.

Lampas is a weaving technique that was popular in the Middle Ages and the Renaissance in Italy, France and Spain. Today this technique is mostly used only for producing heavy upholstery fabric or cloths. Lampas combines two weave structures to create a pattern composed of weft floats which are bound by a binding warp. Pattern areas are where the secondary weft appears on the main fabric. As a result the pattern is added to the main fabric, which is formed by the main warp and main weft. In this technique the weft of the secondary structure patterns the main structure. The pattern can be made by main, pattern or brocading weft threads that float on the face and are bound by the binding warp. Each main and secondary structure can be plain, satin or twill weave. However, in Beiderwand cloth (Germany, 18th century), a subset of Lampas, the pattern areas are considered to be where the main structure appears on the face of the fabric. The main and secondary structures do not exchange positions.

Experimental part

The experimental part describes fabric with motifs which are similar to patterns taken from an original folk costume (***Figure 8***). The density of the original sample is 16 ends/cm and 14 picks/cm, the warp and main weft were made of linen, while the patterning weft threads were made of cotton. The loom used for weaving the fabric had a limited number of shafts [16] and weft patterning was also limited. Therefore it was not possible to replicate the whole pattern, but only one part of it. Based on the original fabric the corresponding density and warp and weft yarns were chosen. The warp was a 36 tex × 2 cotton yarn, and the main weft was a raw cotton yarn of fineness 28 tex × 2, while the patterning weft threads were acrylic, dyed in 4 colours (red, green, black and yellow) of of fine-

Figure 8. *Original pattern (apron).*

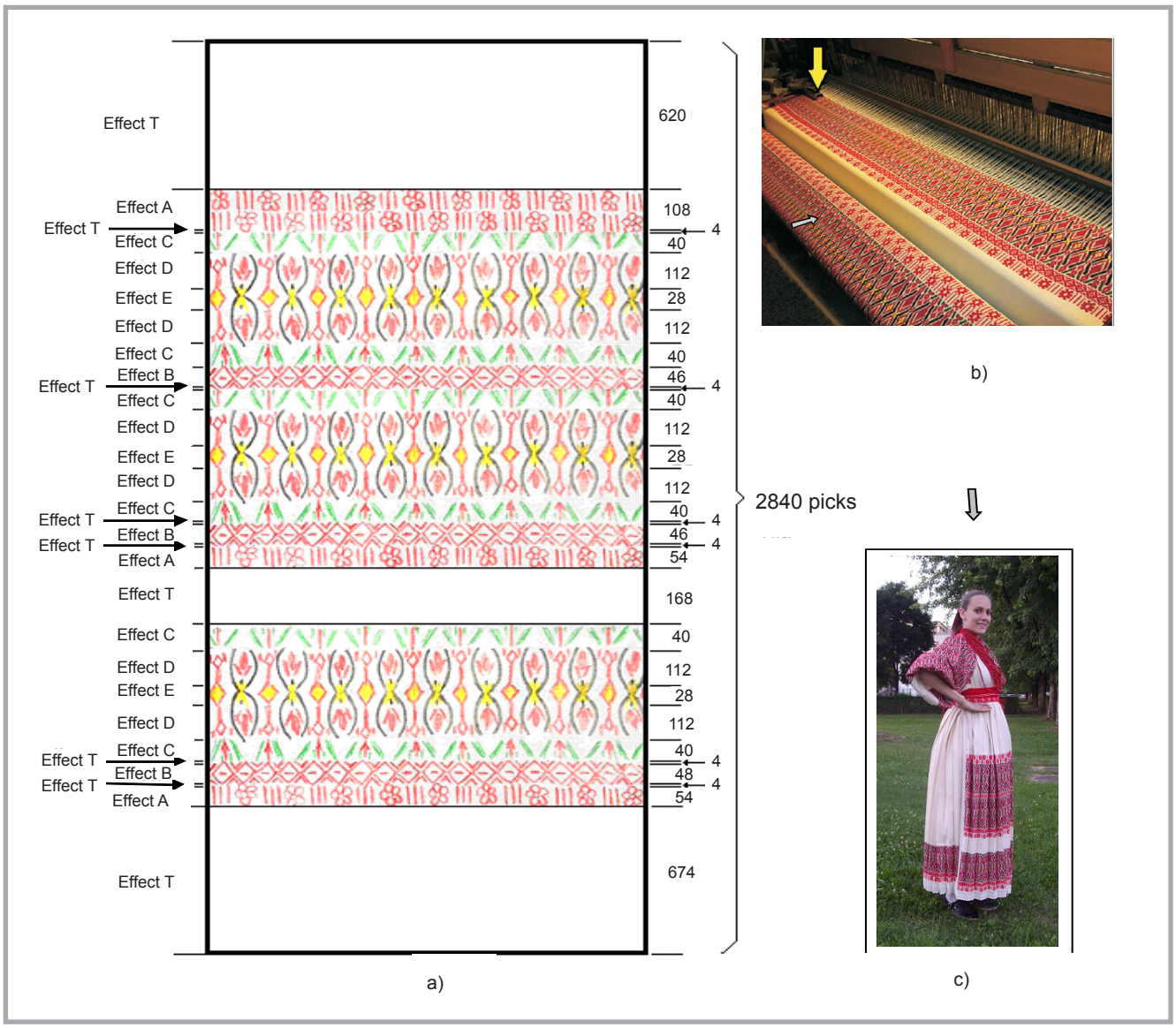

Figure 9. *Position of the effects on the fabric with a total of 2840 picks: a) developed pattern, b) woven pattern on the loom, c) stitched replica of a folk costume, man sawn.*

ness 34 tex × 2. The warp density in the reed was 13 ends/cm, and in the fabric 14 ends/cm. The fabric width was 145 cm, weft density was 12 main weft threads + 12 patterning weft threads/cm. The shuttle less Dornier loom was equipped with rigid rapiers with the possibility of weft patterning (eight different weft threads) and the mechanical positive dobby with capacity of 20 shafts. Maximum working width of the machine was 210 cm and the insertion rate was 150 picks/min.

The preparation of the loom was complex:

- placing of the warp beam with cotton warp on the loom
- drawing the warp into the shafts (reverse drawing into 15 shafts with two threads in a heddle)
- drawing the warp into the reed (2 threads into the reed dent with 6.5 dents/cm
- drawing the warp into drop wires
- weft preparation (red, green, yellow, black and grey cotton weft) and placing on the loom frame
- punching the weave card with a total of 2840 weft threads according to the effects (***Figures 9 - 12***) and placing on the loom
- punching the card for the arrangement of weft colours and placing the card on the loom
- matching the weave card with the card for the arrangement of weft colours
- start weaving together with matching weft density with warp density
- fabric inspection (at least one weave unit) and correction of possible faults.

After preparatory works weaving was performed according to the weave design. In one rotation of weave card and weft arrangement card one weave unit with a total of 2840 picks was woven. Since the weave card and the weft arrangement card are relatively long, additional frames are necessary to achieve a smooth rotation of the cards in the circle.

Discussion

Replicating fabric patterns that are part of ethnic heritage today is very difficult despite many efforts of various associations and other groups that have had or have the resources and knowledge to achieve this.

Fabric that has been replicated on automatic loom was based on original folk

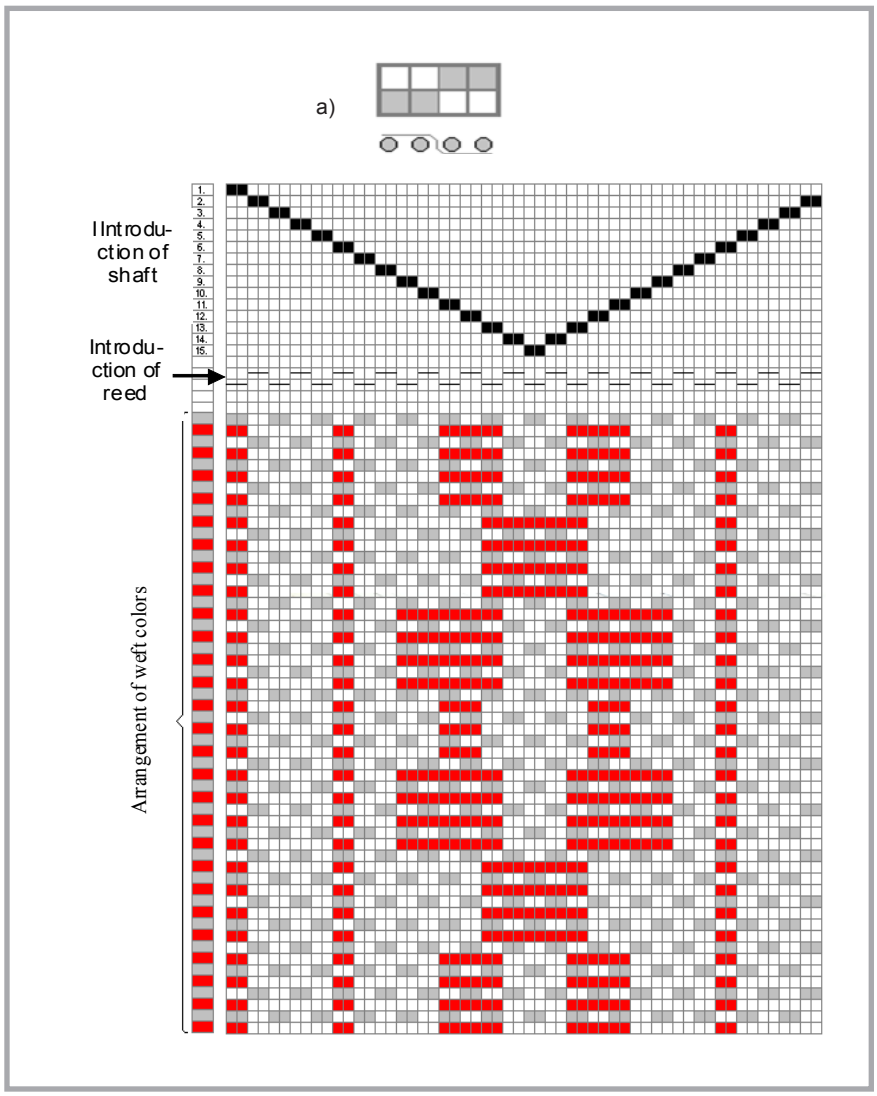

Figure 10. *Effects on the fabric (main and effect A): a) cross-section of the main weave, b) effect A with weft colour arrangement, introduction of reed and shafts.*

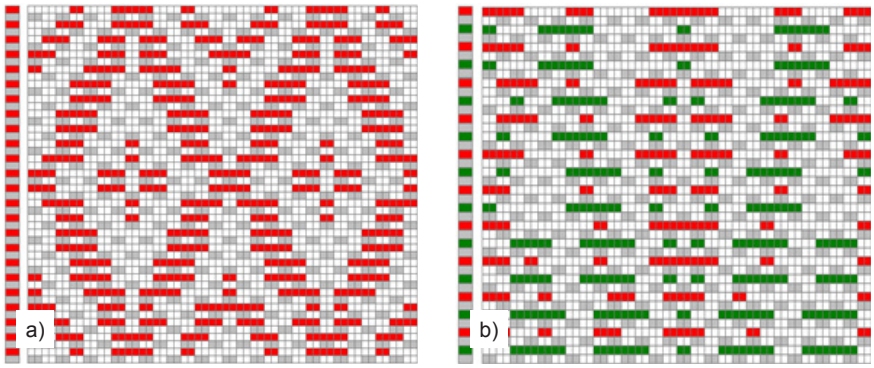

Figure 11. *Effects on the fabric (B and C); a) effect B with weft colour arrangement, b) effect C with weft colour arrangement.*

costume worn in Posavina (region in Croatia). The motif that was used consists of multiple different effects which are distinctive and unique for that particular Croatian region. If this replica was produced on a hand loom, the style of weaving used would fall under Samite fabrics.

The main fabric is made of cotton yarn in the warp and weft direction in reinforced plain weave and longitudinal rep (R 1/1, with weave unit: 4 ends and 2 picks, ***Figure 10.a***). The fabric pattern consists of five effects made with patterning wefts in color in the shape of one, two- or three-weft woven fabric.

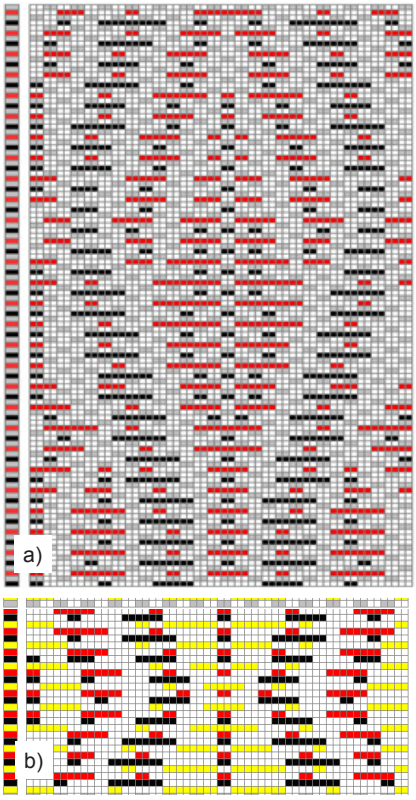

Figure 12. *Effects on the fabric (D and E); a) effect D and b) effect E with weft colour arrangement.*

One-weft woven fabric consists of one main weft and one patterning weft (arrangement: one main and one patterning weft) creating the pattern only on the fabric face over the whole fabric width (***Figures 10.b*** and ***11.a***). Two-weft fabrics with two multicolored wefts (arrangement: one main weft and one patterning weft) create the effect in ***Figures 11.b*** and ***12.a***. The last effect (***Figure 12.b***) shows a three-weft fabric where the effect is created by three multicoloured patterning wefts, the main weft thread is inserted only at the end of this effect. Considering effects, it can be determined that there are a total of four multicolored patterning weft (red, green, black and yellow) that create all five effects. For the effects or motifs A and C only the red patterning weft was used, for B effect green and red, for D effect red and black and for E effect yellow, black and red patterning wefts. In all effects, except for E effect, the main weft was inserted after each patterning weft in rep weave, while the patterning wefts had their weave which created a normal pattern on the fabric. This means that it is very important to match the weft arrangement with the weave. Before weaving the weave card and weft arrangement card should be placed in a manner that the weave corresponds to

weft colors. To obtain the proper dimensions of motifs and best quality replica, it is extremely important to match the density of warp and weft. This type of weaving falls under Samite fabrics with one effect.

Conclusion

This paper describes the design of a woven fabric and the process of making an ethnic motif woven fabric. Weaving ethnic patterns on the loom required very complex preparation of the loom and materials, accurate decomposition, appropriate loom with the possibility of weft patterning and extremely extensive know-how in the production of complex fabrics.

Large weave units require large card lengths for mechanical dobbies and Jacquard machines (this motif required 2840 picks) which raises a spatial problem.

The preparation of cards for colour arrangement of 2840 wefts was long lasting and complex process, as well as the procedure of placement of relatively long card.

This work has proved that some complex patterns and motif parts of the folk costume can be woven on the automatic loom. As such those patterns are replicas and necessary substitution for original patterns woven on hand looms.

Replicating traditional patterns and motifs on modern looms has made production of ethnic cloths much faster and cheaper in relation to handwork. It has greatly helped in production of costumes for folk ensembles and consequently it had great impact on preserving rare and unique samples of distinctive folk cloth.

Editorial note

1) All Figures presented in the article are the author's own work.

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