SELÇUK ÜNİVERSİTESİ
SOSYAL VE TEKNİK ARAŞTIRMALAR DERGİSİ
1.Uluslararası Sosyal ve Teknik Bilimler Sempozyumu
USTEK'2022 Özel Sayısı

Kasım, 2022

ISSN: 2146-7226

Dergi Ana Sayfası: http://sosyoteknik.selcuk.edu.tr

Görüntü Analizi ve Dokuma Kumaş Tasarımını Birleştirerek Bilgisayar Destekli Tasarım

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Makale Bilgileri

Makale geçmişi:
Alındı 15 Eylül 2022
Kabul edildi 24 Ekim 2022

Anahtar kelimeler:
Bilgisayar destekli tasarım, CAD
Dokuma kumaş tasarımı
Tekstil tasarımı

Özet

Bilgisayar destekli tasarım uygulamaları, tekstil ve moda endüstrisindeki önemi her geçen gün artmaktadır. Tekstil yüzey tasarımında dijital ürün yelpazesinin artması, sanal simülasyonlara imkân sağlayan yazılımların tercih edilmesine neden olmuştur. Kumaş tasarım programları, tekstil tasarımcılarının işlerini kolaylaştırmalarının yanı sıra tasarımcıların daha yaratıcı olmasını ve buna bağlı olarak ürün çeşitliliğinin artmasını sağlamaktadır. Gerçek numuneler yerine sanal numunelerin oluşturulmasıyla zaman tasarrufu ve düşük numune maliyeti sağlanması bu tür uygulamaları daha da çekici hale getirmektedir. Kumaş tasarım programlarının dikkat çeken avantajlarına rağmen, lisans maliyetinin yüksekliği ve kullanıcıların bu uygulamaları kullanabilmeleri için eğitim görme ihtiyacı duymaları gibi dezavantajlar, bu tür yazılımların tekstil ve moda endüstrisinde geniş çapta kullanımına engel olmaktadır. Lisans maliyeti dezavantajı özellikle tekstil tasarımı eğitimi veren kurumlar için daha büyük bir engel teşkil etmektedir. Bu çalışmada, bu dezavantajları göz önüne alarak hem maliyet faktörünü ortadan kaldırmak hem eğitime yönelik eksiklikleri gidermek adına, iki farklı kullanıma açık yazılım kullanarak, tekstil tasarımı eğitiminde kullanılabilecek bir uygulamanın örneği gerçekleştirilmiştir. Bu çalışmadaki uygulama örneği, dokuma kumaş tasarımını içermekte olup, öncelikle görüntü analiz yazılımı ile temin edilen örnek kumaş numunenin yapısı analiz edilmiştir. Atkı ve çözgü sıklıkları, iplik yoğunlukları tespit edilmiştir. Görüntü analizi sonucu elde edilen veriler kullanılarak, dokuma kumaş tasarımı yazılımı ile farklı iplik hareketleri içeren dokuma kumaş tasarımı gerçekleştirilmiştir

Computer Aided Design Combining Image Analysis and Woven Fabric Design

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Article Info

Article history:
Received 15 September 2022
Accepted 24 October 2022

Keywords:
CAD
Computer aided design,
Textile design
Woven fabric design

Abstract

The importance of computer aided design applications in the textile and fashion industry is increasing day by day. The increase in the range of digital products in textile surface design has led to the preference of software that allows virtual simulations. Fabric design programs not only facilitate the work of textile designers, but also enable designers to be more creative and increase the product variety accordingly. Time savings and low sample costs by creating virtual samples instead of real samples make such applications even more attractive. Despite the remarkable advantages of fabric design programs, disadvantages such as the high license cost and the need for users to be trained to use these applications prevent the wide use of such software in the textile and fashion industries. The disadvantage of the license cost is a bigger obstacle especially for the institutions that provide textile design education. In this study, an example of an application that can be used in textile design education has been realized by using two different licence-free software to eliminate the cost factor and to eliminate the deficiencies in education, taking into account these disadvantages. The application example in this study includes the woven fabric design, and firstly the structure of the sample fabric sample was analysed by using the image analysis. Weft and warp numbers and yarn densities were determined. Using the data obtained as a result of image analysis, woven fabric design with different yarn movements was carried out in woven fabric design software.

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1. Introduction

Nowadays, virtual simulations have played an important role in designing and marketing. They provide virtual realism in product presentation thanks to rapidly developing technology [1-3]. They present many advantages: like not consuming time, giving fast and correct results and no sampling cost. Independent of working place, it enables designers to be more creative and accordingly, increase the product variety and identify the pattern of textile structures.

Zhang and Xin presented a review of woven fabric pattern recognition based on image analyses technology. They described the key process and specific pattern recognition systems managed by researchers. They summarized limitations in digital pattern recognition for woven fabrics [4].

Shady, et al. investigated in identifying the pattern of a woven structure in addition to evaluating other surface parameters via the digital image process. In his study, the samples included three fabric structures with two constructions for each structure were evaluated manually using a magnifier and the results were compared to those of the digital image approach developed. The approach results showed good agreement compared to the results [5].

Karnik and Admuthe developed an automatic method for woven fabric structure identification based on digital image analysis techniques. In their study, they applied the wavelet transform to analysis the structure of woven fabrics and detected the yarns density of woven fabric samples having different weave types, different fibre appearances and yarn counts. The recognitions results matched the actual structure of tested samples [6].

Lim and Kim developed an integrated hardware and software system to automate the analysis of various woven fabric structures. They used a digital microscope to capture high resolution images to analysis the intersection of warps and wefts. From intersecting regions, they created an artificial neural network to determine the woven structure of fabric [7].

CAD systems presents the remarkable advantages but there are some disadvantages such as high licence cost and the need for users to be trained to use these applications prevent the widespread use of such software. The licence cost disadvantage of CAD applications makes it difficult especially for institutions providing textile design education. In this study, an example of a practice that can be used in textile design education has been realized by using two different licence-free software in order to both eliminate the cost factor and the deficiencies in education. In first part: product dimensions and fabric structure were analysed via image analysis software. Then using the data obtained from the image analysis, a woven fabric design having different yarn movements was carried out with the woven fabric design software.

2. Method

Two licence-free software (Digimizer and DB-weave) were used in this study. "Digimizer" is image analysis software capable of investigating on images. "DB-weave"" is design software capable of creating weaving charts. A woven product was provided from market. The sample product, a fabric swatch, was shown in Figure 1. It has a surface containing several yarn movements.

Figure 1. A woven swatch

3. Results

In first part of study, the woven structure was investigated via image analysis software. The yarn density was measured after defining the unit (cm) corresponding to pixels in the image taken nearby a ruler (Figure 2.).

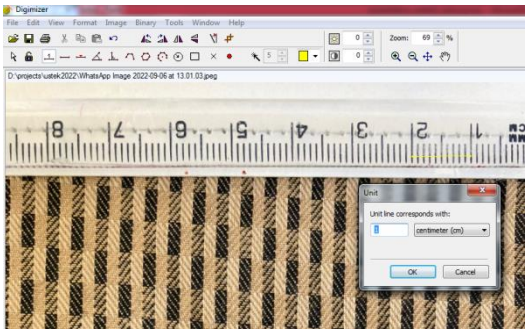

Figure 2. Defining unit corresponding to pixels

The fabric density was counted via image analysis in both warp and weft directions. The yarn density per area (cm²) was measured as 38x27 per 1 cm² (Figure 3.).

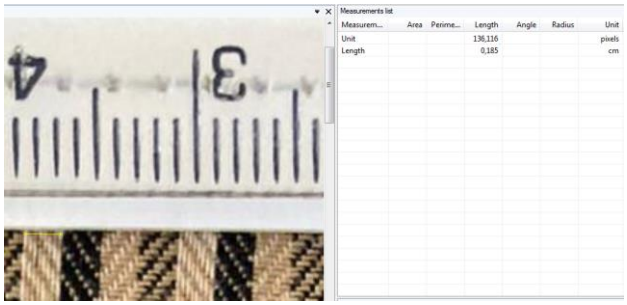

Figure 3. Measuring the yarn density per area

Before starting to create woven charts, the fabric density (warp x weft: 38x27) for adjusting software was inputted into woven design software (Figure 4.).

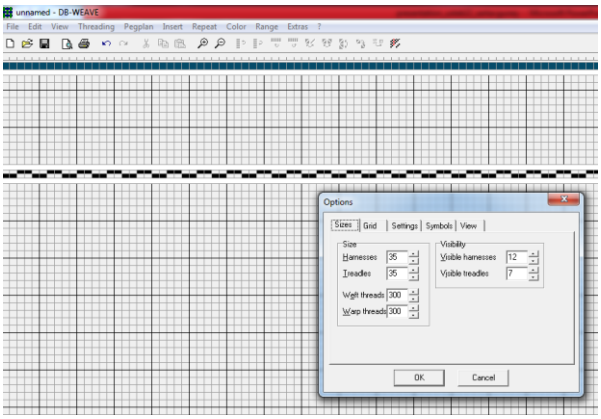

Figure 4. Adjusting the knit design software

In second part of study, the patterns repeated in surface of the fabric swatch were determined (Figure 5.).

Figure 5. Determining patters repeated in surface

Image analysis software enables the user to see real yarn movement. It is especially useful for student in education (Figure 6.).

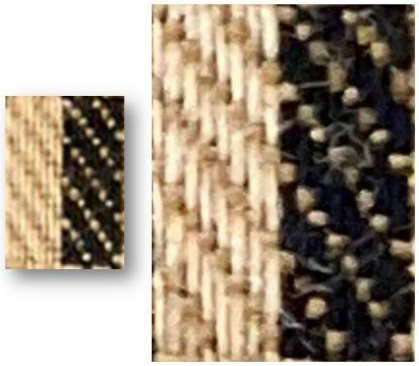

Figure 6. Zooming in image to see real yarn movements

Patterns determined were created one by one in woven fabric design software. The weaving chart of first pattern was created in Figure 7.

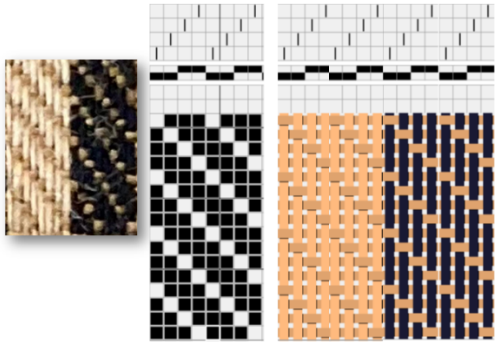

Figure 7. First pattern and its weaving chart created in woven fabric design software

The weaving chart of second pattern was created in Figure 8.

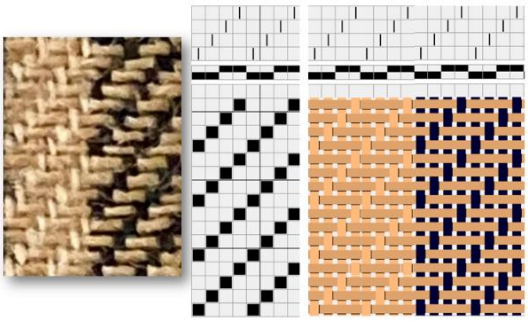

Figure 8. Second pattern and its weaving chart created in woven fabric design software

4. Conclusions and Recommendations

CAD systems have remarkable advantages but disadvantages such as high licence cost and the need for users to be trained to use these applications makes it difficult in the widespread use of such software, especially for institutions providing textile design education. To minimize these disadvantages, in this study, a practice that can be used in textile design education has been realized by using two different licence-free software to both eliminate the cost factor and the deficiencies in education.

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