

# TZG 2024

International Scientific-Professional Symposium  
"Textile Science & Economy"

Book of Abstracts  
DIGITAL FASHION

University of Zagreb  
Faculty of Textile Technology  
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## BOOK OF ABSTRACTS

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the 16th consecutive and the 6th international one with the theme  
"DIGITAL FASHION"  
2024

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## **Editors note**

Dear colleagues, participants and guests,

This year's International Scientific and Professional Symposium, "Textile Science & Economy" (TZG 2024), is the 16th in a row and the 6th international one organised by the Faculty of Textile Technology of the University of Zagreb, on January 26th 2024. This year's symposium is dedicated to "Digital Fashion" and gives new insights, ideas and methodologies into this valuable and specific research field.

The "Book of Abstracts" presents a variety of research papers from different scientific and artistic fields that deal with the issue of digital fashion and the application of advanced digital technologies in fashion and textile science. All abstracts are arranged alphabetically by the author's name and were peer-reviewed for this book. In addition, during the 16th International Scientific-professional Symposium "Textile Science & Economy", participants are presented with poster presentations which illustrate and frame their research.

In Zagreb, Croatia, January 2024

Katarina Nina Simončič and Petra Krpan

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## Acknowledgements

We want to express our gratitude to our patrons and donation companies, who helped tremendously in organising this year's International Scientific-Professional Symposium, "Textile Science & Economy", in Zagreb on January 26th 2024. Without them, this symposium would not be possible.

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**abstracts**

## DIGITAL CLOTHING INSPIRED BY STREETWEAR

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Abstract:

This paper shows the production of a digital garment inspired by streetwear. The digital garment was developed based on a conceptual sketch. The basic pattern was constructed and tested on an avatar. The avatar was previously adapted to the measurements used for the construction of the basic pattern. The basic pattern was virtually tested and corrected. The pattern prepared in this way served as the basis for modeling the pattern according to the given sketch. The modeled pattern was applied to the avatar and the movement was simulated.

The construction of the basic pattern, the modeling and the computer simulation were carried out with the computer program package Clo 3D. In this way, a digital garment was created that can be adapted to the user's measurements and wishes. A digital garment is not physically produced and is therefore intended exclusively for use in a virtual environment.

Keywords: digital clothing; streetwear; Clo 3D; 3D computer construction and modeling

## **PATENT ZIPPER AS AN AESTHETIC AND FUNCTIONAL ELEMENT OF CLOTHING**

Blaženka BRLOBAŠIĆ ŠAJATOVIĆ; Rahela STRINIĆ; Irena ŠABARIĆ; Ksenija DOLEŽAL

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Abstract:

This paper will present a zipper originally designed as a part of the construction of a garment that serves to put it on faster and easier. However, its role did not stop only at functionality, so throughout history, the zipper began to gain aesthetic importance as well. A short historical development of the zipper from the moment when it had a purely functional role to the very moment when it becomes part of high fashion and how it can contribute to the design of a garment and its aesthetics will be described. In the experimental part of the work, a fashion collection of women's clothing will be presented, created in the vector computer drawing program Adobe Illustrator, inspired by the zipper used in fashion. In this collection, the zipper will play a primary role in aesthetics, but at the same time there will be an emphasis on its functionality.

Keywords: zipper; clothing construction and modeling; fashion collection; Adobe Illustrator

# APPLICATION OF NON-DESTRUCTIVE INSTRUMENTAL METHODS FOR THE ANALYSIS OF BLACK YARN FROM A HISTORICAL LITURGICAL TEXTILE

Klarisa ČOP 1; Ana SUTLOVIĆ 1; Sandra LUCIĆ VUJIČIĆ 2; Sandra FLINČEC GRGAC 1

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## Abstract:

Nowadays, conservation and restoration is regarded as a multidisciplinary science that encompasses various branches of science. The importance of these disciplines lies in the preservation of the heritage of a particularly wide range of historical textiles. The colour of historical textiles was created through the harmony of weaving techniques and the shades obtained with natural dyes. However, it is well known that many of the old textile dyeing methods are not environmentally acceptable due to the use of high concentrations of chemicals. Apart from being environmentally unfriendly, chemicals also cause difficulties and challenges in the conservation and restoration of historic textile objects. One example is the use of green vitriol (iron(II) sulphate) to achieve black tones, which leads to great instability and sensitivity of the textile material. In this paper, a sample of black yarn obtained from a phelonion depicting the Ascension of Christ, owned by the Orthodox Dalmatian Diocese in Šibenik, restored at the Croatian Restoration Institute, was analysed. The phelonion is a Russian-made, in which fabrics of French origin were used, and it is dated to the 18th century. The analysis was carried out using remission spectrophotometry, Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The images of the fibres in the SEM and the specific spectral bands in the FTIR confirmed that the silk was the raw material. The probability of the presence of iron is based on historical facts about the achievement of black tones by dyeing with natural dyes and on the FTIR analysis, i.e. the occurrence of peaks in the wavelength range 790  $\text{cm}^{-1}$  and 1100-1110  $\text{cm}^{-1}$ . Furthermore, due to the low reflectance values and the high values of the dyeing depth, it is assumed that a high mordant concentration was used. This fact can be confirmed by historical dyeing recipes in which significant amounts of iron salts are used in combination with different tannin sources to achieve a high depth of brown and black colouration. Ultimately, these salts are one of the main causes of the brittleness of textiles.

Keywords: natural dyes; mordants; historical textiles; VIS; FTIR; SEM

## GREEN FASHION DESIGN EDUCATION – CASE STUDY

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### Abstract:

Fashion design study programs provide a unique opportunity to equip graduates with the necessary knowledge, skills, and creative problem-solving approaches to reduce the negative environmental impact of current fashion manufacturing processes. The theme of sustainability is an opportunity for students to apply critical thinking skills in the creative process and experiment with concrete sustainable design practices. The aim is to integrate sustainability as a design standard, explore sustainable construction techniques, and find new solutions through design concepts, material selection, pattern development, assembly procedures, and the product life cycle (in accordance with ecodesign principles). In this case study, the use of the creative solution of zero waste patterning in the teaching of art lectures in bachelor and master courses in fashion design is presented. The article presents the principle in the process of a specific student project from the Design Department of the Faculty of Textiles of the Technical University of Liberec (FT TUL).

Keywords: ecodesign; fashion; zero waste pattern; sustainability; education; creative design

## PERSONAL SPACE BETWEEN PHYSICAL AND VIRTUAL

Elena FAJT; Tanja Nuša KOČEVAR; Alenka MORE;  
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### Abstract:

The fashion and textile industry has been fascinated by digitalisation for decades. But it was not until the 21st century, and especially with the outbreak of the COVID-19 pandemic, that digitalisation in the fashion industry really took off. Digital tools offer new, innovative and creative approaches in which many brands recognise sustainable and commercial benefits. The use of virtual prototyping can shorten the work process. It can also reduce the amount of physical sampling, which is important for production but very damaging to the environment. Fashion brands are increasingly using digital fashion, virtual reality and 3D animations to present their stories and new collections. By using interactive technologies, they are luring fashion enthusiasts into the fantasy world of fashion magazines and inspiring virtual shows. Digital tools and virtual sampling also enable retailers to offer more personalisation and customization with the help of configurations and virtual fittings. Virtual and augmented reality help customers visualise how garments will look on them before they buy and can help customers engage with fashion through other digital channels, such as gaming. In the fashion industry, the acceleration of digitalisation is expected mainly from the next generations, who have more digital experience, and education systems play an essential role in promoting skills and the use of digitalisation. From September 2022, the Department of Textile and Clothing Design at the Faculty of Natural Sciences of the University of Ljubljana is included in the international Erasmus + Me-You-Us project. The project focuses on the development of digital 3D competences in the field of textile and clothing design for diversity, inclusion and the green transition. The Erasmus+ Me-You-Us project involves a three-year collaboration between three higher education institutions: Designskolen Kolding (DK), Willem de Kooning Academy (NL) and the University of Ljubljana (SI). The project aims to develop nine freely accessible educational modules in the field of textile and clothing design, which will include various digital tools. In the first year, the University of Ljubljana explored the synergy between manual and digital design as part of the "ME" modules, which ended at the end of the 2023 summer semester. It developed the module "Personal space between physical and virtual". The students used CLO3D and explored the processes of digital design, virtual prototyping, digital development of clothing and export of 2D patterns for the physical implementation of clothing. The students created digital collections and physical garments that represent a close connection between the real and the virtual.

Keywords: fashion and textile design; digital design; education; virtual prototyping; synergy between manual and digital design.

## DESIGN AND APPLICATION OF LUMINESCENCE YARNS IN TEXTILE INSTALLATION

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### Abstract:

In this work, the luminescence of yarns was investigated in the context of artistic textile design. For this purpose, cotton yarns were modified to create an artistic collection of checkered fabrics. The yarns were treated with a commercially available optical brightener (FWA, Fluorescent Whitening Agent) and integrated into woven fabrics for the textile installation. This type of textile can be used in interior design and architecture as well as for individual exhibits in galleries. The study investigated the influence of the FWA on the design effect, namely the different visual effect during the day and at night, and showed the potential of using checkered fabrics in design objects.

Keywords: luminescence, optical brightener, textile design, textile architecture

# THE INFLUENCE OF ARTIFICIAL INTELLIGENCE ON FASHION INDUSTRY

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Abstract:

Artificial intelligence and its elements are powerful tools that can be applied in many processes, including the fashion industry, from concept and design to material sourcing, production, logistics and retail. The application of artificial intelligence can contribute to various improvements such as speeding up and scaling processes, handling large amounts of data that humans are not capable of, and offering consumers new ways of experiencing retail. This paper aims to show how artificial intelligence is changing the fashion industry. The specifics of artificial intelligence are described, including machine learning, computer vision, robotics, and natural language processing. It is described how clothes can be designed and produced using elements of artificial intelligence and two examples from the practice of sewing and handling textiles are presented.

Keywords: artificial intelligence; computer vision; robotics; sewing; handling

# THE IMPORTANCE OF PRODUCTION SCHEDULING ON THE EXAMPLE OF MEN'S SHIRTS MANUFACTURING

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## Abstract:

Production scheduling is a process of managing time slots in which certain work orders need to be produced. The implementation of production scheduling in the garment industry is based on finding an optimal schedule of machines and devices as well as of processing job operations in order to reduce the manufacturing cycle time. In the present paper is shown an example of scheduling a work order of 280 pieces of men's shirts with the purpose of indicating the importance of this process in the garment industry. Given example clearly illustrates that production scheduling can reduce the manufacturing cycle time, in other words time of cutting, sewing and finishing processes in the garment industry. With that kind of set and managed production time slots, the difficulties with meeting the delivery dates are avoided, which represents a great contribution to the organisation and the business of the garment industry.

Keywords: production scheduling; garment industry; manufacturing cycle time; delivery date

**DOCUMENTING AND PRESERVING TEXTILE HERITAGE USING DIGITAL  
DOCUMENTATION TECHNIQUES:  
THE CONSERVATION AND RESTORATION OF HEADGEAR FROM THE BALTAZAR  
BOGIŠIĆ COLLECTION IN CAVTAT**

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**Abstract:**

This paper focuses on methods of the Digitization of tangible cultural heritage, specifically on digital techniques used in recording the conservation and restoration process performed on a 19th century headgear from the Baltazar Bogišić collection in Cavtat. Tangible cultural heritage is in constant process of deterioration, so it is crucial to combine old and new technologies and digitization methods to improve our ability to preserve it. The methodological approach to conservation and restoration documentation of headgear includes written text, as well as different photographic and graphical records. The data comprises information related to the condition of object, material composition, manufacturing techniques, as well as data obtained during conservation and restoration treatment. Detailed and professionally made conservation and restoration documentation should provide all the key information relevant for the future researcher, curator, or conservator.

**Keywords:** tangible cultural heritage; Digitization; textile conservation and restoration; headgear

## **“WHAT’S UNDER THE HOODIE?” REDESIGN OF A HOODIE AS AN INSPIRATION FOR STAGE CLOTHES**

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### Abstract:

This paper delves into the innovative redesign of a quintessential garment: The Hoodie intended for the dynamic requirements of stage performance. The reinvented hoodie stands out due to its multifunctionality, sustainability, and aesthetic appeal. With a commitment to close to zero percent textile waste, the design places a strong emphasis on environmentally conscious fashion, making it a responsible and forward-thinking choice. The redesigned hoodie is crafted to cater to the unique needs of stage performers, especially the band "Trivan." Beyond its visual appeal, the hoodie incorporates features that ensure mobility, durability, and comfort. Its multifunctional design includes advanced textiles for ergonomic fit, sweat-wicking properties for comfort, and integrated tech pockets for modern utility. Elements inspired by "Trivanizam" spiritual philosophy are subtly integrated, allowing the garment to communicate deeper narratives while maintaining its primary focus on functionality and design. The essence of this paper revolves around transforming the conventional hoodie into a stage-ready, multifunctional garment. By intertwining sustainable practices with advanced design techniques and multifunctionality, this redesigned hoodie promises optimal performance for artists on stage while also championing eco-conscious fashion.

Keywords: The hoodie; sustainable design; zero waste; multifunctionality; CLO3D; 3D printing

# COMPUTER DESIGN OF THE WORKPLACE IN THE TECHNOLOGICAL SEWING PROCESS USING THE ERGOPLAN PROGRAM

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## Abstract:

In this paper, the computer design of the workplace was carried out using the ERGOPlan program, i.e. its modules ERGOMas and ERGOMan in the technological sewing process when performing the technological operation of fastening the seam on the sleeves, length and shoulder, which is performed on the universal sewing machine JUKI DDL-555-4. The ERGOMas module determines the sitting height, size and height of the work surface based on the worker's body height. The ERGOMan module was used to simulate the execution of a technological operation according to technological suboperations. From the presented dynamic and static simulation of technological operations at the workplace, it is evident that the work is performed in an ergonomically favorable working position, which results with lower workload and worker fatigue and leads to higher workplace productivity.

Keywords: technological sewing operation, computer design, ERGOPlan program

## ELECTRIC ENERGY FROM THE SOURCES INTEGRATED IN FOOTWEAR

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Abstract:

The paper presents the results obtained by researching the influence of walking speed and placed coils and permanent magnets at three positions in high boots. The measurements were carried out on a treadmill under controlled conditions in the Laboratory for Thermal Insulation Properties of Clothing, University of Zagreb, Faculty of Textile Technology. The experimentally obtained values indicate that the largest number of electric impulses is obtained from the inductive source at the position in the top of high boots (in the area of the upper leg), where is the greatest possibility of changing the magnetic flux when a permanent magnet passes near the coil in a shorter time than at the knee or foot position.

Keywords: electric energy; inductive sources; footwear; walking speed

# AI'S TRANSFORMATIVE IMPACT ON DIGITAL FASHION: INNOVATIONS AND ETHICAL CONSIDERATIONS

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## Abstract:

This article explores the transformative impact of Artificial Intelligence (AI) in the field of digital fashion. It critically examines innovative initiatives, including the "AI Generated" magazine by Sevda Albers and the Adidas SPEEDFACTORY concept. It also highlights recent and notable examples where designers (Daria Shapovalova, Irina Raicu, Marco Simonetti, Maison Meta) drew inspiration from the legacies and aesthetics of renowned fashion brands like: Adidas, Jacquemus, Monklet, Nike, and Tommy Hilfiger. These designers have skillfully integrated AI technology into their work, resulting in some of the best AI-driven projects that pay homage to the brands' legacies. The study provides an overview of the distinctive features of collaborations between designers and AI. These collaborations can customize fashion experiences for individuals by using AI to consider personal preferences, enhancing both creative design and overall product quality. Furthermore, the article addresses ethical considerations, including privacy, transparency, consumer autonomy, and job displacement, associated with AI integration in the fashion industry. It emphasizes the central role of responsible AI implementation in achieving personalized fashion excellence. As the digital fashion landscape evolves, this article presents the considerable potential of AI to enhance personalization, design innovation, and product quality.

Keywords: Artificial Intelligence (AI); Digital Fashion; Fashion Technology; Fashion Design

## DIGITAL TOOLS IN THE DESIGN OF A COLLECTION AND A FASHION PORTFOLIO

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Abstract:

The work Digital tools in the design of a collection and a fashion portfolio explains the concept of a fashion portfolio as an irreplaceable presentation document in contemporary fashion, with a particular focus on the role of the portfolio in digital fashion. Using relevant examples from the world of contemporary fashion, the digital tools used to create the fashion collection and the associated digital portfolio for the KOVARI 22/23 fashion collection by designer Alison Ivašić are analyzed. Using the example of the analysis of parts of the designer's portfolio, we follow the example of the digital design of a fashion project from the definition of the fashion concept to the production of garments with special emphasis on the role of the digital tools used for the simulation of 3D visualizations.

Keywords: fashion portfolio; fashion collection; digital fashion; CLO 3D

# DIGITAL ARCHIVES OF CONTEMPORARY FASHION PHOTOGRAPHY

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## Abstract:

With the transition from classic illustration in fashion magazines to the first fashion photograph, there is a radical shift in the reconciliation of the body, dress and fashion. In this research, we will present the significant shift from fashion illustration to fashion photography at the end of the 19th and beginning of the 20th century and their mutual connection on a global scale. Moreover, we will explore how illustrations and photographs are kept within specific digital archives in today's new media environment. This paper focuses on the concept of 'archives' to investigate the history of dress and clothing and present new digitally manipulated archives of contemporary fashion. With the shift from analogue to digital photography, fashion became a global digital archive, a platform for researching, viewing, preserving and studying dress and fashion. The term 'archive' implies organization and systematization. However, in modern times, thanks to new media and innovative digitization possibilities, fashion is transformed into a complex digital form, often interactive. Contemporary fashion photography includes postmodern collage concepts and the combination of various digital techniques. Furthermore, the collage process occurs in digital form, and the photograph takes on complex levels of multiple meanings, as Barthes explained in exploring the polysemy of images (Barthes, 1964). In addition, this way, photographs become digital collages, attaching various visual and textual codes and symbolic meanings. There is a significant change in the process and methodology of photography, but also the relationship with the clothing object. In this paper, we argue how, in contemporary fashion photography, there is a visible transformation of the body and dress and their mutual relationship in the photograph. Thus, we introduce the term 'covered body' instead of 'clothed body' (Calefato, 2004) for specific bodily transformations occurring in fashion photographs from the 1980s onwards. Fashion photographs are thus not only 'representations' of fashion but rather the creators of today's fashion content. Furthermore, this work explores how digital archives of contemporary fashion photography have significantly changed, how we observe and understand fashion and the reasons for the increasing archiving of fashion and clothing artefacts.

Keywords: fashion illustration; fashion photography; digital archives; covered body; digital collage

## INKJET PRINTING AND PLASMA IN THE DIGITAL FASHION CONCEPT

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### Abstract:

Advanced technologies in the textile industry and the concept of digital fashion have changed the way clothing is designed, produced and consumed. Digital fashion, the result of this combination of technological innovations, is becoming omnipresent and offers a number of benefits. Design adaptability is a key element of digital fashion. Thanks to digital printing, inkjet technology and plasma surface modification, designers and manufacturers have more freedom to create different patterns and designs. With these tools, prints and shapes can be precisely applied to fabric, making it easier to customise clothing to meet customer's unique needs and preferences. Fast production is also a feature of digital fashion. Digital printing processes combined with plasma surface modification eliminate the need for time-consuming material preparation processes and chemical treatments. This significantly speeds up production and shortens product development time. Sustainability is becoming increasingly important in the fashion industry, the use of plasma and environmentally friendly surface modification methods reduces the environmental impact of the textile industry. Reducing waste and the need for large inventories, helps conserve resources and reduce the negative impact on the environment. Advanced technologies such as digital printing and the use of nanotechnology enable the production of garments with advanced features such as water resistance, antibacterial properties and reflective surfaces. All this makes digital fashion a combination of aesthetics, functionality and environmental responsibility. This concept meets the demands of the modern consumer who is looking for personalization, quick availability, high quality and environmental protection in the fashion industry. Digital fashion is thus becoming the future of the fashion industry, harnessing technology to create innovative, sustainable and adaptable products.

Keywords: Inkjet printing; plasma; digital fashion; advanced technologies

# DIGITISATION OF HISTORICAL DRESS AND TEXTILE COLLECTIONS: FACILITATING PLATFORMS FOR ACCESSIBILITY, PRESERVATION, AND RESEARCH OF MATERIAL CULTURE

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Abstract:

By adopting new museological functions, surviving artefacts open up the possibility of illuminating complex interrelations between the lifecycle of humans and objects. Imbued with a unique and intimate material memory, historical textiles encapsulate evidence surrounding their conceptualisation, production, and consumption, as well as their distinct participation in the construction of social and cultural identities. Encouraged by conservation-related requirements and challenges posed by the traditional mechanics of storage and display, collections and archives have embraced a range of advanced technologies in order to strengthen their role as repositories of material information. The potentially unlimited virtual space of digital representations contributes to the specific goals of individual collections by enabling enhanced accessibility and widespread dissemination of content, thus allowing the values embedded within the physical structure of objects by both their makers and users to cross the barriers of institutional settings. Furthermore, considering the fragile nature of historical textiles and their susceptibility to deterioration, the development of digital collections lowers the risks of excessive handling while providing unprecedented opportunities for scholarly research and alternative pathways to artefact investigation. In order to address the diverse implications of the digitisation process, this paper will explore the relationship between physical and digital collections of dress and textile objects as material remnants of the past, the ability of digital representations to convey authentic cultural meaning and value, as well as the ongoing demand for the standardisation of data and its interoperability within the digital environment.

Keywords: digitisation; dress; textiles; preservation; collections; material culture

# THE INFLUENCE OF TEXTILE MATERIALS ON FIT IN THE DEVELOPMENT PROCESS OF DIGITAL MEN'S SOCCER CLOTHING

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## Abstract:

In addition to aesthetic criteria, soccer clothing must also meet functional requirements, where it is very important to ensure comfort when wearing it. For this reason, the correct selection of textile materials for the production of such clothing, as well as the development of cuts that will ensure unhindered movement during demanding sports activities, are of crucial importance. The regulations for the design of professional football clothing are very demanding and are regulated by FIFA/UEFA. The paper presents research into the possibilities of developing digital football clothing, where the possibilities of development and simulation of a two-layer model of a men's football jersey and additional training clothes were investigated. The impact of different textile materials intended for the production of sportswear on the fit and functionality of the developed models on customized 3D body models was analyzed. The possibilities of rendering the designed and developed 3D models of men's soccer clothing in different variations of colors, details and symbols on the models were investigated.

Keywords: textile materials; soccer clothing; digital clothing; CAD system; 3D simulation

# REVOLUTIONIZING FASHION PROTOTYPING: THE POWER OF 3D TECHNOLOGY IN FIRST SAMPLE DEVELOPMENT

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## Abstract:

The fashion design industry has undergone a significant transformation in recent years due to the adoption of 3D technology in pattern making and fashion design. Pattern makers and fashion designers are utilizing virtual prototyping to optimize the creation of initial samples, resulting in numerous advantages that extend beyond conventional fashion production. One of the most significant advantages of this innovative approach is the precision and efficiency it offers in pattern making. By constructing and modeling patterns within virtual 3D software programs and subsequently testing them on 3D avatars tailored to desired size and proportions, pattern makers can achieve an unparalleled level of accuracy. This ensures a flawless fit, minimizes errors in the final production, reduces the need for rework and material waste, and significantly enhances overall garment quality and consistency. The integration of 3D technology significantly reduces the need for physical prototypes, resulting in substantial cost savings. The accelerated development cycle ensures that garments reach the market faster than ever before, providing fashion brands with a competitive advantage in an ever-evolving industry to stay ahead of the competition. Furthermore, the use of 3D technology aligns with the ever-growing demand for sustainability in the fashion sector. The reduction in physical samples dramatically decreases material waste, contributing to a more environmentally friendly production process. Creativity is another area where 3D technology excels. The ability to visualize and experiment with designs on digital avatars allows designers to visualize their sketches and have max control over the design process. This enables creative exploration, allowing for the testing of a wide range of colors, textures, and styles with remarkable ease. In summary, this abstract underscores the pivotal role that 3D technology plays in reshaping the creation of initial samples in the fashion industry. Its implications extend far beyond the design studio, with significant benefits, including precision, cost-effectiveness, sustainability, and creative potential. The main goal of this thesis is to explore these subjects in greater depth and demonstrate the transformative impact of 3D technology on fashion prototyping, offering the potential for a future characterized by efficient, economical, and environmentally friendly fashion manufacturing.

Keywords: 3D technology; prototype; first sample; sustainability; precision; efficiency

# CONDUCTIVE TEXTILES IN SMART CLOTHING PROTOTYPE FOR ELDERLY ADULTS

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## Abstract:

In the presented study, a combination of innovative conductive textile materials and the usage of emotional and creative/artistic design was presented for the fabrication of an aesthetically pleasing and functional smart clothing prototype for elderly adults. Firstly, the fabrication of conductive textiles was accomplished using different nanoparticles (copper and MXene), and a conductive polymer poly3,4-ethylenedioxythiophene:polystyrene sulfonate (PEDOT:PSS), applied onto textiles according to different procedures, i.e., electroless plating, dip-coating and screen printing, respectively. In addition, the surface properties and the electrical conductivity were inspected. Secondly, two workshops were organized, considering the co-creation approach, i.e., involving the elderly adult participants (aged 65+), fashion designers, clothing manufacturers, human factors specialists, psychologists, and material experts. As a result, a clothing concept was designed, i.e., ergonomically shaped trousers for various activities, which predicted the inclusion of conductive textile(s) and two assistive technologies: i) a sensor for monitoring incontinence and ii) a pedometer/step counter. The aim was to address the needs of elderly end-users.

Keywords: conductive textiles; smart clothing prototype; design; assistive technology; elderly adults

# DIGITAL DESIGN AND DEVELOPMENT OF A NON-STANDARD 3D FASHION CLOTHING PRODUCT

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## Abstract:

In today's modern world, digital fashion has become one of the priorities in the fashion industry. It offers enormous opportunities in all areas of the value cycle, from design to sales, and the technologies used are evolving rapidly, especially in the context of sustainable approach to the product development process. The publication presents the research conducted in the field of 3D visualization of non-standard spatial modeling of fashion clothing products using the CAD systems. The possibilities of 3D visualization of these types of custom products have not yet been thoroughly explored, but they could be a huge step towards in the development of digital fashion and sustainability. The research includes the design of a garment model with a spatial 3D element, the construction and modeling of garment pattern and the development of a 3D prototype. In that demanding process, the possibilities of simulating such a complex spatial elements were investigated in terms of modifying the simulation and fabric parameters in order to obtain targeted 3D visualization. In the final stage developed 3D model was rendered in different variations of fabric colours and textures.

Keywords: digital design; 3D fashion; non-standard clothing; virtual clothes; CAD system; sustainability

# DETERMINATION OF THE WOVEN FABRICS POISSON'S RATIO BASED ON IMAGE ANALYSIS

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## Abstract:

This paper presents a new method for measuring Poisson's ratio in uniaxial tensile tests, based on recording and analysis of a series of specimen images. Poisson's ratio changes over the fabric sample stretching due to the woven fabric's anisotropy and it results from the interaction between warp and weft and can be expressed in terms of structural and mechanical parameters of the system. The paper investigates the influence of the yarn count of fabric sample on the value of Poisson's ratio when the fabric is subjected to an axial load. For the purpose of testing, a regular dotted grid was drawn on fabric samples. Image analysis creates local maxima in the places where markers occur. Experimental testing was carried out on cotton woven fabrics in plain weave. Samples are stretched with tensile force in the weft and warp direction and based on different measured values of fabric stretching and lateral narrowing, Poisson's ratio in warp and weft direction is calculated. The obtained Poisson's coefficients are in accordance with literature data, which confirms the correctness of the developed method.

Keywords: woven fabric; Poisson's ratio; warp; weft; image analysis; digital camera

# DESIGN AND DEVELOPMENT OF DIGITAL CLOTHING WITHIN THE STUDY PROGRAMS AT THE UNIVERSITY OF ZAGREB FACULTY OF TEXTILE TECHNOLOGY

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Abstract:

The digitalization of fashion design and the development of digital clothing is a process that has intensified significantly in recent years, although various digital technologies for the design and development process have already been in use in the fashion industry for more than two decades. Digital prototyping, or the development of 3D garment models, is the basis of digital clothing development and is primarily used to develop new collections in the fashion industry. Development and implementation of various types of digital clothing in numerous areas was encouraged with the intensive development and application of artificial intelligence and various computer platforms for the marketing and sale of real or digital clothing, development in the film and games industry, development of the Metaverse and with the rapidly growing interest for the use of digital clothing in social networks. In this context, the educational processes and teaching content in the field of design and development of clothing models should be continuously modernized so that students acquire the necessary knowledge and digital skills during their studies and have the necessary skills for competitive inclusion in the labor market after graduation. The paper provides an overview of the gradual introduction of computer technologies and CAD systems used within the study programs at the University of Zagreb, Faculty of Textile Technology, with a focus on digital design and development of digital fashion products, as well as functional clothing for special purposes and historical costumes. The process of developing a digital 3D garment and teaching methods in various courses of the Textile Technology and Engineering and Textile and Fashion Design study programs is explained. The results of students' work achieved through the teaching process and master's thesis are presented, in which digital fashion collections and individual digital garments were realized.

Keywords: digital clothing, design, 3D prototype, study programs, Faculty of Textile Technology

## THE TRANSFORMATION OF FASHION MAGAZINES FROM PRINT TO DIGITAL FORMATS

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### Abstract:

This research will show how printed media fashion magazines have adapted to new technologies, that is, how the digital platform has expanded their influence and reshaped the content. The subject of the research are the fashion magazines Vogue, Marie Claire and Elle, which used to be published exclusively as a printed edition, but today they also have digital platforms. Fashion magazines thus managed to enter a new phase of growth and adapted to the new times. The concept of a fashion magazine in the printed edition and on the digital platform is different, which will be shown by researching their concepts. The goal of the research is to emphasize the difference between the fashion magazine in print and the version on the digital platform, and to prove how concepts have developed in numerous new directions in the midst of the Internet environment. Also, the goal is to show how a one-way fashion magazine that was published only in print turned into a 'multi-way' magazine that allows and requires reader interaction. It will also be shown how the content, as well as the commercial side of the fashion magazine, has changed, because content is marketed differently on the Internet and in print, and advertising on the Internet provides a number of other opportunities than those in print. With the change in content formatting, the trends have also changed, and it will be shown how the new digital frameworks have influenced the diversity of styles in this century.

Keywords: fashion magazine, Internet, digital media, media, print, content, fashion

# DIGITALIZATION OF FUNCTIONALIZATION OF MATERIALS SURFACE FOR APPLICATION IN FASHION INDUSTRY

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## Abstract:

This paper describes the process of digitalization of the surface functionalization process of materials with special hydrophobic and antimicrobial properties that can be used as such in the fashion industry and/ or in medical applications. Special layers containing nanoparticles of metal and metal oxides, in addition to providing special shine and tactile sensations, also have protective properties (against water, UV radiation, viruses and microorganisms). Particularly effective are silver, zinc and titanium oxide nanoparticles, which are therefore increasingly used in the fashion industry within fibers or as a coating on materials to improve surface characteristics such as microbicidal, waterproof, antistatic or UV protection, color ingenuity, dirt resistance, odor-resistant, stain resistant, crease-forming resistance and better thermal performance. In order to apply nanoparticles evenly and homogeneously to the surface of textile materials, several procedures are used, and this paper will describe the procedure of functionalization of the surface with nanoparticles using sol-gel method, i.e. the deep coating procedure. The homogeneity of the coating, as well as its persistence, directly depend on the process parameters that control the functionalization process itself (which includes reagent concentrations, operating temperature, mixing speed, ultrasound frequency and others). Multiparameter optimization would not be possible without the use of sophisticated mathematical models and algorithms that can be applied for the purpose of conducting and managing processes (such is the statistical methodology of experiment design, neural networks, genetic algorithms, etc.). For the purposes of this paper, the design of experiment methodology was chosen that conducted the optimization of all working parameters of the deep immersion method simultaneously. Using the sophisticated Design Expert State Ease software version 9.1. it was possible to simultaneously optimize all six operating parameters of the process and achieve uniformity of the coating, homogeneity of nanoparticle distribution, durability of the coating while preserving the tactile properties of the material. This coating can be applied to various substrates, which allows the fashion industry to functionalize not only innovative fashion textile materials, clothing and footwear, but also fashion accessories that include handbags and other everyday materials, increasing their innovative usage possibilities and a marketing value.

Keywords: design of experiment, digitalization, functionalization, coatings, nanoparticles

## REVIVAL OF SERICULTURE IN SLOVENIA

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### Abstract:

Despite the extraordinary development of synthetic fibres, silk is still the most valued textile fibre, representing luxury through softness, pleasant lustre, beautiful colours, high strength, and durability. Slovenia has favourable natural conditions for growing white mulberry *Morus alba* L. tree, the leaves of which are fed to the silkworm *Bombyx mori* L. On the territory of today's Slovenia sericulture was an important economic activity, which began already in 16th century. It included rearing and breeding of silkworms, reeling of cocoons and production of silk yarns and fabrics. The spread of sericulture started in Goriška, where it was implemented also until the middle of the twentieth century. Unfortunately, the knowledge was only preserved in written sources, but the experiences of our ancestors were entirely lost. A sericulture and silk industry in Slovenia in the past as derived from original professional and scientific literature is briefly presented. In the year 2018 an Institute of sericulture entitled "Inštitut za svilogojstvo in svilarstvo RLB« was established in Maribor by dr. Rebeka Lucijana Berčič. It is the only institution in Slovenia that offers professional help to silk rearers, who already practise sericulture by a large number of individuals and families from Koper to Goričko as the locally grown silk according to the guidelines of organic mulberry cultivation easily meets the criteria of a sustainable and environmentally friendly textile material. Today, it is used in a form of filament yarn for Idrija lace or for hand woven fabrics, and in a form of silk nonwovens for interior textiles. Silk mats are directly made by 2D spinning of silkworms. The process of silkworm flat spinning is shown in a digital material (video film) on the ISS\_RLB website and is accessible via QR code. The process and the structure of the silk nonwoven material is described.

Keywords: mulberry silk, raw silk; silk mat; flat spinning; decoration; digital media

## PROBLEMS OF MAKING COSPLAY COSTUMES

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### Abstract:

Cosplay is intended for special occasions such as various sci-fi conventions. The costumes are usually tailored according to the chosen character from the favorite game, comic, movie or similar. Making costumes based on game characters is challenging, as the starting point is a drawing of a costume that often does not work completely in reality. For this reason, a lot of experience and experimentation is required to make the costume as true to the original as possible. In the experimental part, two cosplay costumes based on characters from PlayStation games were created. The first is the costume of Aloy from the game Horizon Forbidden West, and the second is the character of Freya from the game God of War Ragnarok. The costumes were made by students of the University of Zagreb, Faculty of Textile Technology, with the help of mentors and in cooperation with PlayStation Croatia. The aim of the work is to bring the production of cosplay costumes closer to a wider audience and to draw attention to the challenges involved. As a result of the work, you can see two costumes made for the selected characters.

Keywords: cosplay, PlayStation, Freya, Aloy, making cosplay costumes

# IMPACT OF NANO IMPREGNATION ON COTTON FABRIC

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## Abstract:

Due to its ability to improve and protect the properties of textile fibers, nanotechnology is becoming increasingly important in the textile industry and can be classified as a scientific discipline. By processing textile fibers, in this case cotton fibers and fabrics, with the method of nano-impregnation, one of the outstanding properties of cotton fibers, hydrophilicity, is not only influenced but completely transformed, making the fiber hydrophobic. Such manipulation of a natural cellulosic fiber such as cotton is a highly inventive method that aims to improve and possibly change the purpose of cotton itself through nanoimpregnation by adding other properties to it besides hydrophobicity, such as an antibacterial effect or antistatic properties and resistance to various stains that can be removed with light water pressure. The paper also contains an experimental part showing the behavior of cotton fabric before and after nano-impregnation. The results before and after nano-impregnation are shown by microscopic analysis.

Keywords: nanotechnology, cotton fibre, cotton fabric, nano impregnation, textile industry, textile fabrics

# DIGITAL FASHION - EXAMPLES OF IMPLEMENTATION IN HIGHER EDUCATION STUDY PROGRAMS AROUND THE WORLD

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## Abstract:

The article presents examples of the implementation of the course "Digital Fashion" in the educational system of universities in the field of fashion design. It analyzes the outcomes and objectives of the course that develop new skills in students. When evaluating the above-mentioned course content and its implementation, special attention was paid to the importance of cooperation with various economic factors, especially with virtual sales platforms, fashion houses and artificial intelligence development laboratories. In line with the new educational requirements, the work points to the importance of developing and upgrading teaching skills that contribute to new educational models with the help of potential employers. Digital fashion, which has become an integral part of the textile and apparel industry, has disrupted historically established patterns of production and consumption and, above all, education. It has become a key indicator for the future of fashion. Fashion design courses should therefore adapt to this in order to be able to respond successfully to the new demands of the labor market.

Keywords: digital fashion; curriculum; higher education; implementation; new technologies; fashion design

# DIGITALIZATION OF ELECTROSPINNING PROCESS BY RESPONSE SURFACE METHODOLOGY

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Abstract:

Electrospinning emerges as a valuable and efficient technique for generating continuous nanofibers by using electrical forces. Electrospinning and the resulting nanofibers exhibit a diverse array of applications owing to their distinctive properties and nanoscale structure. The realm of its application spans from filtration to various biomedical uses, including tissue engineering, wound dressings, and drug release. In line with the electrospinning process mechanism, a fundamental electrospinning configuration includes a high-voltage system, spinneret, and collector. Aiming to regulate the structure of electrospun fibers and facilitate their practical use, extensive endeavors have been directed towards the adaptation of the electrospinning setup and procedure. Only by applying modern digitalization techniques and algorithms is the multiparameter process guidance possible. Despite the relatively simple components of the electrospinning setup (comprising a high-voltage system, spinneret, and collector), determining the optimal parameters for producing fibers with specific properties remains a challenging task. Consequently, this work introduces a computational approach, leveraging the response surface methodology (RSM), to simulate and optimize the electrospinning process. The primary objective is to enhance the comprehension of the fundamental principles governing the vital parameters that influence the process, and optimize the effects and advancements aimed at refining and stabilizing the electrospinning procedure. Using the sophisticated algorithms it is possible to simultaneously optimize all operating parameters of the process and achieve the most efficient process and the outcome result (electrospun fibers of desired mechanical, chemical and physical properties). This approach can be applied to various other systems, enabling not only the material science but also the fashion industry to apply innovative electrospun fibers in fashion textile materials, clothing and footwear, but also in fashion accessories that include handbags and other everyday materials, increasing their creative potential and marketing value.

Keywords: response surface methodology, digitalization, electrospinning, optimization

# THE ART OF FASHION STORYTELLING: ANALYZING BRAND NARRATIVES IN CINEMATIC SHORT FILMS

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## Abstract:

This paper explores the pivotal role of storytelling in the highly competitive fashion market, where brands strive to differentiate and connect with consumers. The focus is on cinematic storytelling through short films produced by renowned brands – Burberry, H&M and Nike. As traditional advertising shifts towards transmedia storytelling, this paper investigates how these brands strategically employ narrative techniques to create relatable, memorable, and emotionally resonant connections with their target audience. Central to this paper is the application of content analysis, a systematic examination of visual material. This method enables an in-depth understanding of storytelling techniques employed by the selected brands. The analysis covers Burberry's historical narrative, H&M's humor-based approach, and Nike's inspirational storytelling. In conclusion, while each brand employs unique strategies, they share common goals of building emotional connections, reinforcing brand identity, and fostering consumer loyalty. The research contributes to understanding the evolving dynamics of storytelling in the fashion industry and its implications for brand communication in the digital age.

Keywords: storytelling, fashion industry, cinematic narratives, content analysis, brand communication, transmedia storytelling

## GREEN EXHIBITION AND THE GREEN SUMMER SCHOOL OF GREENTEX PROJECT

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### Abstract:

As part of the project "Sustainable Design and Process in Textiles for Higher Education" (2021-1-PL01-KA220-HED-000032201; acronym: GreenTEX), from the Erasmus+ program: Partnerships for cooperation in higher education, innovative solutions and opportunities for action for sustainability in the textile and clothing industry are being developed. At the stage of training young people who will enter the labor market in the future, it is necessary to take action to raise awareness of this problem and provide knowledge on how to solve it. Project partners from 5 European universities developed different educational solutions related to sustainable textiles - a textbook, case studies, a multimedia platform and an online exhibition "Green Exhibition", part of which was developed as a pilot educational solution "How to deal with textile waste?" These project results are presented in this paper.

Keywords: sustainability of textile, education materials, exhibition, summer school, GreenTEX project

## DIGITAL CATEGORIZATION OF TEXTILE MATERIAL TEXTURE

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### Abstract:

The structure of the fabric, which depends on the geometrical structure of the fibers and yarns, affects the surface quality of the fabric, i.e. the texture and inevitably its perception which is ultimately defined by the weave of the fabric. The definition of texture depends on the particular application; there is no formal approach and completely precise definition of texture, but generally texture is perceived as a visual or tactile characteristic of the surface that determines the appearance of the surface (material). Although it is well known that texture can visually and instrumentally affect certain textile processes, such as textile printing, and consequently the colour characteristics, quantity and quality of this effect is not yet well understood. Furthermore, textile surface irregularities, non-uniformity and roughness determine the appearance of the material surface, but also affect the digital imaging and simulation of the texture of a certain textile material that can be applied within the digital fashion concept. Considering the complexity of the relationship between the structure and texture of textile material and their digitalization, this research deals with the analysis and categorization of digital fabric samples of different structures, i.e. the influence of the topography of the textile material on its digital imaging.

Keywords: texture, structure, textiles, digital imaging, GLCM, image analysis

## DIGITAL FASHION AND ARTIFICIAL INTELLIGENCE

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### Abstract:

By digital fashion, we understand clothing made using computer technology and 3D software, but the term itself denotes new and unlimited possibilities of fashion and clothing in the digital environment. Unlike traditional fashion, which requires real materials and fabrics, digital fashion requires data and code, meaning there are no limits to what can be designed or created. Thus, contemporary fashion becomes a platform for transferring from the traditional understanding of fashion and clothing to an entirely digital object. In this context, fashion does not have to be 'tactile'; it is recognized by a specific visual, fashion and digital code. Therefore, the concept of 'tactile transmediality' is of great importance in researching the concept of digital fashion and its significant influence on the change of society and the creation of metamorphic identities. Furthermore, everything can be tailored in fashion digitally, according to particular tastes and needs. This paper will explore the relationship between digital fashion and artificial intelligence (required to create products with complex social and technical software), considering the complex relationship between AI and fashion as a model for shaping fluid identities in contemporary digital visual culture.

Keywords: digital culture, artificial intelligence, identity, fashion object, intermediality, tactile transmediality, visual culture

Phygital fashion practice  
Case study: Tribute brand

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Abstract:

The text is based on the research into the role of digital fashion in the production and dissemination of phygital fashion products. The research offers insight into digital fashion through several key terms (uchronic time, skins, digital skin, Internet of Things, Metaverse, sustainability and inclusivity). Digital space gives the possibility of constantly recreating and performing a digital body whose existence crosses the boundaries between digital and physical context. The research is based on a case study analysis of the digital fashion project ODDS by Tribute brand that further examines the potential for critical transformation of user experience in the online context.

Keywords: digital fashion; fashion system; phygital fashion product; digital body; Tribute Brand

BOOK OF ABSTRACTS  
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