

Digital Innovations in Computer-Aided Design Software for Weaving at ITMA 2023

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Introduction

The focus of ITMA 2023 was on “Transforming the World of Textiles” with attention to sustainable innovations and digital advancements. This was seen in many processes of the textile industry from fiber development and production to fabric finishing. Included in these processes where digital advancement could be seen was in the area of computer-aided design (CAD) for the weaving industry. CAD for weaving is an essential step in the development of woven fabrics and the demands of the software are constantly adapting and changing. Digital advancements for improving function, speed and visualization are constantly being updated to meet the needs of the modern textile design world.

This paper reviews four different computer-aided design software companies focused on woven design for dobby and Jacquard development and production. All of the software companies reviewed can be used for CAD computer-aided design and communication to the manufacturing equipment through computer-aided manufacturing (CAM). Each company has a strong set of tools for each part of the fabric design process starting from initial pattern design development to technical weave development and image simulation and

communication to the weaving machinery for production.

The reviews below consist of a background of each of the companies and the areas in which they have shown advancements in digital innovation. All information comes from conversations and demonstrations with the software vendors on location at ITMA, promotional material that was handed out at the show and from the individual company websites. The companies were all located in Hall 9 at ITMA and are reviewed in alphabetical order.

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Computer- aided Design Software for Weaving

Arahne <https://www.arahne.si/>

Arahne is a software company based out of Slovenia that specializes in developing CAD/CAM systems for dobby and Jacquard weaving. Established in 1992, they work closely with many mills and are very customer focused, developing their software with the designer experience as a main focus. Arahne is closely in step with the international textile industry and has adapted to the ever-changing needs of speed, function and flexibility. The Software is available in 17 languages and runs on Mac OSX, LINUX and Windows (with virtual box, Vmware or Windows Subsystem for Linux). Arahne has different software products including

ArahPaint, ArahWeave ArahView 3D and Arah Drape developed to suit the needs of the woven designer from initial concept development to final production.

ArahPaint, the drawing product developed by Arahne allows the weave designer to draw or edit images in seamless repeat using all the standard drawing tools. It has the ability to work in multiple or single layers, can draw in fabric density and quickly clean the image of

unwanted pixels with their special despeckle tool. The program can also load CAM formats so it can be used to verify the correctness of Staubli, JC5 or Bonas EP files. A new special feature is a filter that uses mathematical algorithms to design quick variations of patterns by rearranging motifs into different distorted mosaic type patterns. This program can be freely downloaded for Mac, Windows or Linux, and works without limitations.



Figure 1. ArahPaint drawing product

ArahWeave, Arahne's technical weaving program, combines the function of dobby and Jacquard design software into one single product. It includes functions for creating weave files at a maximum size of 65000 ends x 65000 picks that can be sent directly to the loom and are adaptable for a variety of looms. It has a weave development function with a database of 41,000 available weaves, a fabric cross-section view, automatic correction of long floats, a thread pattern generator for making complex thread patterns, a fabric price calculation feature and allows up to 500 colors variants in one file.

Innovative advancements to **ArahWeave** are a weft blanket tool and realistic fabric

simulation. The weft blanket tool, a function of **ArahWeave XL** can handle up to 260.000 ends and picks and allows customers to weave many different designs in a continuous file without stopping the loom, thus reducing the cost of sampling down to normal weaving. Realistic fabric simulation that includes technical data like thread pattern, weave structure, density, color and yarn composition with interactive editing allows the designer to immediately see what a fabric will look like in real time. These simulations can then be applied to Arachne's fabric mapping and draping programs **ArahView 3D** and **ArahDrape** to show how the fabric will look in application. Simulations can also be exported as a GLTF file to external

fashion design and draping programs like CLO3D. Both of these innovative digital advancements show a movement toward

sampling efficiency, production time and overhead.



Figure 2. ArahWeave Weft Blanket tool

EAT - The DesignScope Company

<https://www.designscopecompany.com/>

EAT DesignScope is one of the oldest established CAD for weaving software companies that is still running today. Originally developed in Germany in 1983 as a means to simplify the working steps in the woven textile production industry, it has now turned into a software house and consulting company for many applications of CAD/CAM for the textile industry. Working closely with its customers, this software was developed based on the needs of textile production and has grown with the textile industry since then. It has been consistently updated and adapted to meet the ever-changing creative and technical needs of both the designer and the manufacturer. This software is available in many languages and currently runs on windows and depending on the market needs might offer different options in the future. The EAT DesignScope company offers a range of modern software solutions for woven design from dobby and Jacquard to technical weave development

and simulation. The woven software components of EAT DesignScope are divided into different product categories and include **Dobby**, **Jacquard**, **3D Weave**, **3D Weave Comp** and **Simulation**.

EAT Dobby has all the necessary functionalities for creating a Dobby pattern like an easily adaptable arrangement of the shafts/harnesses, adjustment of the peg plan and an easy change of colors. A new integrated Stripe editor in the **EAT Dobby** program allows for the easy creation of stripes and squares.

The **EAT Jacquard** is an extremely flexible program that is unique in that it works with a running chain system which carries all necessary information from the functions related to the development of a woven design. The **EAT Jacquard** program includes many functions related to jacquard fabric development including drawing, color reduction and correction, expansion, weave application color reduction, box motion and

machine definition. New updated functions to **EAT Jacquard** program includes a new mask function that helps to find similar areas in a pattern and automatically change them in one step and an addition of an EAT layer editor that works with up to 50 vector layers at a time and can simultaneously change densities of the fabrics in the different layers.

Unique programs to EAT DesignScope are the **3D Weave** and **3D Weave Composite** programs. **3D weave** allows the user to develop and display an infinite number of weave constructions from simple weaves to multilayer weave constructions. Specific parameters of the weaves such as number of warps, wefts and interacting compound

layers can be set and reviewed in a digital 3D model which can be rotated and adjusted. This feature is ideal for creating and reviewing a variety of weave structures. For more advanced technical weave structures, EAT has developed the **3D Weave Composite** program. In this program weave structures can be developed as composites of a cross section of warp or weft that can be visualized and controlled with the 3D view. For final production this cross section can be converted to a traditional flat weave file. This multi-dimensional function of the **3D Weave Composite** allows the user to visualize complex weave structures in a new way, allowing room for fabric design innovation.

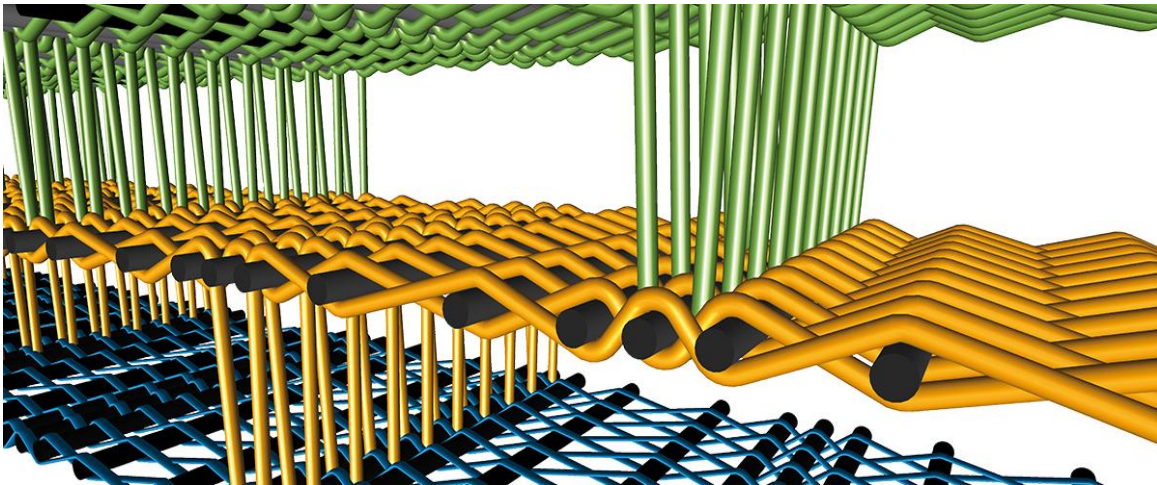


Figure 3. 3D Weave Composite product by EAT

EAT DesignScope has a woven textile **Simulation** function that has been continuously improved over the years. This simulation feature starts at the yarn level and can be modified to specific yarn parameters, fabric densities, lights/shadows and perspectives which enables the user to simulate a variety of high-resolution textile designs very quickly. A new yarn creation function has further pushed the simulation feature by easily allowing the user to create and display light and shadows in the yarn

which in turn impact the end result in the fabric simulation. Finally a **3D Mapp** program allows for the high resolution simulations to be applied to 3D rendered CAD images to best display design concepts in application.

Continuous innovative digital advancements to EAT DesignScope software programs have propelled this company and established its place as a strong player in the textile design industry.



Figure 4. 3D Fabric Simulation product by EAT

NedGraphics <https://nedgraphics.com/>

NedGraphics is a global company with offices in America, Europe and Asia. It has been around for 45 years, providing software solutions for the apparel, home furnishing, carpet and retails industries around the world. NedGraphics creates design software for a variety of textiles including print, woven, and knitted fabrics as well as for carpet design, color management and calibration, merchandising and more. The software can be obtained in modular units depending on the needs of the customer. For the weaving sector of the industry, they provide a variety of software options including Easy Weave, Dobby Pro, Texcelle solutions and Jacquard CAD/CAM solutions. All software products run on Windows and several run on both Windows and Mac.

Easy Weave is an easy-to-use weave program that allows designers with limited technical weaving knowledge to create

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simple dobby patterned fabrics like plaids and stripes. It has a full complement of tools for inputting various warp and weft color arrangements. It has an option to create custom weave patterns by inputting custom weave textures or using one of the hundreds of weaves in the included library. It offers simulations of the woven fabric with realistic yarn textures.

Dobby Pro allows the designer to easily develop any type of woven dobby fabrics. With a variety of tools, it can meet the design needs of a beginner to advanced woven dobby designer. Design ideas can be started from scratch or by using a fabric scan as a starting point. Features of the software allow the user to create basic and compound weaves, access automatic float checking and instantly convert files to be produced on any weaving machine. Your own yarns can be scanned in to visualize your fabric and weave structure in real-time.

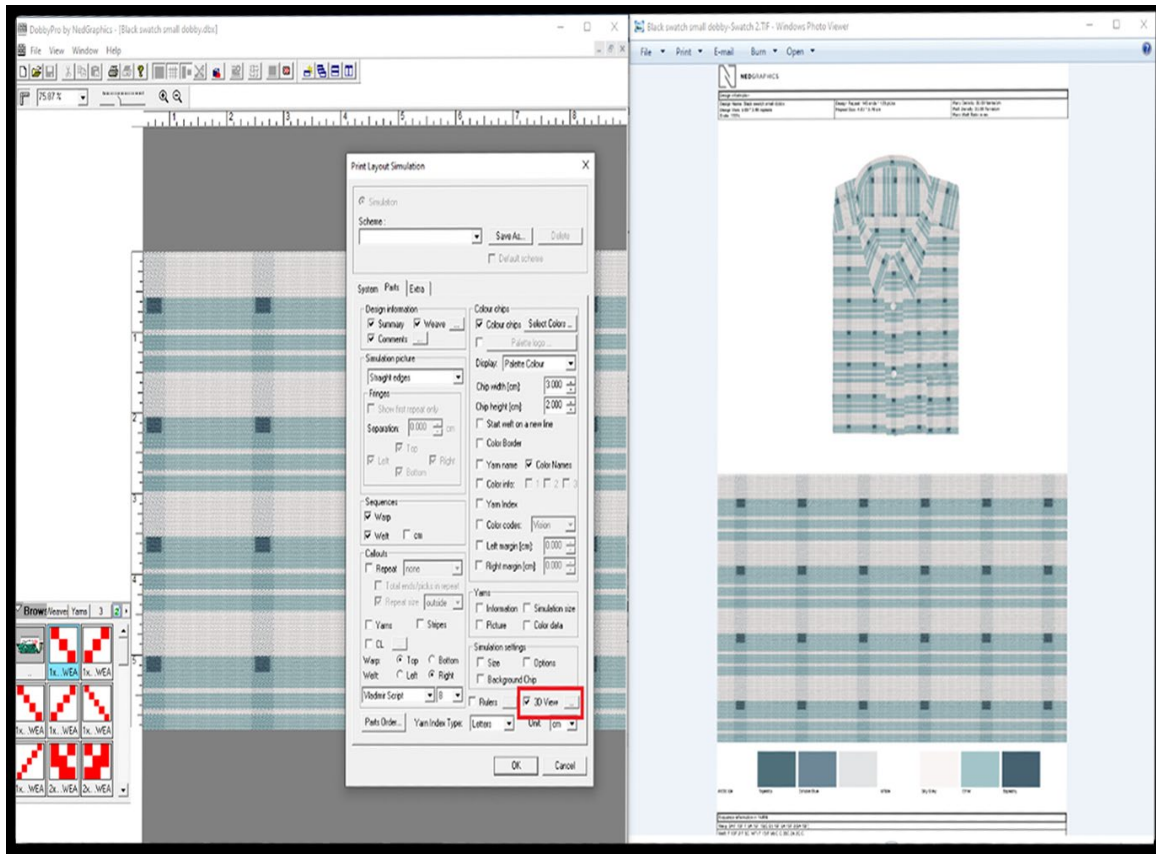


Figure 5. Dobby Pro product by NedGraphics

Texcelle is a more complex software program used by Jacquard and Carpet companies and provides the designer with all the necessary tools to create a woven design. It is user friendly and offers over 150 design functions tools for drawing, scaling and creating repeat structures. It has additional special features that make the weave design process more efficient like an option to fill patterns or weave structures, support large files, the option to work on multiple designs simultaneously, an easy access clipboard where designs can be stored and an easy-to-use color palette saving function.

Jacquard CAD/CAM solutions is the most complex weaving software by NedGraphics

where advanced Jacquard fabrics can be taken from concept development to final production. A variety of woven fabric types are supported in this software including upholstery, terry, ties, velvet or labels. Functions include easy creation and storage of weave files, automatic and manual float checking, export of files to run on any type of weaving machine and instant creation of production data. An advanced high quality simulation engine where yarns can be scanned enables the generation of realistic virtual samples that can be re-colored using their True Coloring Software. Pair it with other NedGraphics programs like **Texcelle** to create a fully creative suite.

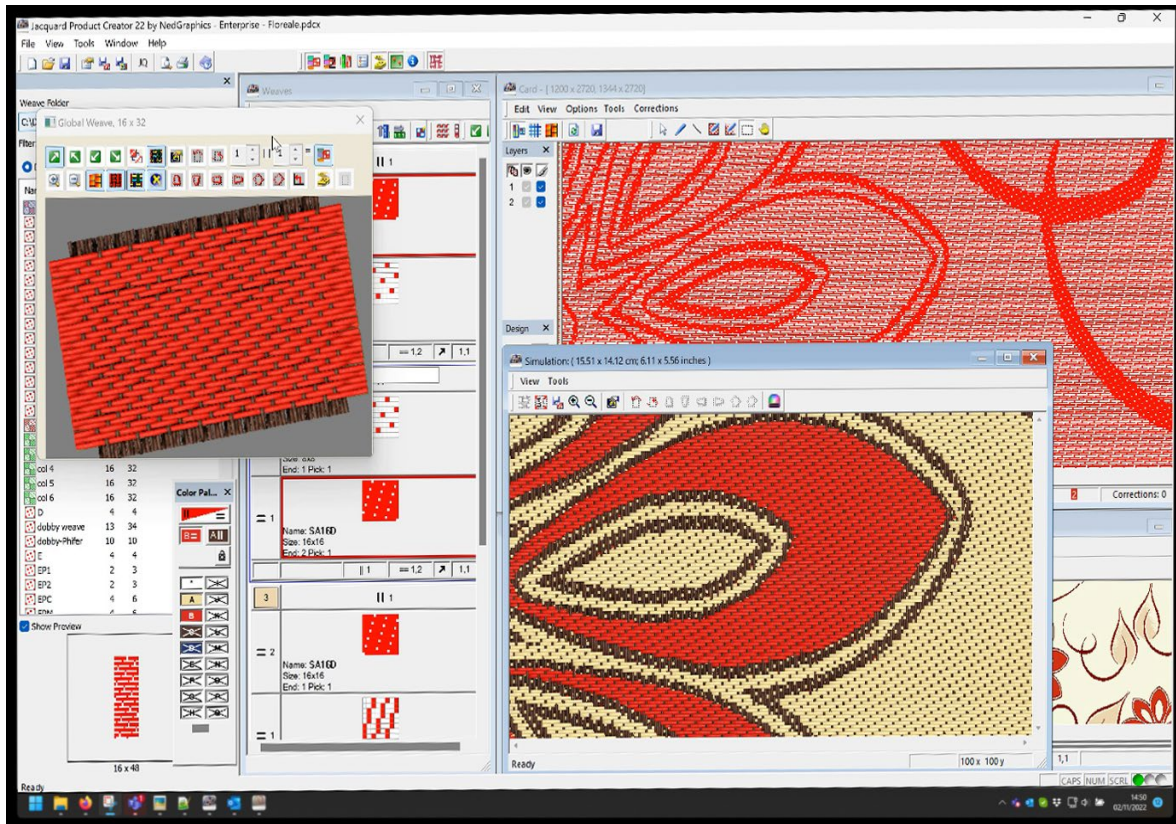


Figure 6. Jacquard product by NedGraphics

In addition to weaving software NedGraphics has a variety of software products for other textile development needs. For printed fabrics NedGraphics has a variety of design creation and preparation products to ensure designers will get the best printed fabric. **Color Reduction & Cleaning** allow designers to reduce the number of colors and clean up art images, **Easy Coloring** enables recoloring of their designs, of colors of a design, and **Design & Repeat** caters for motif repeats, and all products enable better color palette management whatever program you are using. NedGraphics has recently partnered with Pantone® to integrate key Pantone libraries and the X-Rite i1Pro 3 spectrophotometer in upcoming NedGraphics software releases. For presentation options, **NedGraphics Storyboard & Cataloging** allows designers to create professional presentations, storyboards, line sheets and catalog pages. Their **Easy Map Creator** lets you apply your fabric designs directly onto 3D simulations of

garments or furniture, with an option to automatically change the color options. In addition, NedGraphics is also a leader in software for **Carpet Design Solutions**, covering the complete workflow from design to production ready files. Its tiling software product creates stunning and realistic floor layouts for office buildings, hotels, and other commercial spaces.

NedGraphics listens closely to its customers and every year adds new enhancements to their software based on the needs of the industry. They are on top of digital design innovation in the industry which comes through in their advanced simulation functions and user centric interface.

The biggest announcement and development for NedGraphics this year are the NedGraphics for Adobe® plug-ins and extensions to Illustrator and Photoshop. These NedGraphics design products for sketching, design, repeat functions, coloring,

knitting and weaving allow for an ease of use, time and cost savings and an accelerated design workflow.

With an extensive innovation roadmap, NedGraphics plans to continue delighting their loyal customers and plan on welcoming many new designers to the **NedGraphics** family.

Penelope <https://www.penelopecad.com/>

Penelope is a global graphic software company focused on the development of programs for the textile industry. The Barcelona based company is well established with over 600 customers in 36 countries. They have more than 30 years of experience, originating in 1986 with a dobbie development program and adding Jacquard software 1994. Their focus is client oriented with a user-friendly interface and a powerful set of tools for each part of the fabric design process. The Penelope software is divided into two product categories, **Dobby CAD** and **Jacquard CAD**. Each of these software products come with a variety of design tools and functions that can take a designer from initial concept development to exporting CAM files for final production.

Penelope Dobby CAD has all the tools needed to design and produce dobbie fabrics. Dobby designs can be easily created and adjusted to meet the needs of the designer through user friendly tools. After designing it is equipped to generate files with all technical data needed to communicate to a variety of industry machines like looms and sample warping machines. In addition this software can manage and produce different combinations of designs for blanket sampling.

Penelope Jacquard CAD, like their dobbie program has all the tools needed to create and produce a woven fabric but with the complex demands of Jacquard design. It is equipped with a strong drawing component **Penelope IMAGE** which has the ability to work in layers and in vector format and can also work in multi-density options. For technical weave needs, warp and weft layouts can easily be created and edited. There is a tool for easy generating weaves with a library of 3,500 basic weaves that can be easily accessed and simulated. Additionally, there is an automatic float cutting tool. The software can automatically convert a predesigned image into a graph with the image parameters, make color blankets and can automatically generate designs and colorways.

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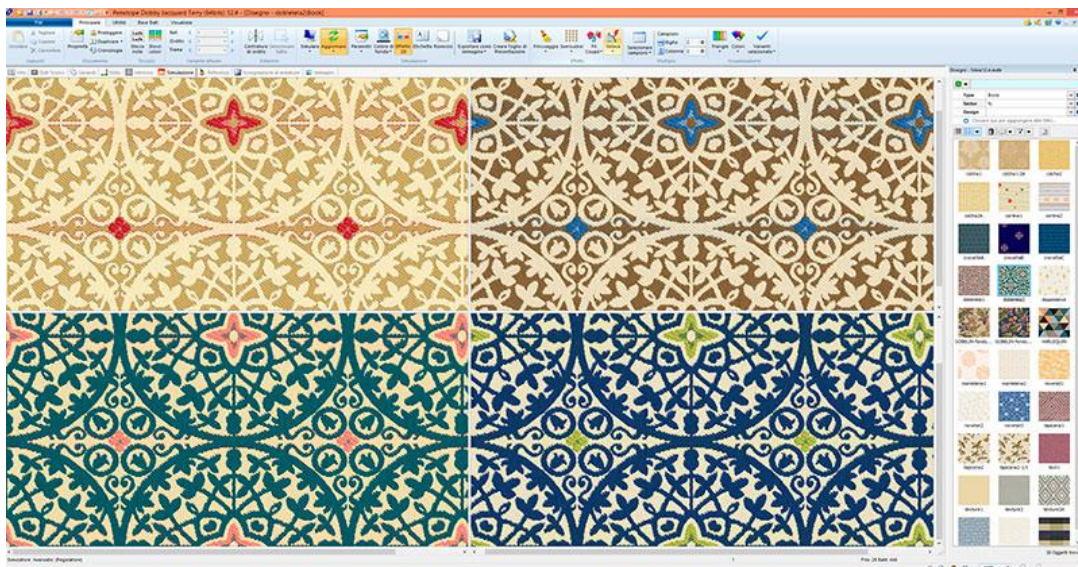


Figure 7: Penelope Jacquard CAD product

Innovative digital advancements for both the Penelope **Jacquard CAD** and the **Dobby CAD** are the yarn creation tool and a powerful simulation tool. The yarn creation tool uses a colorimeter feature to accurately reproduce yarn colors into the system. One of the strongest features is the Hyper realistic fabric simulation which can simulate all types of fabric effects including leno weave, seersucker, brushing effects with high quality graphics. One of the biggest announcements

from Penelope in terms of simulation is its new partnership with CLO3D. A digital texture from Penelope can now be exported from Penelope and dragged and dropped directly into CLO for immediate simulation onto a digital 3D mapping form. These advancements towards realistic fabric simulation show the companies' understanding of the needs of the textile industry



Figure 8: Penelope Jacquard simulation

Conclusion

Digital advancement in Textiles was a strong theme at ITMA 2023 and was greatly represented in the area of computer-aided design software for weaving. All of the companies reviewed in this article work closely with their clients in the industry and react to their needs as well as anticipated

needs in software development. Any of these computer-aided design software for weaving programs would be a good choice for any company that produces woven textiles to work with. All four companies reviewed in this article are up to date on innovations in the industry and designed for the contemporary woven textile designer.