Qualitative and comparative evaluation of 2D and 3D applications in clothing design and production

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Abstract:

Clothing design, like other essential and practical human needs, needs to be transformed in line with industrial developments and technology of human societies. So that the new methods have significant advantages over the older methods in terms of speed of operation, final production and reduction of error rate, cost and needs assessment of society. This issue has played a direct role in the quality of the final product in different countries, so the variety of software for scientific centers and the industrial sector has created the question of which of the available software is used in scientific training centers or in industry. To be taken. An issue that has widened the gap between training and manufacturing in the industry due to software diversity. Therefore, by comparing general and specialized software, in addition to identifying the advantages and main capabilities of each of them, it is intended to explain the combined use of software for three-dimensional clothing design. Therefore, the existing and widely used software in clothing design in two groups of two-dimensional and three-dimensional have included the volume of research samples and their evaluation and analysis is based on clothing design methodology, which is done in three parts, pattern making, texture and gender design, and fabric color, and finally the final presentation. The research method is based on a qualitative approach and an applied-developmental goal that led to the improvement of the current situation. Finally, the results showed that with the help of two-dimensional software and their combined use without the cost of purchasing the original version of the pattern can be designed, and the final output can be seen in three-dimensional software and tries to solve the problems caused by sewing before the production stage.

Keywords:

Clothing design, technology, 2D software, 3D software.

Introduction:

When acquiring skills and creating different specializations is in line with the needs of society, the correct use of resources, creation and motivation in different segments of society, industry flourishes and increases wealth and national prosperity and leads the country to increasing and sustainable development. Gives (Khanifro Others, 2001, 9). Coordination of existing facilities and needs of the community in different sectors and based on new technologies is an issue that helps speed up and strengthen product production. The more urgent the need for these products for society, the more vital it becomes to address this issue. Clothing as one of the most basic human needs is placed next to housing and food, and therefore it is necessary to pay attention to the design of clothing based on new techniques and facilities of the current era, which is based on advances in software technology. Unlike in the past, when clothes were mostly made based on meeting natural needs, from today's human point of view, the features and characteristics of this phenomenon are significant for various applications in terms of individual, social, psychological and cultural needs. Designing clothes based on new methods and using

specialized software in order to use them in presenting the final three-dimensional design is a method that can meet these needs well based on new capabilities. Of course, various researches have been done in this regard. So that Maryam Shenjour in her research "Comparative study of the capabilities of conventional clothing design software and the possibility of using MATLAB software in their promotion" (1396), high cost and time-consuming traditional methods and that method is obsolete داند. In another study by Najmeh Heidarzadeh Abdolabadi entitled "Study of the effect of 3D technologies on the design and production of clothing and other clothing accessories (software, scanners, 3D printers)" (2017) The importance of 3D clothing design Raises. Mansoureh Nikokar with the title "3D printing technology and its application in Iranian clothing" (2015) mentions another use of software that the importance and impact of 3D printing on the world of fashion and clothing. Mahboubeh Rasti in "Virtual Pro clothing system with real face composition" (2013) has used the software to scan the face and examine the problem of pattern and comfort of clothing. However, most of them have raised the issue of the need for new software and have also used them in various fields. However, the difference between the present study and other examples is that, firstly, it does not consider the use of a software and how to work with an example as a criterion and considers relying on an example as an advertising or dangerous factor in its dependence. As in the discussion of sanctions, these problems for the activation codes of some software from foreign companies, disrupted the performance of work and training centers. On the other hand, it focuses on the design principle and asks the audience to design with Pay attention to the capabilities of the software in a combined way.

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Research Method

The present study is based on the study of existing and widely used software in various fields that are used in two-dimensional and three-dimensional. Therefore, the volume of samples is the current situation, i.e., the most widely used samples, and is based on the experiences of researchers and experimental research, in addition to qualitative library studies and content analysis of programs and measuring the capabilities of each of them. To evaluate the quality of each software has been examined and in comparison, with other software, the superiority or lack of superiority in terms of efficiency, accuracy and speed of action and attention to the conditions of sanctions regarding receiving the activation code has been considered. Considering the role of research in improving the efficiency and existing methods in clothing design, this research should be considered as a practical example in the field of development that has a descriptive and analytical nature to analyze software and how to use their combination in achieving The final 3D design is used to minimize the gap between education and industry by identifying superior clothing design programs and with the knowledge of this evaluation, the main path of software design for clothing design should be explained.

Technology and Clothing Design

Technology is a phenomenon made by human hands and mind and consists of two main pillars of hardware and software. Hardware is any material tool, and software is knowing how to do the work or the trick of using the tools. Technology, from the very beginning, has strengthened the physical and mental capacity of human beings, and in the history of human life, human societies have been based on the continuous progress of technology. Some see technology as a source of wealth, and some for welfare and, most importantly, as a tool of power to dominate nature and society. The amazing advances in science, information, and technology in today's world are such that we are in an avalanche of information in society. The number of technologies has increased so much and the growth of information has

accelerated so much that it is as if only the knowledge of the existence of technologies has become a technology itself. In fact, this is the reason for the existence of services such as technology information system. (Etemad, 1373) An issue that defines the main task for users and it is nothing but not being dependent on a method and software and using a combination of them in clothing design.

Clothing Design Software:

Clothing design, like any other work, has changed a lot over time, and with the advancement of technology, two-dimensional patterning has changed to three-dimensional pattern making, and professional tailors and designers are well aware of the need to use new technologies. Today, with the advancement of technology and practical tools, the use of traditional methods has become less efficient due to their high cost and time consuming. The key to success for industrialized countries in the production of clothing, the use of new methods and along with the correct use of modern tools, new design methods and various other factors, one of which is the use of graphic and design software. Today, most professional designers use a number of software to achieve the final form of clothing, which are discussed in the diagram below.

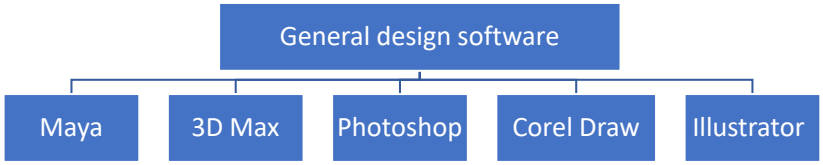

Diagram 1 - General clothing design software.

General Design Software:

Clothing designers design in different ways. Some implement their initial ideas on paper and some draw their design with the help of computer software. Once the designer is fully approved by the designer, it requires modeling that uses general and specialized software. Among the various general and graphic software, Illustrator is more useful than other software because it has more design and drawing tools and is therefore used more and this is important and significant compared to software, much of which depends on the power of manual design.

Illustrator software capabilities in clothing design

Fabric design is one of the most important features of this software. To do this, you must first consider the dimensions that are suitable for the weaving machine and ordered, and then design different shapes using drawing tools.

Figure 1- Example of fabric design in Illustrator. Reference: Authors

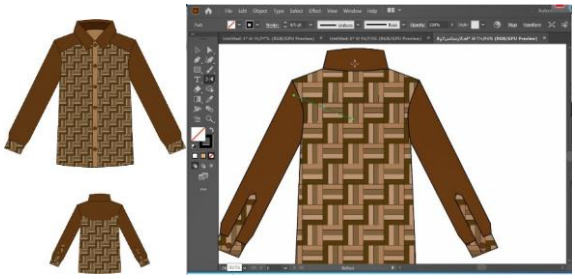

Figure 2 - Example of a mannequin and a line dress in Illustrator. Reference: Authors

In the field of flat design, which is called fashion flat or schematic of clothing design, this software can be considered important. To draw the line of the dress, and to better show the model, a simple and linear mannequin is used by first placing the mannequin in the software environment and then the model of the dress is drawn.

Clothing illustration is another feature of this software that can handle it well. First, the designed mannequin is entered into the software as a scanned file, and with the help of line tools and editing, all the mannequins are removed and then the color step is performed.

Figure 3- Sample illustration with Illustrator. Reference: Authors

Vector design and compatibility with other software such as Photoshop and Cloe3d , and advanced color palette and fast and accurate editing and in any case shrink or enlarge the size taking into account the unchangeable quality, PDF output, Persian language support, Ability to group design elements and objects, for quick and easy editing, the ability to type text quickly due to the presence of character text and paragraphs, the ability to work quickly and easily with points in a vector path, special software capability to perform Crop operation , To create range of cuts to get the output, is also another feature of this software and naturally with these capabilities has a good position among clothing designers.

Capabilities of Corel software in clothing design

Unlike Photoshop software, Corel software is a vector software and an advantage for Corel. Because you can resize your design as much as you want without losing quality. Multidimensional design and routing tools This software is very efficient for design. The photo editing capabilities of this software and its website design tools are unique in their kind. In designing clothes in modeling with the help of point and line tools, this software first draws the main lines of the clothes and with various tools for editing curved and broken lines, the final design is formed. In Figure 5, where the main lines are related to the lower body, first the vertical lines in the middle of the front and then the waist line, the hip line and the edge line of the skirt are drawn, and then the pliers are created. Drawing the pattern according to the actual size and giving the unit of measure to the pattern and creating color are other features of this software.

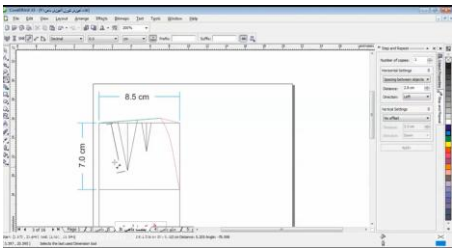

Figure 4 - Example of drawing a pattern with Corel, (www.aparat.com/v/Ubrsd/?t=134)

This software, with its various tools for drawing lines and geometric shapes, is able to create various designs that are used in fabric production and printing centers. The most important tools in Corel are the Pick Tool and the Shape Tool, which do the work of editing and formatting shapes and lines. Corel software is also able to pattern due to its design tools, but it is not specialized in this work and is most used in designing clothes and has the ability to design shapes and patterns.

Figure 5- Sample of fabric design in Corel Draw, Reference: Authors

Most geometric patterns and knots in different designs can be designed with the help of this software, and because it is a vector file, the designs prepared during cutting or printing are of high quality.

Photoshop software capabilities in clothing design

Photoshop is a professional photo editing software used to create and edit photos and is pixelated. In designing clothes with the help of this software, many and various designs can be created.

Figure 6 - Sample print design on clothes using Photoshop
(https://www.google.com/imgres?imgurl=http%3A%2F%2Ftadris)

A new document is created to design the fabric in Photoshop. From the main menu of Photoshop to Edit> Fill and the settings of the Fill section in the Contents section and the Pattern option, different roles can be created with the help of shapes and geometric shapes.

Figure 7- Sample of fabric design with Photoshop, Reference: Authors

To design clothes in this software, you must first enter a template in the software environment, and in the next step, by creating a new layer, you can draw the design you want using the pen tool, line tools, and editing tools, and if desired. Added color to the design.

Figure 8- Sample of clothing design with Photoshop: Authors

Capabilities of 3D Max software in clothing design

3DMax is a software package with the ability to build 3D models, animation and rendering. This software is one of the most powerful programs for designing 3D animation and rendering models in the field of computer graphics. It has very wide features and relatively easy performance, and also its biggest feature is good modeling features. Materialization in this software or creating the design, texture and gender on

the models is made, which in this stage helps to make the scene more natural and real by making different materials with different properties and different textures.

Figure 9 - Example of gender texture in 3D Max, Reference: Authors

To achieve precise control over skeletal deformity, a Skin or Physique Modifier can be used to smooth the shape of the characters as the joints move, even in the hardest parts such as the shoulders. Skin deformity can be controlled using Direct Vertex Weights, the volume of the vertices defined by the Envelope, or both. Capabilities such as weight tables, colorable weights, and storage and loading of weights allow easy editing and proximity-based transfer between models and provide the precision and flexibility needed to create complex characters. In addition to the Reactor Cloth Modifier, the software has an integrated clothing simulator engine that allows the user to transform any three-dimensional object into clothing or build clothing from scratch. Many advanced features have been added to Scan liner over the years to render in 3D Max.

This software has a better capability than marvelous designer software for lighting the scene, so models designed to be better displayed are included in this program, which itself has a significant contribution in introducing the work.

Figure 10 - Lighting example in 3D Max , Reference: Authors

Capabilities of Maya software in clothing design

Maya is one of the most advanced animation and 3D modeling and animation software that is widely used in film studios, animation as well as the video game industry. Of course, Maya's strength is in its modeling tools, and in large companies they use this feature more. Features of this software include flexibility and personalization capabilities that allow professional users to easily change the environment to their liking. Maya is a comprehensive software that is divided into different sections, each of which is responsible for

editing and creating one of the manufacturing steps. Is approaching. The features of this software are very close to Trade Max, and this makes users doubt which software is better, for example, 3D Max only allows users who use Windows, but Maya for Available for Windows, Linux, etc. operating systems.

Figure 11 - Example of editing mannequins in Maya (https://sariasan.com/wp-content/uploads/2019/09/maya.jpg)

Capabilities of 2D software in clothing pattern design:

Clothing design, like any other work, has changed a lot over time; With the advancement of two-dimensional modeling technology, it has changed to three-dimensional pattern making.In the design unit, computer software is used to design clothes in flat (two-dimensional), illustration of clothing and fabric design, presentation and fashion show. Regarding pattern design, general and specialized software are used in clothing design, which is explained below in terms of their capabilities for use and application in clothing design.

Gemini Pattern Design and Sizing Software:

A product for accurate, fast and error-free design according to the wishes of clothing manufacturers. Using this software, costume and pattern designers can design the desired pattern according to their desired method and without restrictions, then using standard size tables in the software archive or using their own approved tables that have been added to the software. It is possible to size the pattern. Utilizing Persian and English user interface, tools of advanced pattern design functions such as Sassoon creation tool, Sassoon transfer tool, pleats in different ways, clothing seam creation functions, arrangement, etc. provide designers with the possibility to easily and avoid common design errors. Design a pattern. It is also possible to create complete and uniform curves using the curve function in the design of pattern curves. It is possible to control and draw the best curve. Among the most important features of this software product, we can mention the Persian user interface, the ability to connect with other reputable software products in the world, as well as advanced clothing hardware devices such as digitizers, plotters and automatic cutting machines. Also, if the template is sized, all sizes are entered directly into the software system through a digitizer. In general, creating new sizing, the ability to control, edit and change the pattern curves, the ability to convert saved template files to the format of files of other known software, transfer the components of a template to a new template to increase design speed and accuracy, the ability to send the mother template into the software In order to change or apply sizing, etc. are the advantages of this software.

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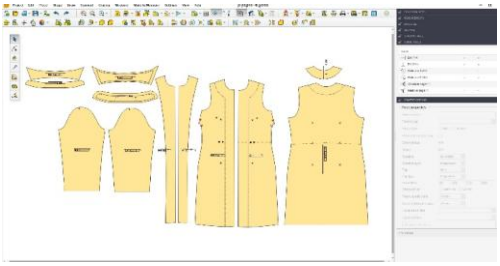

Figure 12 - Pattern designed with Gemini. Reference: Authors , Reference: Authors

Capabilities of Lectra software in designing clothing patterns:

Lectra clothing pattern making software is also a software that is intended for patterning and sewing mannequins from sizes and choosing the color and material of the fabric. Polyester, mani and protection clothing pattern making software are also in this group. This software is the largest pattern design method in the world. This software is designed to adapt production needs to a variety of activities and work levels.

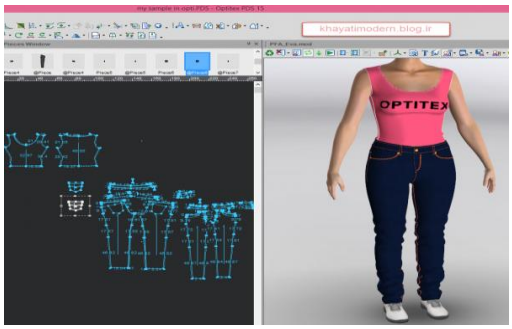

Figure 13 - Sample pattern design with Lectra software. (https://parchezon.com/wp-content/uploads/2021/02/optitex-medium.png)

Lectra software is specially designed for pattern design and the feature of this software provides pattern design and its fit and helps to significantly reduce the review and consistent adaptations. This software is the standard design in the textile industry. With this program, the creation, review, and industrialization and classification of patterns are done faster, with lower cost and higher quality, and the improvement of knitting and sewing materials ensures high productivity and savings. This software provides methods and implements them on plain colored fabrics in sewing and knitting automation. More than a thousand professionals in the world use this tool. Based on the knitting and sewing materials, this software has provided methods that include advanced techniques, fabric sewing operations while having high efficiency.

Patterns of pattern maker software in template design

To draw a pattern, all you have to do is enter the dimensions menu in the new pattern window and enter the dimensions of the body dimensions according to the position shown on the figure. Then by choosing the model of blouse, skirt, pants, shirt and… you can get a very precise designed pattern that can be printed.

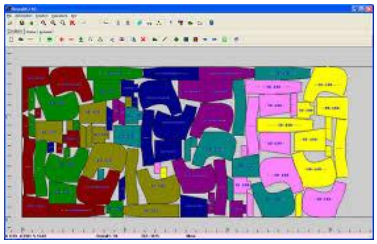

Figure 14 - Sample pattern layout in Pattern Maker software.(https://www.google.com/imgresimgurl)

This software is for pattern and layout and one of the important features of this software is its printing method. You choose the type of paper and divide the template software according to the size of the paper you choose and print each part with precise details to put together. After printing, all you have to do is glue the printed sheets together and have the pattern in real size.

Capabilities of Poly Pattern software in pattern design

Software for pattern design, grading and marker making, including textiles and clothing. High-level tools for this software enable you to build and rank with incredible speed, accuracy and ease. It does not matter what method or method you use to design the template. One of the unique features of this software is that it provides the best and easiest way for the designer to achieve the desired result as quickly as possible and with better quality with shortcut keys, for example, by pressing a key to a suitable curve and regular lines. Achieve the desired result in the template. And these keyboard shortcuts are to speed up the work.

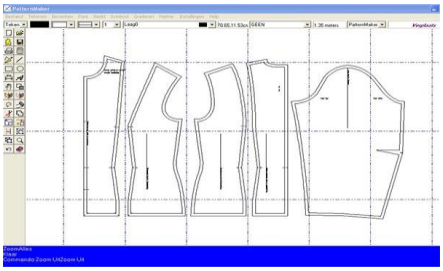

Figure 15 - Sample design pattern with poly pattern. (https://www.yasdl.com/wp-content/uploads/2019/12/PatternMaker-Pro.cover1_.jpg)

Today, the owners of large garment factories use ready-made patterns designed by garment pattern making software to mass-produce garments as well as design various and complex models. Using ready-made templates saves time and money, while also improving the quality of work, satisfying the satisfaction of the target community with more confidence.

Capabilities and features of 3D software in clothing design

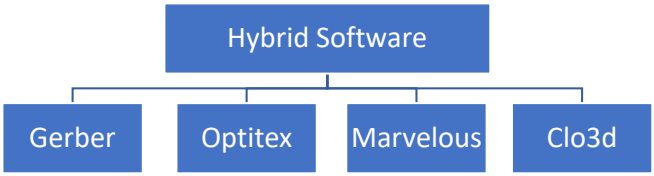

Diagram 2 - Types of hybrid software

This type of software has features such as two-dimensional environment for drawing patterns and three-dimensional for viewing and rendering, and they have this advantage over two-dimensional software.

CLO3D software in clothing design

This software with efficient and wide facilities and tools that are embedded in it has performed all the mentioned design steps including pattern, sewing, adjusting and sorting, sizing and viewing in the tone of a model, and through this in It saves time and money and increases the quality of the design and thus the final product. Using this software, changes can be applied from the starting point of the design to the placement of details and observed at the same time. Also, using a virtual sewing machine, you can connect the parts of the design that have been prepared in three and two dimensions and see the final result. Also in this program, all design standards and design features of all brands are embedded. Another feature of this program is the existence of human avatars and models with different sizes, which allows the designs to be viewed in three dimensions. This software can do two-dimensional and three-dimensional design simultaneously and supports a variety of physical properties of fabrics. In general, performing all clothing preparation operations, including designing, sewing and displaying clothes in the form of modeling, coordinating pattern editing and 3D draping for interactive design, supporting complete design patterns, performing sewing operations and connecting design parts are the main capabilities of this software. Using the features of this program, which has a two-dimensional and three-dimensional environment, it is possible to enter the drawn pattern, which may have been prepared manually or with the help of pattern software, or the design and manual design of the base designer, or if desired Simultaneously draw the pattern on the two-dimensional mannequin and observe the result simultaneously in the three-dimensional environment.

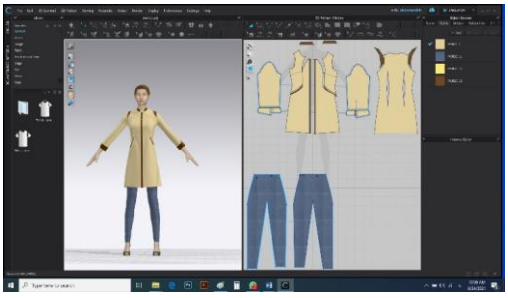

Figure 15 - Clothing design with CLO3D software. Reference: Authors

Design with this software cultivates the creativity of the designer to feel the change or defect in the design at any moment to correct the desired design at the same time. The ability to draw the pattern in any way in two-dimensional environment and in the three-dimensional environment of the desired avatar that is selected and at the moment of the pattern is displayed by activating the button of the sewn pattern parts on the body of the avatar and with the features in this program It includes the gender of the fabric, buttons, decorative stitches, embellishments and other clothing accessories that help the designer to bring the design closer to reality and eliminate problems. As a result, the output of the work can be shared with companies or manufacturers and parties to the contract.

Figure 16 Sample design with CLO3D software. Reference: Authors

In the 3D environment, rotation in all directions examines all aspects of the garment, and one of the special features of this software is rendering the complete file. Another point about editing avatars in this software is the ability to change the size and body of the mannequin. Shows the main difference between this software and marvelous software.

Capabilities of marvelous designer software in clothing design

Using this software, you can freely design all kinds of clothes with any cover. This software has the ability to synchronize and edit the pattern and 3D draping for interactive design. It also allows you to sew the designed patterns together with just a few mouse clicks and view it on the existing model body. This software supports a variety of physical properties of fabrics, including tensile, shear, bending, stiffness, density, thickness, etc., which makes it more successful in simulating better designed models. It is also compatible with popular 3D modeling software such as 3D Max, Maya, etc. Among its most important features: support for full design patterns, 3D Pattern editing synchronization and draping for interactive design, support for 3D modeling software, support for a variety of physical properties of fabrics, support for complete design patterns, pattern editing synchronization and 3D draping for design It is interactive. marvelous designer is almost similar to the CLO3D program with a few differences mentioned and is mostly used for animation. Designers easily put their ideas into action and bring the desired result. It has a two-dimensional and three-dimensional environment, and the beginning of the work is done by drawing a pattern in a two-dimensional environment. . The thing that makes this software so popular is that even those who are not very familiar with the template can put their ideas into action.

Figure 17- Costume Design with Marvelous Designer, Reference: Authors

This program has been great for designing and brainstorming, and you can even help the designer's sense of creativity by adding accessories such as belts, bags, hats, etc. The only thing to consider about this program compared to CLO3D is that Marvelous Designer does not have the power to render, and the rendering feature of an output is such that by rendering accurate details, lighting and materialization become more accurate and the design gets closer to reality. This is while in 3D programs such as animation, rendering must be done, then the next steps will be done and turned into a movie.

Figure 18- Costume Design with Marvelous Designer, Reference: Authors

Optitex software in clothing design

Powerful software for simulating clothes, which is a combination of the latest fashionable clothes and the virtual world. This system simulates the user's desired clothes virtually, taking into account all the tastes of the user. Users of this tool can try on the clothes they want without changing clothes, which is basically time consuming and difficult. Users can also select and test the fabric and color of the system using the software. Modeling clothes is not an easy task for the users of this system either, because there are many options such as material, color, weight and type of fabric that must be applied to all of them. The system then simulates the user's desired clothing virtually, taking into account all tastes. This program is similar to Marvelous Designer and CLO3D with two-dimensional and three-dimensional environment. The simulations of the desired fabric draw the appropriate design, which is first displayed by entering the pattern in the two-dimensional system and editing in the three-dimensional part, and its defects are

eliminated before going to the final stage. Its most important features are fabric simulation system, production of high-quality products due to precise virtual connections, patterns can be easily placed on one or more models in the software and simulation of all pre-production activities related to connections, visualization, Texture, color variety can be named, and also this program has the ability to color and color quality.

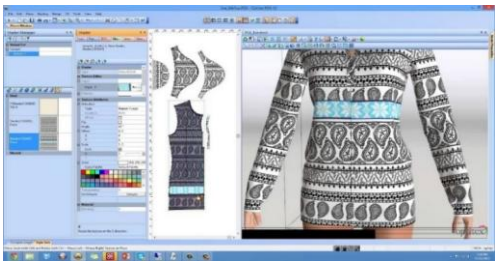

Figure 19- Design with Optitex,
(https://www.google.com/url?sa=i&url=http%3A%2F%2Fheidariali.ir%2Fintroducing-clothing-)

Gerber software capabilities

This software has a lot in common with Gemini software in the preparation of clothing patterns, including the fact that it allows us to coordinate and modify the pattern before cutting on the fabric. Gerber pattern making software is very simple and easy to use in sewing operations. Before sewing, Gerber shows us a simulated sample of a certain size in three dimensions on the mannequin. In the automatic pattern arrangement section, each of these softwares uses a different algorithm in pattern arrangement and their prioritization in piece arrangement is different, which will ultimately different layout output and efficiency or optimal use of fabric space in pattern arrangement. Basically, CAD software includes software that is used for design, and these softwares have very wide possibilities such as various libraries, which correspond to the parts produced in different factories that produce parts.

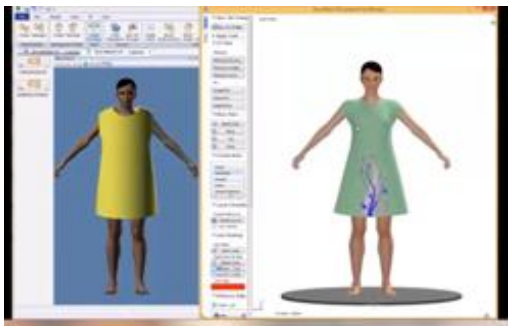

Figure 20- Example of working with Gerber software.
(https://cloud.amoozesh365.ir/video/v32/amoozesh-gerber-part1/amoozesh-gerber-part1-4.jpg)

This software features support for design patterns, pattern editing synchronization, and ease of use in sewing operations. In fact, before you start sewing and the actual physical dose of the dress, a simulated sample with specific dimensions and sizes is displayed on the mannequin body in three dimensions to prevent these mistakes if there is a problem before incurring costs.

Conclusion:

Optitex software is mostly used for pattern makers because it also has the ability to size, and in terms of design capabilities, bows are much more accurate and better than other Gemini, which is very popular and one of its disadvantages is its 3D environment, which is not render able compared to 3D software, and the mannequin in the program is not of good quality in terms of movements and does not seem real, while CLO3D and Marvelous Designer software from The collection of mannequins for men, women and children is of excellent quality. CLO3D software is compatible with more software. The designed pattern can be imported from Illustrator software to. CLO3D software, but to transfer the pattern to Marvelous Designer, it must be done by converting the manual pattern to digital. CLO3D software is made for specialized clothing design. Of course, Marvelous Designer program is similar to this software, but it is more intended and designed for animation. The special feature of this software compared to Marvelous Designer is that it has a mannequin resizing and the mannequin can be edited, and another advantage of CLO3D software is rendering. Of course, rendering after the completion of the design is designed to better display the details of the model, which recognizes the defects and shortcomings of the design, which are the two main features of the two programs. After entering the pattern or designing the pattern in the two-dimensional part of the hybrid software, it should be noted that this design is embedded in a three-dimensional and real environment, and in this way, it first sews the pattern parts with the capabilities of this software and Next, activate the simulation tool to simulate the mannequin's body. You can rotate the entire mannequin and check the design from all angles and from the design defects, including the position of the cuts, the static folds, the length and the shortness of the dress, the looseness, the tightness, the collar play, etc., all can be measured by simulating the designed dress and even the fit of the fabric used and the fabric color, gender, percentage of model acceptance and some 3D software makes it possible to watch movies and animations of the model while walking and prevent problems while wearing and dressing.

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