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THE TOTAL SOLUTION FOR DEVELOPING NEW PRODUCTS OF FOOTWEAR INDUSTRY

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Abstract: *This paper presents new solutions for shoemakers, for developing new products and new markets of footwear industry using the basic function of the* ***system CRISPIN Dynamics CAD SUITE****. These are the key issues - this is why* ***CRISPIN Dynamics CAD SUITE*** *has developed a range of quality software products to give the shoemaker a major advantage in shoemaking. This application offer functions for creating realistic looking designs of footwear products and for flattening the styles for development in 2D. There are also facilities to re-centre front and back guide lines, change foot (no need to re-digitize) and set the correct heel height and roll. It is also possible to create guidelines to match with the last and extend the last for a boot design. The last type can also be changed to a type that allows the entire last surface to be used for a design. The system brings cutting-edge CAD/CAM technology to footwear designers providing benefits through all stages of their product development process. Major benefits include the ability to visualise a design for appraisal and the transfer of the design into* ***CRISPIN 2D*** *pattern development products. This allows increased productivity, shorter lead times, accurate interpretation of 3D designs in 2D and a reduction in the number of samples needed before approval of the design.*

Key words: *design, footwear, last, solid body, style, line, pattern, grading*

1. INTRODUCTION

By classic methodology, footwear designing is a very complex and laborious activity. That is because classic methodology requires many graphic executions using manual means, which consume a lot of the producer's time. The decisive step in this way has been made some time ago, when, as a result of powerful technical development and massive implementation of electronical calculus systems and informatics, CAD (Computer Assisted Design) systems were used in footwear industry. One of the most important uses of calculus systems in footwear design is interactive design by using the CAD system.These are the key issues - this is why **CRISPIN *Dynamics*** have developed a range of quality software products to give the shoemaker a major advantage in shoemaking. This paper presents the basic function for footwear design using the system **CRISPIN *Dynamics* CAD SUITE**, a CAD/CAM system for footwear.

2. CRISPIN DYNAMICS CAD SUITE

This application offers functions for creating realistic looking designs of footwear products and for flattening the styles for development in 2D. There are also facilities to re-centre front and back guide lines, change foot (no need to re-digitize) and set the correct heel height and roll. It is possible to create guidelines to match with the last and extend the last for a boot design. The last type can also be changed to a type that allows the entire last surface to be used for a design. The applications in the suite are:

- **LastMaker** - a program providing the means to design and modify lasts with outputs to various 3D file formats.
- **ShoeDesign** - a program for designing uppers on 3D lasts provided by **ModelTracer** or **LastMaker**. Create realistic looking designs and flatten the styles for development in **Engineer**.
- **ShoeCost** - a program to estimate the cost of producing a particular design. Takes input from various sources including **Engineer**.
- **2D Engineering –** a program for designing on 2D lasts provided by Shoe Design, and Digitizing.

This product has been developed for shoemakers who wish to ensure that their business remains competitive by increasing the efficiency, speed and accuracy of pattern development and grading.

This paper presents the main functions for footwear designing in 3D and 2D space using the applications **Last Maker, Shoe Design and Engineer** [1], [2].

3. FUNCTIONS FOR CREATING AND ADJUSTING THE SHOE LAST

Computer-aided manufacturing (CAM) system is widely used in shoe last manufacturing, which has achieved the digitalization of the machine program from the free-form surface detection method to produce numerical control (NC) required by the shoe last CAM software system automatically. In this type of free-form surface NC, it is common to digitalize the shape of the entity through the three dimensional (3D) measuring system after obtaining the scanned data and processing the natural pattern; the next step is rebuilding the surface model. There are two steps involved in remodelling the discrete data, which has become an entity shape in recent years: the first is ordering the measurement data, the second is the generating for creating the design. In this section will be discussed the method for measurement data technique and creating the format of the solid part of the shoe last technique using the application **Last Maker** [1], [3]. The main function for creating and modifying the format of the shoe last are following:

3.1 Recording the shape of the last

The shape of the last is recorded in 'point cloud data' format performed with the application ModelTacer. The digitizing process is realized with MicroShibeG2X.

For digitizing the shape of the shoe last we perform the steps:

- steps for recording the base point,
- steps for recording the limit of the shoe last and the points for creating "cloud data" format of the last (see fig.1).

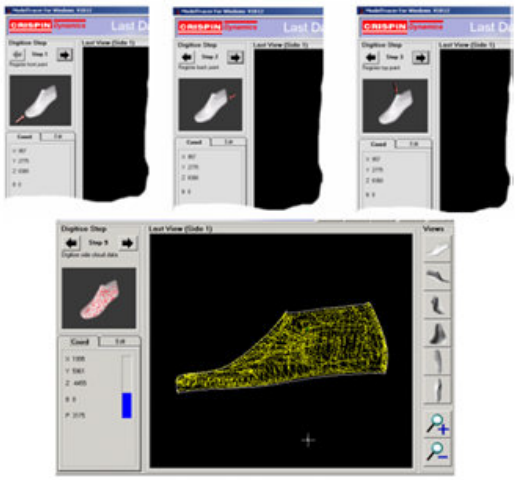

Fig.1: *The steps for creating a shoe last "point cloud data" format*

3.2 Import the shoe last in other application and adjusting the last parameter, comparing and analyzing the new Shoe Lasts

Shoe last is imported in **Last Maker** application**.** The application offers information about the last: Gender, Size, Index, Width index, Toe Spring, Heel Height. This information displayed in the Last Info option is automatically changed accordingly (see fig. 2).

Using the function of the Last Maker application we can visualize and modify the parameters of the shoe last. This function for comparison brings possibility to compare two different lasts; the result can be measured or displayed as a solid last (fig. 2).

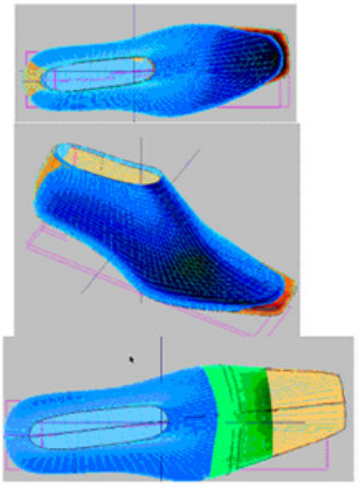

Fig. 2: *Importing the shoe last in Last Maker and modification of the initial format*

3. 3 Proportional Grading

In the dialog Gender Table select Gender you want use for grading, size and width parameters of the current last. In figure 3 are: Window of Gender Table and the results of function grading.

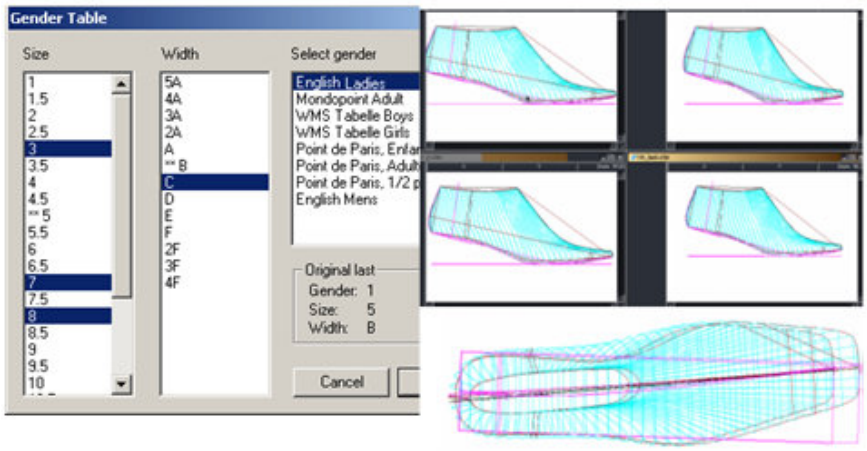

Fig. 3: *Creating the shoes last for other numbers using Last Maker application*

4. FUNCTIONS FOR CREATING AND ADJUSTING THE 3D DESIGN OF THE FOOTWEAR

The module **Shoe Design** brings cutting-edge CAD/CAM technology to footwear designers providing benefits through all stages of their product development process. Major benefits include the ability to visualize a design for appraisal and the transfer of the design into **CRISPIN 2D** pattern development products, see table no. 2. This allows increased productivity, shorter lead times, accurate interpretation of 3D designs in 2D and a reduction in the number of samples needed before approval of the design.

4.1 Input of last data can be taken from **CRISPIN Model Tracer** from our **CRISPIN Last Maker** product.

The last can be extended for designing industrial, leisure or fashion boots (see fig. 4). Guidelines and reference points can be embedded in the last surface to help maintain design standards etc.

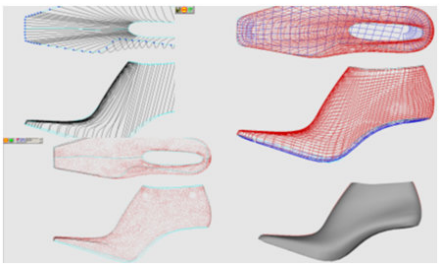

Fig. 4: *Creating the shoes last format 'solid corp.' using Last Maker session of Shoe Design application*

4.2 Creating Style-lines

Style-lines are generated on the last surface with this 'user friendly' software product allowing new designs to be achieved in minimum time whilst achieving an accurate representation of the shoe (see fig. 5).

Fig. 5: *Creating style-line on the last surface with this 'user friendly' using the session of Shoe Design application*

4.3 Flatting

The last form, last bottom and style lines can be accurately flattened at any time during this process (see fig 6) and transferred to a **CRISPIN 2D** pattern development product.

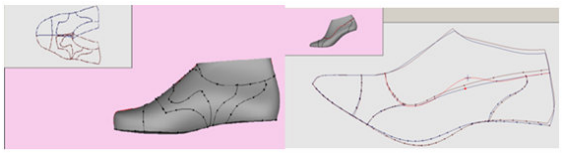

Fig. 6: *Using Shoe Design perming the flattening of the shoe last for creating 2D part*

4.4 Analyzing format of the shoe last and creating design and panel

The shoe can be rotated for visualization or to assist in generating the style lines enabling the designer to view the design from any angle to achieve the desired result (see fig. 7). Enhanced visualization is achieved by applying features such as stitching, eyelets and laces together with colors and textures. An interactive sole design facility is provided.

Fig. 7*: Creating and analyzing realistic looking designs of the footwear products*

5. FUNCTIONS FOR DEVELOPING INTO A FULL SHELL, MAKING THE PARTS AND GRADING

For creating 2D designing of the footwear we use **CRISPIN Dynamics Engineer** to perform the following processes: digitize the flattened or standard half shell, develop into a full shell using various dependant line types, create the individual parts and grading.

5.1 Input

Input is from a 2D digitizer or CRISPIN ShoeDesign. You can use any 2D digitiser supported by the 'Wintab' standard. Digitising is easy to learn, fast and accurate (fig. 8).

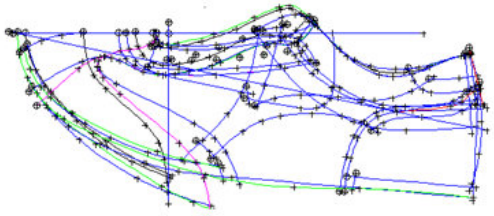

Fig. 8: *The session Engineer for digitizing the base model*

5.2. Creating 2D design

Using the CRISPIN function we develop into a full shell and create sundries effect for the footwear patterns (fig. 9).

Fig 9: *Full shell and sundries effect for footwear patterns*

5.3 Pattern development and execution of the assessment of part pattern

Using the function 'Parts Manager' allows the operator to quickly view the part names developed in the pattern with the ability to view the parts as required (see fig. 10).
Engineer features ready-to-use database connectivity through our 'Data Store' product. This will allow the transmission of patterns around the world for evaluation or interactive on-line 'redlining'. Using the task Assess we can perform the assessment of part pattern for determinining the economic efficiency. (fig. 10)

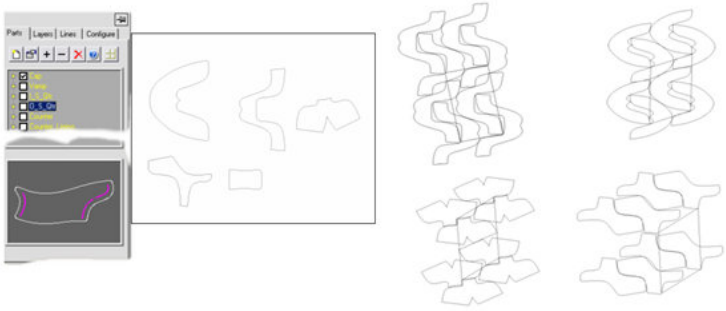

Fig. 10: *Pattern development, creating and visualization of data base of the component parts the base model's and part pattern assessment*

5.4 Grading

The grading a pattern and/or parts can to make by using the **Grade Task Tool Tray**. This task has many functions which launches the dialogs providing all the facilities to set up a size range and

grading parameters. The major functions for the grade are: Choice of **Arithmetic** or **Geometric grade** and whether or not width fittings apply.

Using arithmetic grading basically means that you simply add the size increment value to the previous graded size. If you were to plot the size change on a graph you would find that the resulting line is straight. Geometric grade, where the increment values are applied as a percentage, will produce a curved line.

Using geometric grading basically means that you apply the size increment value as a percentage of the previous graded size. If you were to plot the size change on a graph you would find that the resulting line is curved.

- The definition of the model size, its length and width measurements. The button at the left will start a special measure function. (see figure 11) The values measured are actually stored within the pattern documentation.
- Create and place **Grade Centres** to control the grading process

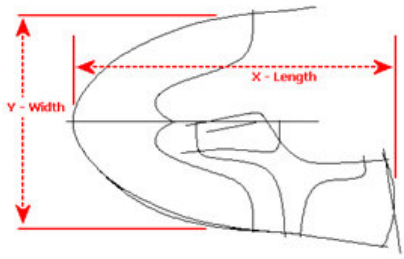

Fig. 11: *Full shell and sundries effect for footwear patterns*

Notes:

1. A 'free space' grade centre actually 'sits' on a single point base line.
2. Any subsequent grade centres can be placed on any standard line type or the intersection of any two lines.
3. When a single line is picked you will be able to put the grade centre at either end of the line.
4. A grade centre can be placed on another grade centre's base line point, thus 'stacking' them at a single location.

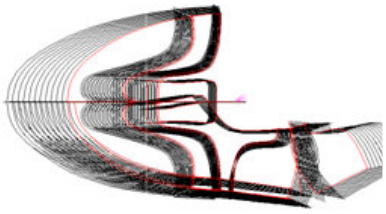

Fig. 12: *Results of the grading*

6. CONCLUSION

With **CRISPIN Dynamics** we can visualise a range of designs on-screen, work out the costs of a new style and even cut out sample shoe components. Reliance on manual skills is largely eliminated, so the staff can work creatively, but with increased accuracy and productivity. Also, it is possible to send designs to a distant office or manufacturing centre in a matter of minutes.

REFERENCES

[1] M.Costea, M.Drişcu, *Crispin Dynamics 3D –New solution for shoemakers creating and modification of the shoe last*, Leather and Footwear Journal 11 (2011), pg 109-120, ISSN 1583-4433

[2] M. Drişcu, *Reconstruction and flattening of the surface shoe last*, Proceedings of The14th Internaţional Conference, Iaşi&Chişinău ModTech2010, May, 2010, Romania, ISSN: 2006-391

[3] A.Mihai, M. Costea ş.a. *Customized footwear insers for high arched foot – one case study*, Proceedings of the 3nd International Conference on Advanced Materials and Systems 2010- ICAMS 2010 Bucuresti

[4] M.Drişcu, *Modelarea formelor plane şi spaţiale ale încălţămintei,* Ed Pim, Iaşi, 2008

[5]***http://www.google.ro/search?q=shoe+size&hl=ro&prmd=imvns&tbm=isch&tbo=u&source=univ&sa=X&ei=KlpTT4DwNaik4ATx7rGzDQ&sqi=2&ved=0CEkQsAQ&biw=1024&bih=515

[6] *** DELCAM Crispin CAD