

RECONSTRUCTION AND FLATTENING OF THE SURFACE SHOE LAST PART 1: METHOD FOR RECONSTRUCTION OF THE SHOE LAST

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The needs on shoe market change today faster than ever. The shoe series are therefore smaller and the new shoe models have to be developed faster. The classical design of a new shoe is bound to the shoe last that is the form on which a shoe is constructed. The last gives the shoe a shape. Basic modules in a modern CAD/CAM system for shoe design are those for last digitising and pattern engineering. The result of the last digitising phase is a cloud of points in 3D space which has to be approximated by a 3D surface composed of the set of independent triangles. Before such a surface can be flattened, the neighboring relations between those triangles have to be established. Although algorithms for the surface reconstruction are very complex, the user is not aware of it, because they are part of the last digitizing module. The result of the surface reconstruction, can be seen in Figure 1.

The surface digitisation is performed in such a way that all the points lie in parallel planes.

Generally, there are a different number of points in the planes. If line segments connect the points in each plane in the order given by the digitizing process, cross-section curves are generated that will be denoted by: c^i , $i = 1, 2, \dots, N$. As shown in [1], a developable surface can be constructed between two cross section curves. These

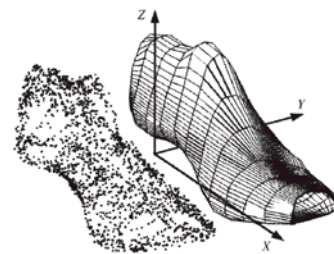


Fig. 1, Reconstruction the surface of the shoe last

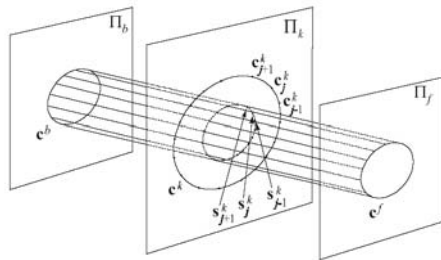


Fig. 2, Method for reconstruction of a surface with developable stripes

kinds of curves are also known as directrix curves. The developable stripe is a special case of a ruled surface [1]. A line segment connecting two points on directrices is called a linear generator [2]. The surface reconstruction is started by the generation of a developable stripe between the cross-section curves c^1 and c^N (Fig. 2).

The method is fast, but it cannot be used for the reconstruction surface of the shoe last. We have tested the method on the real data of a shoe last, where the discontinuation of part of the cross-section curves was eliminated by dividing the last into many parts that were reconstructed and then flattened separately.

REFERENCES

- [1] Faux, I. D., M. J. Pratt (1981) *Computational geometry for design and manufacture*, Chichester: Ellis Harwood
- [2] Gurunathan, B. and S. G. Dhande (1987) *Algorithms for Development of Certain Classes of Ruled Surfaces* Computers & Graphics, Vol. 11, No. 2, 105-112