

RECONSTRUCTION AND FLATTENING OF THE SURFACE SHOE LAST PART 2: METHOD FOR FLATTENING OF THE SHOE LAST SURFACE

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Surface flattening is the mapping of a 3D surface onto a 2D plane, where the distances between surface points have to be preserved. As a result of this operation a flat pattern is generated. Unfortunately, only special types of surfaces can be unrolled onto a plane without errors that result in tearing and overlapping in the generated, flat pattern. These surfaces are known as developable surfaces [1]. It is clear that pattern designers would like to reduce distortions to a minimum. This is very hard to do automatically, although some methods of significantly reducing the distortions do already exist [2] and [3]. The biggest problem in pattern generation is overlaps in the generated pattern [4]. These overlaps in the flat pattern represent gaps in the 3D surface obtained by such a pattern.

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 developable stripes surface.

After the surface is reconstructed, it has to be unrolled to the plane. Unrolling of the developable surface is, in fact, mapping of the 3D quadrangles into the plane, where geodesic distances are preserved. The mapping process must be fast and accurate. The quadrangles constructed in the plane must have the same length as the original 3D quadrangles. It turns out that the quadrangle construction is closely connected with the calculation error. Since calculation errors are accumulated and if the developable stripe consists of many quadrangles, the final error cannot be ignored. Therefore, we have to use the construction method presented in Kolmanic 2002. Flattening of the developable stripe is finished after all the quadrangles of the flat pattern depends upon the primary direction of flattening and the starting position. In our case the primary flattening direction has been u . Each quadrangle has been constructed independently from its neighbor and then translated and rotated in order to preserve the neighboring relation.



Fig. 1, The surface of the shoe last reconstruct

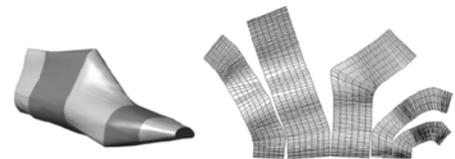


Fig. 2, Result of the shoe last flattening

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