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AUTOMATED DESIGN OF THE RATIONAL SCHEME OF CUTTING OF GENUINE LEATHER ON SHOE DETAILS

Purpose Develop software for automated design of rational schemes for cutting genuine leather on shoe details.

Key words: *automated design, scheme of cutting, natural material, shoe details.*

Objectives. Develop a mathematical model of the problem of automatic design of rational schemes for cutting genuine leather into flat geometric objects with a complex configuration of the outer contour. Develop algorithms based on the proposed mathematical model and software for automated design of rational schemes for cutting genuine leather on shoe details.

Methodology. The research is based on the basic principles of shoe production, methods of mathematical modeling, analytical geometry, theory of algorithms and programming.

Research results. In the footwear industry, the issue of material consumption in production has always been very relevant. High material consumption and high cost of materials used make the task of minimizing costs especially important for the footwear industry. Moreover, the maximum amount of area loss occurs when cutting genuine leather. Therefore, it is necessary to introduce the latest technologies into production, which are based on the use of automated information processing tools and increase material savings and productivity. To develop a mathematical model of the problem of automatic design of rational schemes for cutting genuine leather into flat geometric objects with a complex configuration of the outer contour was to formalize its structural components:

- analytical description of flat geometric objects with a complex configuration of the outer contour;
- analytical description of the outer contour of the genuine leather;
- parameters that uniquely determine the position of the part on the plane;

- analytical representation of the conditions of mutual non-intersection of parts when combined;
- analytical representation of the conditions of mutual non-intersection of a flat geometric object with the boundary of the outer contour of the genuine leather;
- identification of any flat geometric object in the cutting scheme and its removal from it;
- analytical representation of the goal function.

Mathematical models were developed for the given components of the problem. Using the developed mathematical models, the following algorithm of the automated designing of rational schemes of cutting of genuine leather on details of footwear which includes the following points is offered:

- approximation of external contours of genuine leather and details on which it is necessary to cut genuine leather;
- determination of overall dimensions *DlSh* and *HSh* of natural material;
- automatic design of a rational cutting scheme for a rectangular material with overall dimensions Dl and H, where *Dl > DlSh* and *H > HSh*;
- automatic transfer of a contour of natural material to the designed scheme of cutting;
- automatic removal of all details from the designed scheme of cutting of all details which are outside or cross an external contour of genuine leather [1];
- interactive adjustment of the received scheme of cutting for genuine leather.

Conclusion. The proposed mathematical model and algorithms were implemented in the software of automated design of rational schemes of cutting genuine leather on shoe details. This software will increase material savings and productivity in preparatory and cutting production.

References

1.Майкло Ласло Вычислительная геометрия и компьютерная графика на С++ / Москва, БИНОМ, 1997, – 304 с.