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### **ALGORITHM FOR GENERATION OF RATIONAL SCHEMES FOR CUTTING ROLL MATERIALS ON DETAILS OF HARDWARE PRODUCTS**

**Purpose.** *Develop an algorithm for generating rational schemes for cutting rolled materials into haberdashery details.*

**Keywords:** *haberdashery details, cutting scheme, roll material, algorithm, software*

**Objectives.** *Develop algorithms and implement them into software for generating rational schemes for cutting rolled materials into haberdashery parts*

**Methodology.** The research is based on the basic provisions of leather goods production, methods of mathematical modeling, analytical geometry, theory of algorithms and programming.

**Research results.** In the task of automated design of schemes for cutting rolled materials into details of leather goods, taking into account the complete output, the following structural components can be distinguished:

- analytical representation of information about external contours of placed details;
- parameters determining the position of the detail on the plane;
- analytical description of the conditions of mutual non-intersection of details in the cutting scheme;
- analytical description of the system of combining details in the cutting scheme;
- analytical description of the configuration of the material, taking into account the width;
- analytical description of the conditions of non-intersection of details with the material boundary;
- analytical presentation of a permanent inter-template bridge between details;
- analytical representation of the requirements of the complete output;
- mathematical description of the set of admissible solutions of the problem;
- analytical representation of the objective function.

When developing the algorithm, all these structural components were described.

Let's highlight the main steps of the algorithm for generating rational schemes for cutting rolled materials into parts of haberdashery:

- generation of an admissible set of sections [1];
- generation of rational schemes for cutting rolled materials into details of haberdashery products from a permissible set of sections.

Let us consider in more detail the task of generating rational schemes for cutting rolled materials into parts of haberdashery products from an admissible set of sections.

The mathematical model of this problem can be presented as:

$$L = \sum_{i=1}^i L_i \cdot x_i \rightarrow \max$$

under the following restrictions

$$R \cdot N^i - \lambda \leq \sum_{i=1}^i B_{ij} \cdot x_i \leq R \cdot N^i, j = 1, 2, \dots, p$$

where  $L_i = \sum_{j=1}^p B_{ij} \cdot |S^j|$  - useful area of the material in the  $i$  section;

$\lambda$  - permissible deviation of the number of details from the task plan;

$B_{ij}$  - number of  $j$  parts in  $i$  section

$$x_i \geq 0; B_{ij} \geq 0; R > 0; Q_i > 0; x_i, Q_i, B_{ij} - \text{integer.}$$

This is a large integer programming problem. Since the number of admissible sections reaches 10 thousand, there are currently no effective, accurate methods for this problem. A heuristic method was specially developed to solve this problem.

The developed algorithms are implemented in software that has a friendly interface and does not require additional knowledge when working with it.

**Conclusion.** Algorithms have been developed that are implemented in the software for smoothing contour sections of glove parts using parametric B-spline and interpolation spline.

### References

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