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## THREE-DIMENSIONAL DESIGN OF BODY SECTIONS IN AUTOCAD SYSTEM

**Abstract:** The article provides an analysis of modern applications for three-dimensional design of shoe lasts. As a result of the analysis, it was recognized that the sufficient high cost of foreign software products does not currently allow their wideusing. A method of computer-aided design of shoe lasts in the AUTOCAD graphical environment and a program for calculating the main parameters of shoe lasts in the EXSEL environment are proposed, the main stages of designing a shoe lasts are presented.

**Key words:** AUTOCAD, EXSEL, shoe.

**Language:** English

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### Introduction

The leather and footwear industry of Uzbekistan demonstrates steady growth rates. Measures taken under the leadership of President Sh.Mirziyayev to support the production of leather, footwear and haberdashery products serve as an important factor in the consistent development of the industry. An additional impetus for the further development of the industry is also the presidential decree "On additional measures for the further development of the leather and footwear and fur and fur industries" issued in February this year.

An important aspect of the successful development of footwear production is the improvement of design and modeling methods for

leather goods, the introduction of new innovative technologies in the economy, which is repeatedly mentioned in the speeches of the head of our state. [1].

Every year the enterprises of the industry develop and introduce into production more than 500 new models of footwear, more than 100 models of leather and haberdashery products, about 50 models of leather products. The work carried out within the framework of the Localization Program has made it possible to organize the production of more than 80 types of import-substituting goods, thereby saving 35-40 million dollars per year [2].

The intensive development of the digital economy, the growing availability of computer technology and information and communication

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technologies open up great opportunities for the widespread introduction of automated design systems in the footwear industry. At the moment, a number of integrated CAD systems for shoes (CAD) have already been created, which solve various problems of designing and designing shoes and technological equipment. The market of automated systems presents real opportunities for effectively solving the problems of designing shoe uppers, optimal technological processes, cutting shoe materials and grading parts. However, individual stages of design and technological training did not find their development in the process of automation of the shoe industry. The stage of designing spatial objects of shoe production remains insufficiently developed, among which, first of all, the shoe last is.

The main problem of the footwear industry in the Republic is the absence of the very first stage of the footwear production chain - designing a shoe last. Despite the fact that at present 4 enterprises are engaged in the production of shoe lasts in the republic, their activities are mainly based on copying samples of shoes made in Turkey or China. It is known that the last is the main design and technological equipment of a shoe enterprise. Therefore, the automation of the design of shoe lasts is an urgent problem.

Computer-aided design systems (CAD) are usually divided into basic graphic systems designed for the execution of drawings, and applied software for calculations and modeling. Application systems are a tool that provides a better and more productive work of specialists of designers in various industries, examples of foreign programs for three-dimensional design of shoes and shoe lasts are software products Roman CAD (Lectra France), Mine CAD (Spain) ICad3d + Pro (Portugal) [3,4,5], but their cost is much more expensive. Therefore, the most preferable option, as less costly and more focused on the assortment of a particular production, can be considered the development of your own application systems based on widely known basic graphic systems.

The most famous and popular are the following basic graphic systems AutoCAD, CADDy, Micro Station, which are an "electronic drawing board" and are used in various professional areas /

We have proposed a technique for three-dimensional design of shoe lasts using the graphic system AutoCAD

According to this technique, an automatic calculation of the construction parameters is carried out in Excel, and with the help of ready-made

calculations, the contours of the sweep of the track, longitudinal-axis and cross-vertical sections of the pads are designed. The AutoCAD system is used to automate the drawing work. The design process is divided into the following stages:

1. Calculation of construction parameters in Excel;
2. Drawing the contours of the cross-sections of the block in AutoCAD
3. Drawing longitudinal-axial sections of the block in AutoCAD
4. Plotting a scan of the shoe track
- 5 Getting the surface of the pad

To calculate the construction parameters, a software file has been developed that allows you to determine the parameters for constructing the sweeps of the track, longitudinal-axial and cross-vertical sections of the block

As the initial data for calculating the parameters of shoe lasts, the type of shoe, size, weight, type of shoe, and the interval between the weights are:

The parameters for constructing sweeps of the track and longitudinal-axial sections of the block are determined depending on the size N and completeness W of the block according to the equation

$$P = EN + FW + H,$$

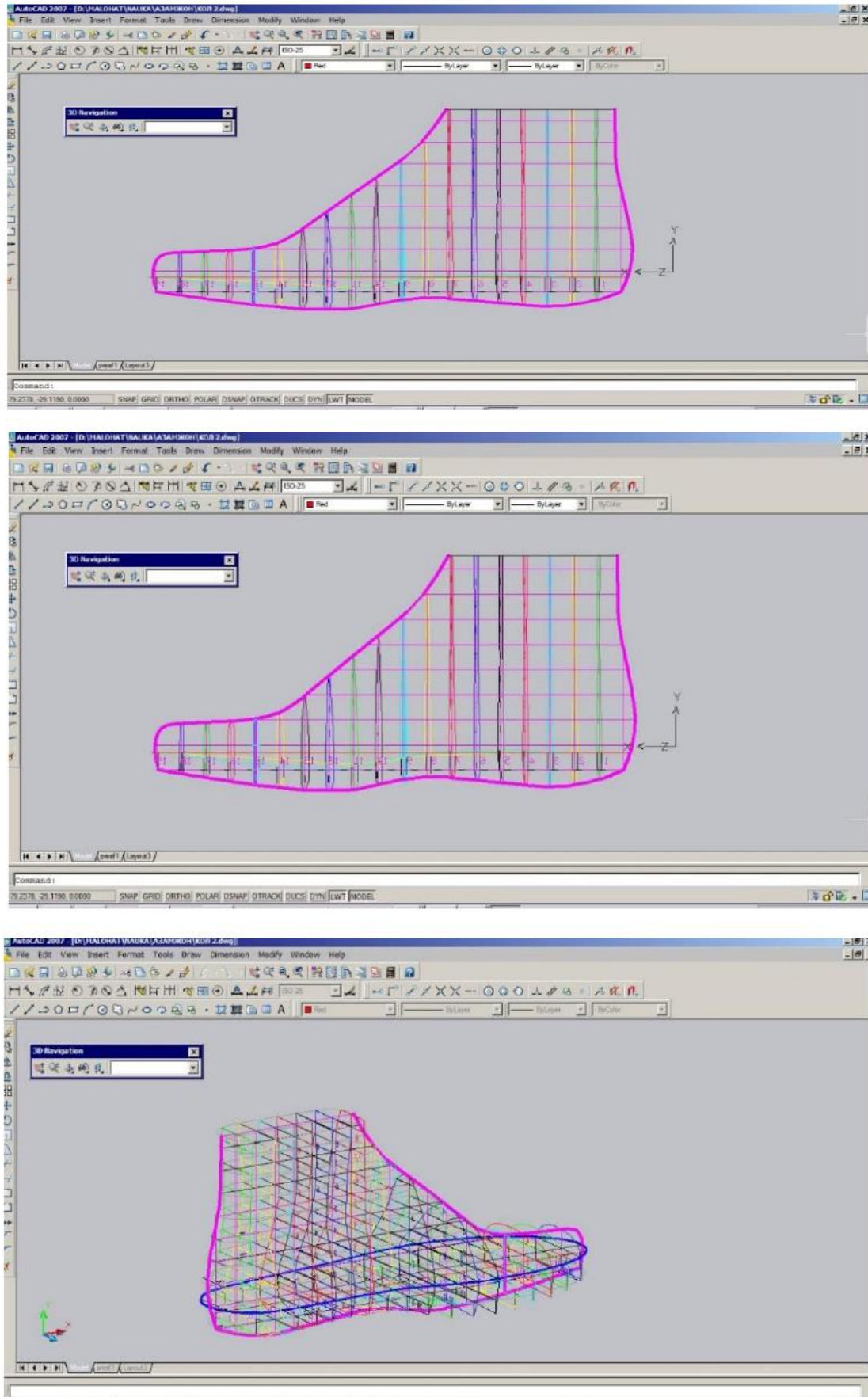
where P is the parameter to be determined, mm; E is a coefficient numerically equal to the increment of the determined parameter for blocks of adjacent sizes; N - shoe size; F - coefficient, numerically equal to the increment of the determined parameter for the blocks of adjacent widths; W - completeness of shoes; H is the free term of the equation, depends on the height of the heel elevation.

In the developed program file, a database has been created that allows the calculation of construction parameters that can be imported into AutoCAD [6].

In AutoCAD, a block is represented by a set of cross-vertical sections, a longitudinal-axial section, lines of the edge of a block track, an overall dimension, an installation face. rice. 1. With the obvious advantages of this method (simplicity of obtaining and representing in the form of flat 2D - contours), such a description has a significant drawback - it does not meet the requirements for the formation of a continuous, smooth surface description, especially in the toes and heels. At the same time, this task is solvable, although it is associated with the need to implement a number of additional transformations.

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Picture 1. Shoe lasts designed in the AUTOCAD system

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The transformation of a two-dimensional block into a three-dimensional one is possible using geometric spatial modeling tools, which will allow the block to be presented as a polygonal model, during the creation of which it is assumed that the technical object is limited by surfaces that separate them from the environment. This is achieved by approximating the surface with a polyhedron, each face of which is

the simplest polygon. The larger the number of edges, the less the deviation from the actual shape of the last. 3D modeling in AutoCAD allows you to look at a drawing or an object from any point in space, and also rotate it.

The proposed method of computer-aided design of shoe lasts was proposed for testing at the private enterprise Energy Shoes (Tashkent).

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