DESIGN OF MULTIFUNCTIONAL ERGONOMIC FURNITURE MADE IN COMPUTER ENVIRONMENT THROUGH LEADING 3D SOFTWARE PRODUCTS

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Abstract: There is a trend recently of urban development in the big cities and population growth. This explains the need of increasing the housing stock, which often leads to the development of the less- and more affordable apartments. This type of apartments is good to be functionally and compactly equipped. In such conditions, the use of multifunctional furniture is a preferred option.

Keywords: DESIGN, 3D, ERGONOMICS, MULTIFUNCTIONAL, FURNITURE

1. Problem discussion

The design of multifunctional ergonomic furniture in a computer environment is a good way to predict in advance the designer’s and architectural solution that saves time and money and leads to quality and desired results [1-9]. The implementation of designing this type of furniture goes through preliminary design stage in the computer environment using modern 3D software products [10-13]. They allow models to be designed with maximum accuracy, and constructive functionality to provide a suitable photorealistic appearance. At a later stage of production the finished 3D models are exported in the relevant file formats to CAM systems, CNC machines and 3D printers [14-19]. Some of the leading 3D computer programs are CAD systems SolidWorks, AutoCAD, the graphic 3DSMax and more [20-15].

2. Objective and research methodologies

Create a virtual model of multifunctional ergonomic furniture involves a preliminary series of problems solved with the designer view and in line with technological and environmental standards and requirements. On this basis, we proceed to the selection of appropriate technical means having the best possible technical capabilities.

The methodologies, choice of 3D technology tools, and the standards and requirements in the modern design of multifunctional furniture is shown on Fig. 1.

The obtained samples of virtual models of multifunctional ergonomic furniture are shown on Fig. 2, Fig. 3, Fig. 4 and Fig. 5. The design of the models is created by fourth-year students in “Industrial Design” at the Technical University of Varna under the guidance of their teachers in the classes in “Computer modeling of industrial forms” and “Industrial design engineering”. For the creation of these models these software products are used: SolidWorks, CAD system, 3DSMax, and AutoCAD.

a) A model of multifunctional furniture - KP “ KMIF2013 “. Designed with SolidWorks CAD system (Fig. 2). Function: a table, a chair, and an armchair. Suggested materials wood, textile, metal:

Fig. 2. A model of multifunctional furniture - KP “ KMIF2013 “; (a) an armchair; (b) a table and a chair

b) A model of multifunctional furniture – JK”MF2013”. Designed with 3DSMax (Fig. 3). Function: a table, a chair, and decorative shelves. Suggested materials: wood, leather, aluminum strips:

Fig. 3. A model of multifunctional furniture - JK”MF2013”; (a) combination of table, chair, and decorative shelves; (b) combination of little tables and chairs with composite colours

c) A model of multifunctional furniture- ISI“Compact”. Designed with SolidWorks CAD system (Fig. 4). Function: a table, a rank, chairs, stools. Suggested materials: by choice:

Fig. 4. A model of multifunctional furniture - ISI“Compact”; (a) the model is folded compactly; (b) unfolded model allowing various options available
d) A model of multifunctional furniture - ED“Ring”. Designed with AutoCAD and 3DSMax (Fig. 5). Function: a table, a rank, a chair, and a shelf. Suggested materials: beech.

Fig. 5. A model of multifunctional furniture - ED“Ring”:
(a) components in disassembled forms; (b) available for studying; (c) available for eating; (d) a combination of chair and shelves

3. Conclusion

This report includes the realization of a goal achieved using methodology with two main aspects: the ergonomically - functional and the constructive - designing. Based on the obtained results it is concluded that the use of modern technological tools such as CAD systems (preferably of medium and high class) and 3D graphics system is a good solution for the creation of multifunctional ergonomic furniture. The possibility of combining some of these software products if it is necessary to improve the quality of certain components and / or to supplement additional functionality is a good condition for obtaining better results. Choosing the right computer system with direct future integration of files to CNC machines is a milestone in the transition of post production and real application of the finished 3D models. Along with the proper use of 3D software systems for the production of quality design of multifunctional ergonomic furniture, the importance is the individual approach, creativity, and precise compliance with the required standards. The results of the design of multi-functional ergonomic furniture created in a 3D environment show the correct approach, the designers view, and the application of appropriate technology tools in the implementation of the models.

References

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