author: Hubert Albertusiak
PhD supervisor: prof. dr hab. Roman Kurzawski

Faculty of Interior Design
Jan Matejko Academy of Fine Arts in Krakow

Kraków, 14.03.2022

**Summary of doctoral dissertation**
***Minimalism and production automation - concepts of structures for CNC cut furniture***

The thesis is concerned with the design of furniture to be cut using 3-axis CNC milling machines. It consists of a theoretical part and a project part.

The introduction focuses mainly on how the understanding of the concept of minimalism in the applied arts has evolved. It is noted that in the twenty-first century the concept increasingly refers to the non-aesthetic dimensions of objects, especially those related to the impact on the environment.

The chapter entitled *Research Issues* highlights the main inconveniences and benefits associated with furniture production using CNC plotters. The difficulties encountered in avoiding waste of material in small batch production, carried out by small factories or craftsmen, were pointed out as the major problem addressed in this thesis. The reason identified for this is the impossibility of using statistical methods in the production quality management and the unprofitability to optimise the production of products in short series.

The objective of the thesis is then set. It is an answer to the previously defined problem by creating designs of universal structures, which can be used in various types of chairs, stools and tables. The thesis therefore also provides an overview of furniture containing effective solutions in this regard.

In the next section appear statistics on the level of interest in the concept of minimalism, compiled using data from the Google Trends service. The findings indicate that the term is growing in popularity and is mainly searched for in the context of interior design and more broadly defined architecture. The thesis also refers to this issue from a historical perspective – the next chapter is dedicated to the idea of minimalism in the context of the development of industrial production methods. It draws on the views and works of authors such as: Henry Cole, Augustus Pugin, Michael Thonet, William Morris, Christopher Dresser, Josef Hoffmann, Otto Wagner, Adolf Loos and Victor Papanek.

The section of the thesis describing selected examples of furniture begins by introducing the concept of negative space, which is well established in the visual arts terminology. An attempt is subsequently made to transfer this term to the field of CNC cut furniture, using the example of particular work created by Ferdinand Kramer. The described table features a form composed of elements that complement each other on the cutting plan, thus reducing the amount of waste to a minimum. More examples of projects incorporating this type of solution are presented in the section that follows. They are mainly considered with regard to the efficient use of material, the simplicity of assembly and the machining time required.

The basic part of the project work is a concept of a CNC cut chair. Its essential part is an element forming the seat and the backrest, which is to be made of a bendable material. The design is based on a rectangular shape which, depending on the divisions made, can create variants that are aesthetically and ergonomically different. Two of these have been made in prototype form. Subsequent designs are based on the original concept of skeleton frame construction for stools. It is characterised by a tension that allows to eliminate fasteners and glue in favour of the use of catches. An important feature of the idea are finger joint connections introduced to maximize material utilization. What follows next is the unconventional use of plywood. The designed concepts are based on experiments involving mechanical bending of pre-cut sheets of this material. As a result, the designs of the components for the seat and the backrest are produced.

Hubert Albertowski