COMBINATORIAL METHODS FORMING OBJECTS OF DESIGN

Iryna KUZNETSOVA[1], Oktyabrina CHEMAKINA, Tatyana SHIMANSKAYA

1. ABSTRACT

The work revealed the use and implementation the combinatorial forming methods in objects design by the Ukrainian designers. By defining the structure of the combinatorial process it is determined the basic directions of forming procedures that are implemented in the design of industrial products and interiors in general.

KEYWORDS: Method, Combinatorics, Forms, Modules, Unification

2. INTRODUCTION

Relevance of the study is determined by the increase of the interest to the creation of a rational and functional interior design. XXI Century opens up new possibilities in the field of design development that are based on the use of structural links of combinatorial methods. Patterns research of spatial elements variative changes, and the methods of design objects ordering will push the design of industrial products. In addressing important design problems combinatorial design methods are the rational foundation. Relevant is the investigation of the combinatorial methods of forming which studies the changing of the geometry and the size of the overall object form, the composition of its parts and components.

In works of Genisaretskogo O. I., Saprykin N. A., Volkotruba I. T., Pronin E. S. [1-5] the particularities of combinatorial methods in the design objects are described. Genisaretsky regards the design of each new object not in isolation but in the context of using the unification method, a certain set of parametric series of combinatorial elements. Pronin divides the structure of combinatorial process to the formal and conceptual level, which includes the general idea, its specification, search of decorative combinatorial element. Design has been investigating intensively in Ukraine over the last decade. But the use and implementation of the combinatorial process methods is based on the geometric forming of design object.

Objective is the identifying of the optimal combinatorial methods of design objects forming in the works of modern Ukrainian designers.

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3. BASIC INFORMATION

Combinatorial methods of forming are used in the objects design identifying the combination and placement of the structural elements of the form, its composition.

Combinatorial elements in the design objects planning can have different Traditionally choosing a combinatorial element Ukrainian designers, as design over the world, first of all apply to the prism, most often to tetrahedral. The common design object with combinatorial prismatic elements in the Ukrainian residential interiors is wardrobe, traditionally known as sliding wardrobe (Fig. 1).

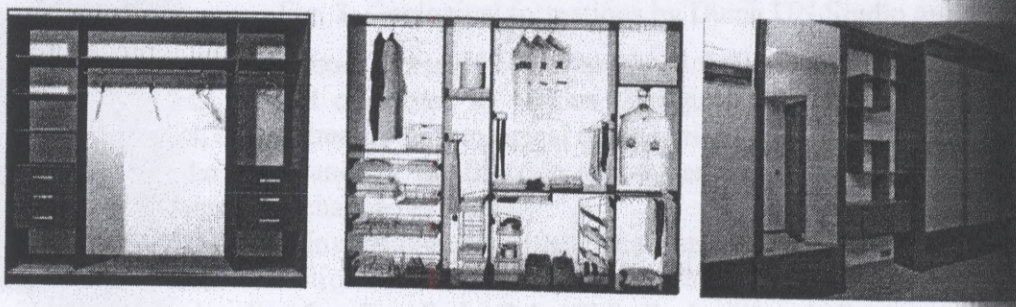

Fig. 1. Sliding door wardrobe

The prism may have rounding, but that does not change its main geome nature. Brick furniture set of KiBiSi design studio is made as masonry. A "Ston wall is formed by cushions folded and joined together in the proper order.

The number of edges can grow. The prism, as a basic element of combinatorics can be wrong. The more complex the shape, the more interesting to crea combinatorial composition, but also more difficult for designer to develop such form Streetwalk outdoor seats by Charlie Davidson do not have combinatorial element (Fig. 2).

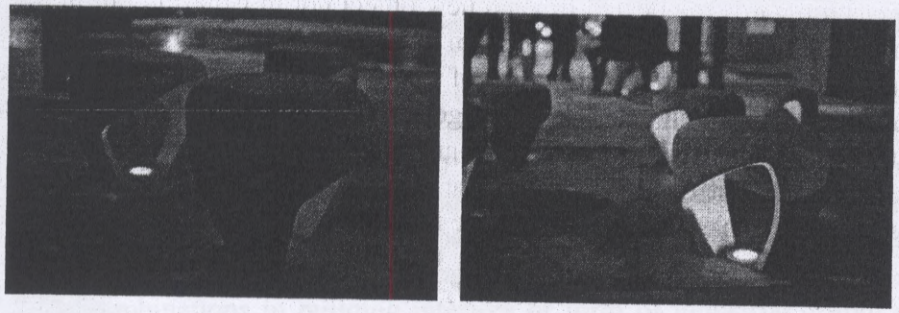

Fig. 2. Streetwalk outdoor seats by Charlie Davidson

You can design them so that they will be combinatorially connected. But at the same time the artistic image of "urban flowers" will be lost. To pick up a form to get a relatively new combinatorial element and make it perform a specific function is the

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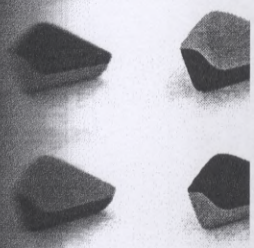

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portant design task. The prototype of such triangular sofas, as shown in Figure 3, for the Dutch UN Studio architects became geological formations.

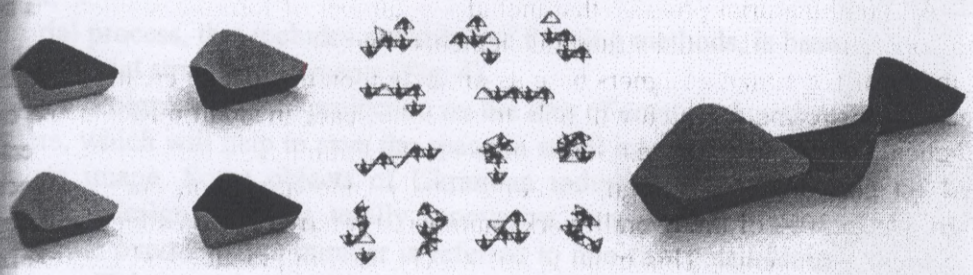


Fig. 3. Geological formations by Dutch UN Studio architects

These „stones", created of polyurethane foam on a steel frame and covered with cloth, can be combined in various configurations, rolled in different corners of rooms, or gathered in the geological compositions in the middle of the room. It means that the importance of the function and the artistic image must be considered while combinatorial change designing.

In selecting combinatorial element Japanese designer Kei Harada took into consideration streamlined form attractive to human and offered the concept of white "marshmallow" sofa called „O keeffe". Each pillow-ball is covered with a stretch fabric that allows the balls to remain undamaged. The form of the sofa is easily changed: chill-out can be easily transformed into a play area for children. The author suggested only the sleek-balls form, which can be classified as a variety of rotational surface.

The basic elements of „fun" cactus couch of Cerruti Baleri Company also represents rotational surface by its shape. But as the chosen artistic image required accordance to our certain perception, the forming line of the given surface was closer to the circular arc, than more lengthened by Kei Harada.

Unification method is effective for the industrial facilities design planning. This method uses a limited number of elements that can form the whole mass industrial production. It uses the unified ranks. There are two main directions in using unification in design practice: typical and intertypic. The latter is performed by creating and applying in diverse articles the same standardized elements – aggregates, components, details. Typical is implemented by creating and producing of unified series of standardized products or with a help of standard size series.

Constructing the shape of the object it is appropriate to use geometric operations: constructions, rearrangements, combinations, dense packing. Geometric combinations in building interiors or form of industrial design object is not always subject to the rules of geometry, the deviations from such rules are frequently observed, the so called deformation of mathematical construction logics.

Kineticism method applies to combinatorial design methods, in particular to the method of transformation. Kinetism is a kind of art, which is based on the idea of

form motion, any change of it. Kineticism method resides in establishing the form dynamics, decoration.

All combinatorial process, that includes a number of forming methods, is based on the operations with initial structural elements (Fig. 4).

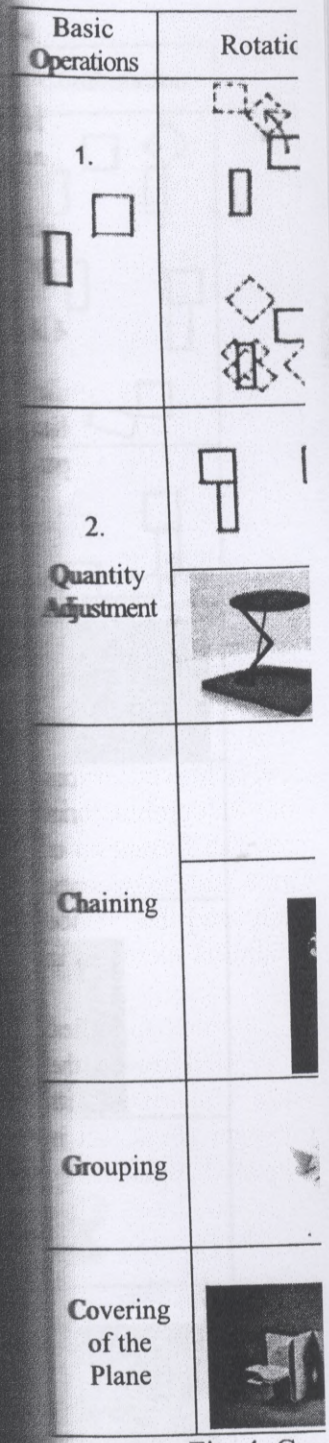
A number of Ukrainian designers base its projection on the idea of creating functional objects – transformers, which will help to save the space in small interiors and create aesthetically complete image. Some objects of Ukrainian industrial designers are based on combinatorial design, creating totally innovative concepts, provocative design. Up to 30% of the overall works number is referred to non-functional design due to their outrageous. This trend is not widely used in practice and it is explained by the conceptual approaches and the search for new forms.

Combinatorial forming methods are constantly used by such modern native designers, as Valery and Ekaterina Kuznetsov, Irina Belan, Ilya Taslitsky, Igor Ostapenko, Grytsya Erde, Andrew Galuska.

Valery and Ekaterina Kuznetsovy frequently use in their project the method of unification. More than half of their concepts are targeted on the non-functional design. Group of room chairs with „Nesun-Polkonosets, Nesun-Spynogris and Prosto Nesun", "Iksoobras" retractable elements (Fig. 5) are based on the use of operations with combinatorial elements. In this case, the main feature of the forming structure is the mechanism of drawers, their configuration can be modified, as this method makes it possible to treat the object as a prefabricated structure, „constructor". In "Iksoobras" concept it is created the chair with drawer and hooks for different needs. The drawer is selected as a structural element of this concept, and a group of functional hooks as an additional decorative combinatorial element.

Ilya Taslitsky offered the creation of "Tablet" chairs, which are based on the idea of saving space and designed for offices, namely, meeting rooms. «Tablet» chairs are configured so that if necessary they can be lifted from the floor. In the construction of this group, there are three details that should be connected. In this case, the basic is a combinatorial method of modularity. Certain parts of the object are interconnected with composite objects like modules; herewith the order of elements can differ. According to the type of operation with the structural elements Taslitsky development refers to the formation of the groups and changes in the number of elements. Operation with the formation of the groups was used in the project of the bar counter, which was designed in conjunction with bar stools. The main mechanism of the product is the design of sliding chairs.

Igor Ostapenko in his „Ostapenko" concept – a collapsible construction that transforms from one version of washbasin to another, – used kineticism method. In general, in most of his works, the designer is guided by the transformation process, the shift of one form to another. Forming with implementation of kineticism method allows us to obtain an unlimited number of combinations of specified basic structural elements. Basic operations are carried out with the object plane, the components of which are modified by the transfer, combinations.



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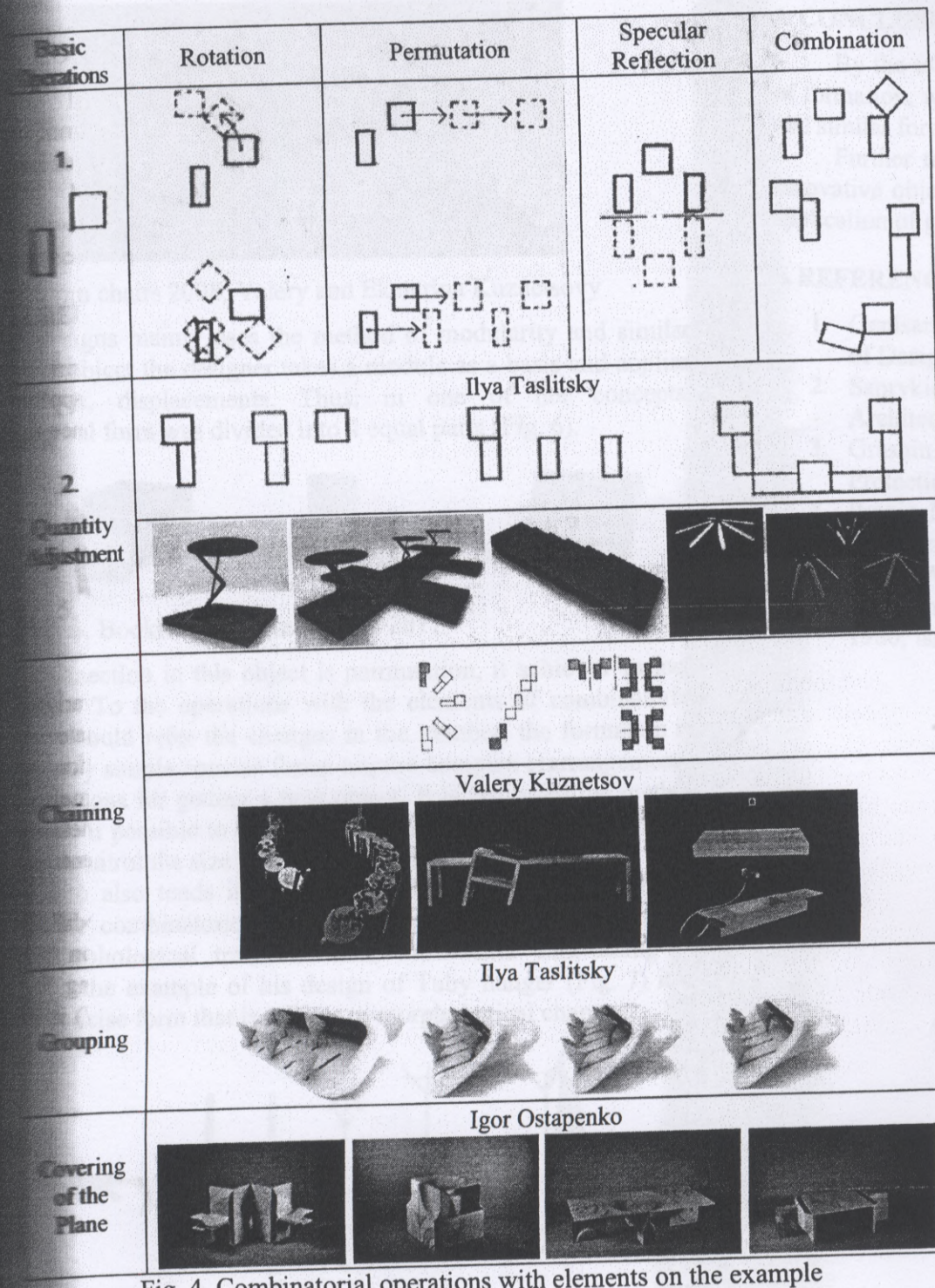

Fig. 4. Combinatorial operations with elements on the example of Ukrainian designers' works

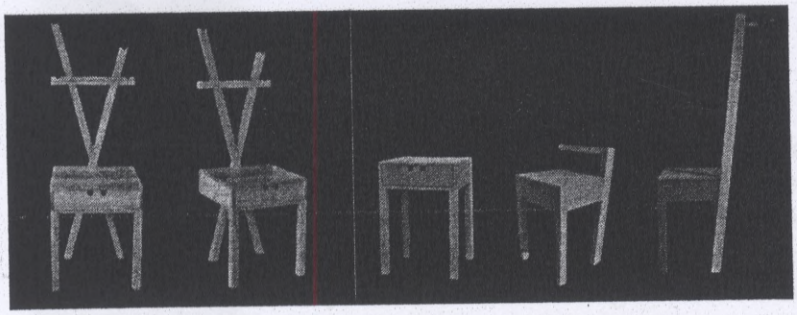

Fig. 5. Group of room chairs 2008, Valery and Ekaterina Kuznetsovy

Irina Belan in her designs mainly uses the method of modularity and similar forms. While designing the object the designer takes a module as a basis and applies it in various permutations, displacements. Thus, in one of her concepts, „Pooftransformer", the general form was divided into 4 equal parts (Fig. 6).

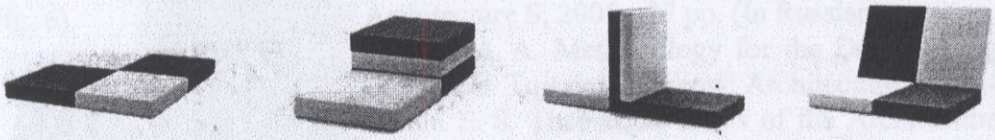

Fig. 6. Booklet Poof, Irina Belan. 2011

The main type of connection in this object is permutation, it achieves various compounds transformations. To the operations with the elements of combinatorial objects of Irina Belan we should refer the changes in the number, the formation of groups and chains. Seemingly simple concise forms require complex rearrangements, group formations and operations for getting a new object. It is also used the method of similar forms, that makes it possible to combine geometrically similar elements in a single object, it allows to control the size parameter, meaning.

Andrew Galuska, who also tends in his object design to complex modified models, often resorts to the combinatorics. In his projects, he is working on the process of the object morphological transformation, meanwhile considering its materials and structure. On the example of his design of Tuby hanger (Fig. 7) it is shown the way to build a concise form that is subject to morphological changes.

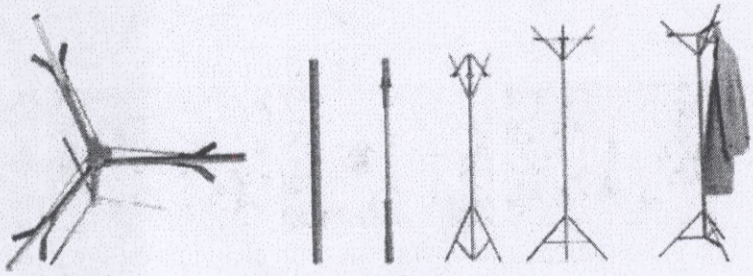

Fig. 7. Tuby Hanger, Andrew Galuska, 2011

4. CONCLUSIONS

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5. REFERENCES

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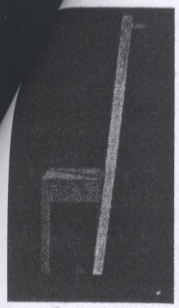

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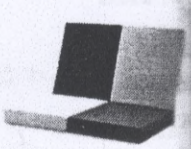

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CONCLUSIONS

By the example of Ukrainian designers' works it is reflected the basic methods formation, which are based on the combinatorics operations: a method of random and similar forms, modular combinatorial method, kinematics, method of unification.

Further tasks of the study consist in determining the features of forming the creative objects of industrial design based on the combinatorial methods with the application of geometric operations.

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Thursday, June 6, 2013,
Faculty of Civil Engineering, Azenes St 16/20, Room 132

Plenary Session **Session Chairman Vidmantas NENORTA**	**14:40**
Assessment of the Engineering Graphic Literacy Skills **Modris DOBELIS, Theodore BRANOFF, Imants NULLE**	
Combinatorial Methods Forming Objects of Design **Iryna KUZNETSOVA, Oktyabrina CHEMAKINA, Tatyana SHIMANSKAYA**	
Perspective View Possibilities **Rein MÄGI**	
Geometrical Education by Using Multimedia Presentation **Miodrag NESTOROVIĆ, Aleksandar ČUČAKOVIĆ, Nataša TEOFILOVIĆ, Biljana JOVIĆ**	
Symbols Used to Define a Projection Method and a Cartesian Coordinate System for a Three-Dimensional Space **Antanas VANSEVICIUS**	**16:20**
 **Coffee Break** **Room 136**	**16:20** **-** **17:00**

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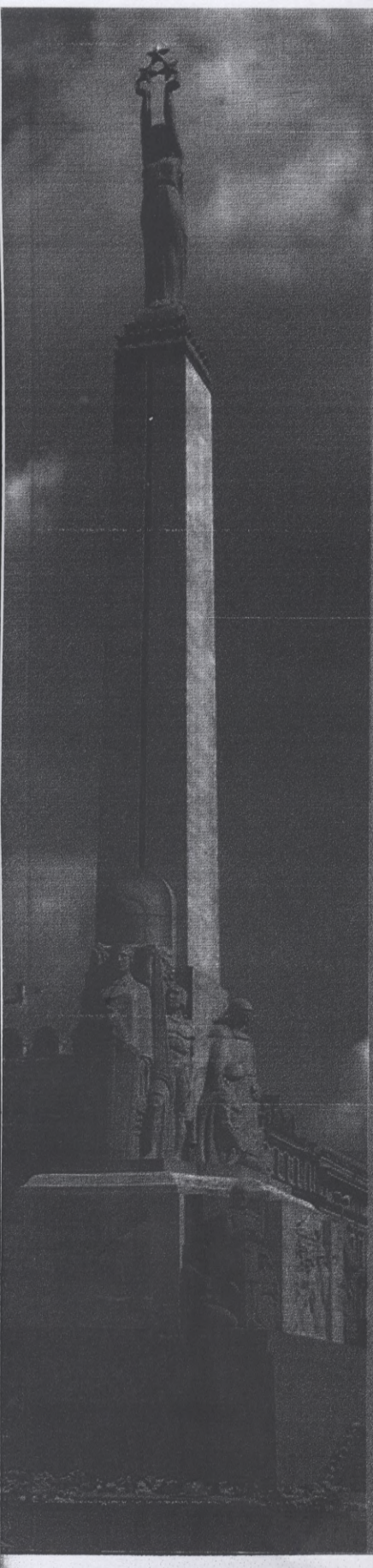

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