

Re-representation of Ludwig Mies van der Rohe's style by form generation

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received October 26, 2021 Received in revised form Nov. 12, 2021 Accepted December 20, 2022 Available online December 31, 2022</p> <p><i>Keywords:</i> Architectural modelling Form synth Industrial design</p> <p>*Corresponding author: Amanda Rosetia Department of Architecture, Faculty of Civil Engineering and Planning, Universitas Internasional Batam, Indonesia Email: amanda@uib.ac.id</p>	<p>Ludwig Mies van der Rohe is regarded as one of the pioneers of modernist architecture. Rohe's works in both architecture and products showed his own characteristics and these characteristics appeared repeatedly in different works. His design is simple and exquisite, and gradually formed Rohe's design vocabulary and style. The design of his works concise and refined, both elegant and popular. This research uses Form Synth style analysis to analyze Rohe's style characteristics and shaping rules, and integrates them in a form of construction. It summarizes the design process of Rohe's design style reproduction, and verifies the feasibility of form construction and redesigns the new products of Rohe's style. Products, hope to provide Rohe's design experience, so that Rohe's design style can be continued. It is more verified that the form construction method can be reproduced.</p>

Introduction

Rohe sought an objective approach that would guide the creative process of architectural design, but was always concerned with expressing the spirit of the modern era (Kim 2005). He is often associated with his fondness for the aphorisms, "less is more" and "God is in the details" (Duval 2019; simplifier.paris 2021). This research takes Rohe's three important architectural design works as the research object, carries out the shape analysis of his architectural design works, extracts the shape features of Rohe's architectural design works, and constructs the Rohe's design through the operation method of Form Synth. The shaping steps of the style are used as the basis for the design and creation of Rohe's architectural shaping furniture to achieve the purpose of design style reproduction. The purpose of this research are:

(1) Based on the shaping method of Form Synth, exploring Rohe's shaping style, shaping characteristics and elements, the boots reconstruct Rohe's design style shaping steps; (2) Using Rohe's modeling steps to create new products and furniture designs to achieve the purpose of style reproduction.

Shape grammar

Shape grammar is a method developed by Stiny and Gips in 1980 (Stiny 1980). They believe that there are rules to produce a new shape followed by changing the position, direction, reflection or size of the initial shape. Shaping grammar includes initial shapes and rules (Haakonsen, Rønnquist, and Labonnote 2022; El-Mahdy 2022). They are "a set of shape rules that apply in a step-by-step way to generate a set, or language, of designs" (Knight 1998) in both 2D and 3D space. Rule shaping is the application of

the initial shaping and the shaping produced by the previous rule application to produce the design. The graph (source) below demonstrates four simple additive rules in shape grammar

(Eilouti 2019). Changing the label position on the second added oblong can result in very different spatial relations and final designs (Gao 2020).

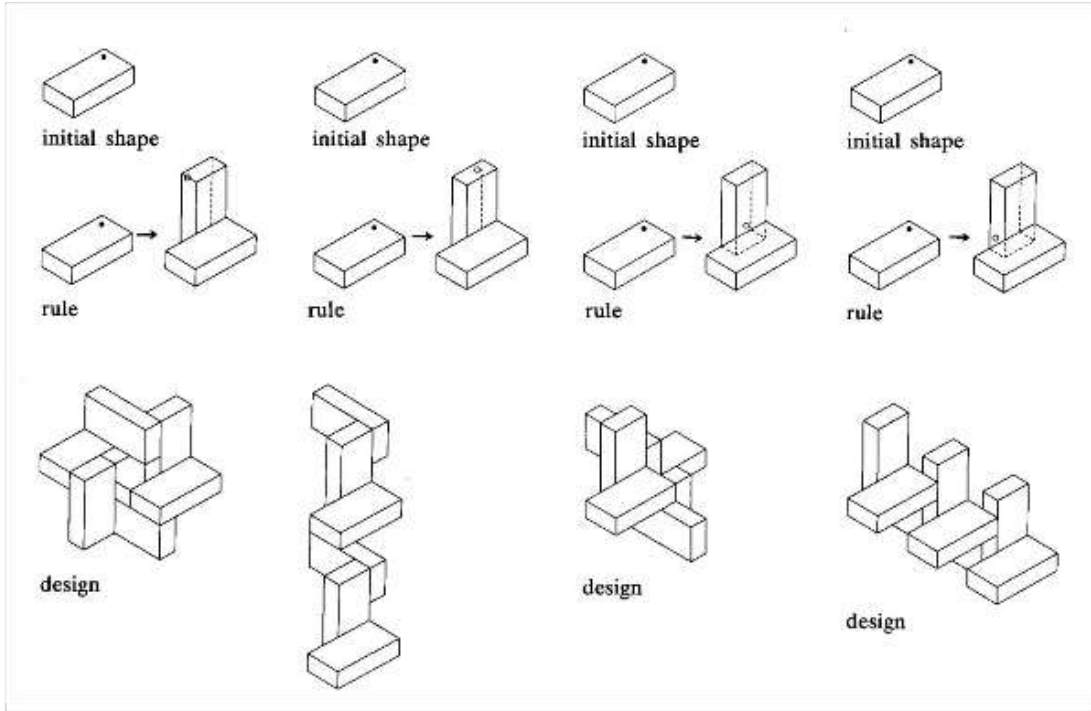


Figure 1. Shape grammar formula
Source: (Gao 2020)

Form synth

Form synth was proposed in an article by William Latham in 1986 (Latham et al. 2008a). Form Synth is a 3D interactive computer simulation system for sculptors (Latham et al. 2008b). Users use basic geometric shapes such as cylinders, cubes, cones and the sphere undergo a series of operations such as Scoop, Bulge, Stretch, Slice, Add and Subtract to obtain what you want to create for the shape, the artist selects one instruction at a time to gradually change the shape (as shown in figure 2) (Latham 1989). This method has considerable potential for mastering the exterior design of buildings, therefore this method is used to establish Rohe's style reproduction rules.



Figure 2. Form synth rule
Source: (Latham 1989)

Method

In this paper, we apply the same principle and philosophy of architectural style to designing form for an industrial design. Rohe's architectural style are being analyzed using Form Synth method to be transformed into a new language of industrial design.

Architectural modelling steps

The form synth method allows us to carefully define each part of the element to be developed. First, the top, middle and bottom operation allows us to significantly distinct the subtraction or addition of the form. Rohe has a similar and yet significant style for every works. Which cause a confusion at the first glance but when we take a closer look with the help of 3 parts division on his figure, his style can be variant to the six operations of form synth.

As the observation has a lack of primary data, our research are mainly focuses on defining and following the steps operation using the form synth and qualitative observation method. With the implementation of 5 Rohe's works, we put our observation into a table where all elements of form synth operation are determined in Rohe's designs. To later be the primary elements of our representation of his style.

Result and discussion

Form construction of architectural design

Form as a literal conception is a shape of constructed material. Form refers to primary elements to begin a construction or design stage development in architecture (Mitchell 1980). Begin with imagination for what has surrounded or an articulation of a line of poet to the extend where we saw something abstract and make it into our perception of form.

Architectural design develops the form of a building from users, site or neighborhood, space and layout, and material. These factors are commonly used to begin a design development (Ching 2007). Determining who are the user for our design can be very useful to what should we develop by meeting the user's requirement. Having an understanding of the site and planning surrounded of the later design can help us forming a desire and avoided advantage. And knowing what material to use as a core structure or finishing can add distinctive value to design the form.

Analysis and integration of architectural style

Through figure observation, we chose several works from Rohe and observe the figure to be analyzed into the Form Synth table. Shown in the figure below we divide the building into 3 parts: Top, Middle and Bottom. This first step is to determine how Rohe has develop his Architectural style through his work, what are the elements he has develop into the final form as a building, and where are the Form Synth method used in this figure.



Figure 3. Rohe's building 1 analysis diagram

Table 1. Bulding 1 analysis database

Building 1 analysis database (figure 3)				
S	Form method	Parts		
a	Basic shape	A1. cubes	A2. cuboids	
b	Personification three part	Top Middle Bottom	Top High < 1/3 High; Top Width = Width Middle High > 1/3 High ; Middle Width = Width Bottom High < 1/3 High ; Bottom Width > Width	
c	Add	Top Middle Bottom	C1-1. thin cuboid C2-1. thin cuboid C3-1. thin cuboid	C1-2. thick cuboid C2-2. thick cuboid C3-2. thick cuboid
d	Substract	Top Middle Bottom	D1-1. small cuboids D2-1. small cuboids D3-1. small cuboids	D1-2. large cuboids D2-2. large cuboids D3-2. large cuboids
e	Scoop	Top Middle Bottom	E1-1. depth E2-1. depth E3-1. depth	
f	Material		Cast Iron	Steel Glass
g	Color		Black	White Dark Grey

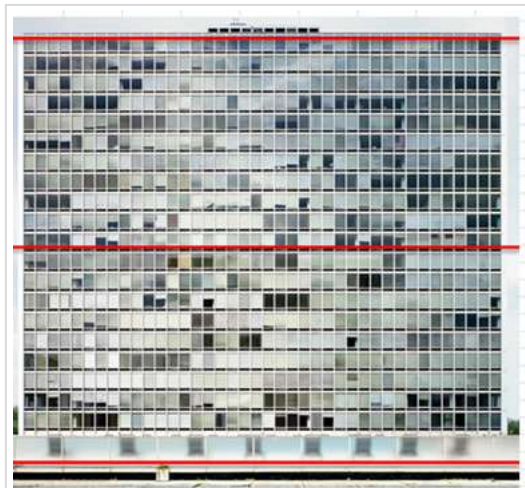


Figure 4. Rohe's building 2 analysis diagram

Table 2. Bulding 2 analysis database

Building 2 analysis database (Figure 4)				
S	Form method	Parts		
a	Basic shape	A1. cubes	A2. cuboids	
b	Personification three part	Top Middle Bottom	Top High > 1/3 High; Top Width < Width Middle High > 1/3 High ; Middle Width = Width Bottom High < 1/3 High ; Bottom Width > Width	
c	Add	Top Middle Bottom	C1-1. thin cuboid C2-1. thin cuboid C3-1. thin cuboid	C1-2. thick cuboid C2-2. thick cuboid C3-2. thick cuboid
d	Substract	Top Middle Bottom	D1-1. small cuboids D2-1. small cuboids D3-1. small cuboids	D1-2. large cuboids D2-2. large cuboids D3-2. large cuboids
e	Scoop	Top Middle Bottom	E1-1. depth E2-1. depth E3-1. depth	
f	Material		Cast Iron	Steel Glass
g	Color		Black	White Dark Grey

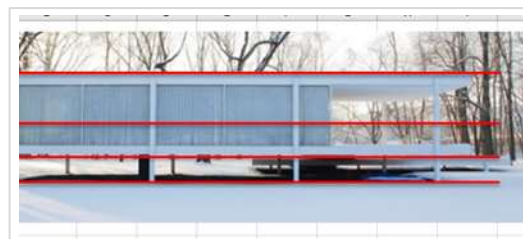


Figure 5. Rohe's building 3 Analysis diagram

Table 3. Bulding 3 analysis database

Building 3 analysis database (Figure 5)				
S	Form method	Parts		
a	Basic shape	A1. cubes	A2. cuboids	
b	Personification three part	Top	High < 1/3	A2. cuboids
		Middle	High; Top	
b	Personification three part	Bottom	Width < Width Middle	A2. cuboids
		Bottom	High > 1/3	
c	Add	Top	High; Middle	A2. cuboids
		Middle	Width = Width	
		Bottom	Bottom	
c	Add	Bottom	High < 1/3	A2. cuboids
		Bottom	High; Bottom	
		Bottom	Width > Width	
c	Add	Bottom	C1-1. thin cuboid	C1-2. thick cuboid
		Bottom	C2-1. thin cuboid	C2-2. thick cuboid
		Bottom	C3-1. thin cuboid	C3-2. thick cuboid
d	Substrat	Top	D1-1. small cuboids	D1-2. large cuboids
		Middle	D2-1. small cuboids	D2-2. large cuboids
		Bottom	D3-1. small cuboids	D3-2. large cuboids
e	Scoop	Top	E1-1. depth	A2. cuboids
		Middle	E2-1. depth	
		Bottom	E3-1. depth	
f	Material	Cast Iron	Steel	Glass
g	Color	Black	White	Dark Grey

Conclusion

As we know, each of every architecture work of Ludwig Mies van der Rohe has many similarities. Therefore, he becomes one of the architects that has a big impact on the architecture world.

Due to the thick style of Rohe's work, the final design does not seem to be complicated. Firstly, to keep the Rohe's fervor in the design. To interpret Rohe's style vividly. Secondly, the analysis from Form Synth database convey a practical and simple furniture with personification of top, middle and bottom ration with determined Material and Color. To a personal preference, a deep impression to remember Van der Rohe's soul in the work, a simple design has been carried.

The result that have been produced is not intended to be used, it is but for an exhibition. To show the connoisseurs that Ludwig Mies Van Der Rohe has a big impact on the architecture world, so that he is deserved to be remembered by us. Besides, the chair is made on purpose to show that it is based on Rohe's style. In the opinion, this product is not made to express one's style, but Rohe's.

This chair product is unique in the use of transparent material at the bottom part. According to the design, inside it is the mockup of one of Rohe's buildings.

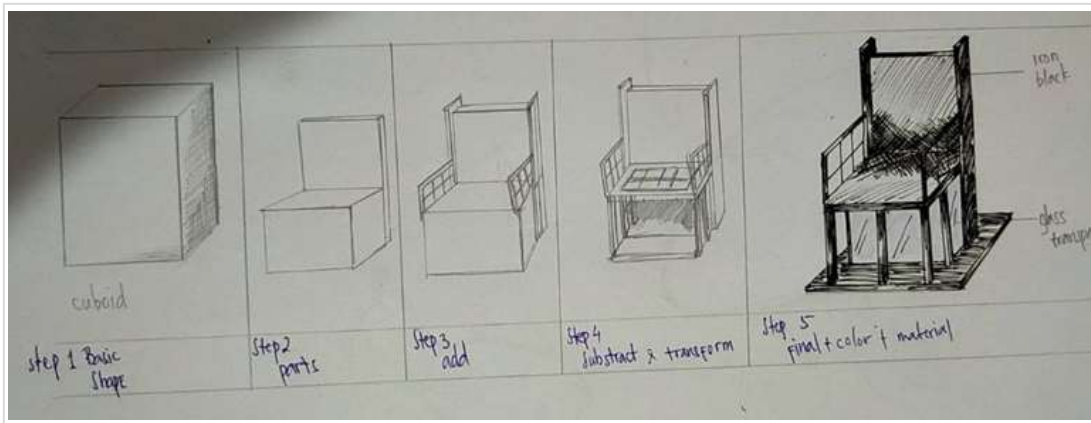


Figure 6. Design sketch

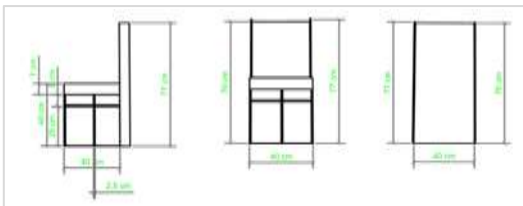


Figure 7. Chair dimension



Figure 8. 3D model and prototype

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Author(s) contribution

Ding-Yang Hsu contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Amanda Rosetia contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

Coral Aswanti contribute to methodology, supervision, and validation.

