

# Text-to-Image Generative Artificial Intelligence As Conceptual Mechanism For Architectural Design

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## ABSTRACT

This study investigates the potential of text-to-image generative AI applications to be used as exploration mechanisms for architectural design rather than mere visualisation tools. We examine whether text-to-image generative AI applications can "understand" architecture's spatial and geometric configuration in meaningful and creative ways. Our experimental method used a series of architectural plans and artistic patterns as image prompts, combined with varied text prompts and parameters to evaluate Midjourney's capacity for geometric and spatial interpretation and creativity. The experiments focused on the application's capacity to (1) generate diagrams from architectural plans, (2) create variations of two-dimensional drawings and patterns, and (3) transform two-dimensional layouts into three-dimensional spaces. Results indicate that Midjourney can generate meaningful abstractions and spatial configurations but struggles with strict spatial fidelity, particularly for asymmetrical or fragmented layouts. The study highlights the significance of short prompts and increased image weight parameters for improving fidelity and structural coherence. While Midjourney exhibits potential as a conceptual tool for highly creative architectural exploration, it lacks the precision required for deterministic spatial manipulation. Dall-E performs significantly better in fidelity and alignment to the original drawing, but further research is needed to determine its potential use as an assistive tool for architectural design. The findings contribute to the discourse on AI-assisted architectural design for creative ideation and suggest further research into the design capacities of other similar models.

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## 1. INTRODUCTION

Text-to-image generative AI applications can generate highly detailed images in response to user-provided phrases and keywords -so-called text prompts. The capacity of these platforms for creative agency has sparked debates and concerns among architects [1], [2], [3], although generative computational tools in architectural design are not new [4], [5]. As early as the 1960s, architects proposed ideas and developed methods to automate design processes within a context shaped by early forms of artificial intelligence, computational models in cognitive science, structuralism, and design methods theory. Some architects

introduced mathematical graphs and set theories to formalise architectural design using syntactic and associative rules [6], [7]; others leveraged evolutionary computing [8], [9], cellular automata [5], [10] or animation techniques such as dynamic field simulations [11], to generate and vary architectural drawings, forms, and patterns [12]. Applications for generating optimal floor plans using genetic algorithms are widely available [13], [14], while text-to-3D model AI is an active area of research [15], [16], [17].

Currently, text-to-image generative AI applications present substantial opportunities for architectural design exploration and the production of preliminary ideas [18], [19]. For example, practices like Zaha Hadid Architects (ZHA) use them for visual brainstorming during the early stages of design, while Coop Himmelb(l)au has leveraged these applications by creatively exploring the "space" of forms of the firm's extensive design legacy [20], [21]. Furthermore, recent studies in architectural education have highlighted the potential of text-to-image generative AI applications to foster student creativity and support the early conceptual stage of the design process by reducing cognitive load [22], [23], [24]. These developments present challenges for practitioners and educators, particularly in further refining these tools to facilitate creative exploration [25].

By employing the so-called "transformer" models, generative AI tools offer intuitive interfaces, easy incorporation into design workflows, and the capacity to enhance creative processes through rapid ideation and visualization [26]. While current applications of text-to-image generative AI in architectural design primarily focus on the formal and visual aspects of buildings, our study is concerned with the spatial, geometric, and diagrammatic configuration of architectural drawings. Our experimental method examines whether text-to-image AI applications can extract diagrammatic configurations, create variations of drawings, and transform two-dimensional shapes into three-dimensional spaces. We aim to determine whether text-to-image generative AI applications can be used as conceptual mechanisms, rather than visualization tools, that can collaboratively contribute to architects' abstract design thinking.

## 2. RESEARCH METHODOLOGY

### 2.1. Generative AI in the Context of Architectural Design

Architectural design is an iterative process evolving from abstract, open-ended schemes—typically conveyed through sketches—to concrete and comprehensive designs. While this process is characterised by exploration and sometimes regressive phases of gradual discovery, designers ultimately maintain control over the outcome [27]. In contrast, text-to-image generative AI lacks such user control due to its "black box" operations, where the transformation from user-provided text prompts to image output remains opaque and largely unpredictable [28]. Describing architecture in words raises questions regarding the relationship between language and architecture. Using language to narrate concepts, explain building features, or communicate construction methods has long been integral to the practice of architecture. Manuals such as *De Architectura* by Vitruvius, Villard de Honnecourt's sketchbook, and *De re Aedificatoria* by Alberti contained textual instructions and descriptions of buildings rather than conventional drawings. Even into the 20th century, Adolf Loos asserted that good architecture "can be written" [29], and Bernard Tschumi claimed that architecture cannot exist without text [30]. Language can expand our understanding and perception of architecture, but it cannot fully convey the designer's intentions due to the unbridgeable gap between textual and visual representation [31]. In text-to-image AI, the automated image generation process bypasses the critical step of conceptual translation from text to drawing. Nevertheless, some level of control over the outcome can be achieved by optimising the content and structure of text prompts through methods like 'prompt generators' and 'structured prompting' [32], [33], [34]. Users can also prompt the application to create alternative variations of the results or edit and evolve some selected images to get more satisfactory outcomes. They can even upload image prompts for the application to use as references or drawings and sketches to render accordingly [35], [36].

This study investigates whether text-to-image generative AI applications can be reoriented to make meaningful contributions to architectural design and practice by facilitating creative thinking and enhancing the cognitive processes essential to architectural design. This application requires a nuanced understanding of the underlying mechanisms driving AI-based generative tools, their potential capacity to "understand" the diagrammatic aspects of design, and the spatial and geometric configurations of architectural drawings. To this end, we pursued a series of experiments using Midjourney, a text-to-image generative AI tool, to test whether and to what extent the model could extract the geometric and spatial properties of architectural drawings and patterns. Midjourney is accessible through the Discord chat

platform. It generates images by combining a text prompt with a reference image using a latent diffusion model (LDM). It encodes the reference image into a latent space, extracting structural, colour, and composition features. Simultaneously, the text prompt is processed via a transformer-based language model, mapping semantic relationships. The model fuses both inputs through cross-attention mechanisms, guiding noise denoising in the diffusion process to synthesize an image that aligns with the reference's visual characteristics while adhering to the prompt's conceptual instructions. The final output emerges through iterative refinement, striking a balance between adherence to the reference image and interpretative creativity.

This research used both the latest version of the model (v6.1) and the earlier one (v5.2). Using text prompts and reference images of architectural plans and artistic patterns, we produced a series of output drawings according to 3 different categories: (a) diagrams, (b) variations of plans or patterns, (c) drawings of three-dimensional spaces. We were interested in the unpredictability inherent in the generation process and whether and to what extent we could control the output. Departing from the conventional focus of AI-driven tools in architectural design—often centered on generating forms or visual representations of buildings and spaces—our investigation emphasized abstract, diagrammatic, organizational, and geometric configurations that underlie architectural design.

## 2.2. Method

This research examined (a) whether the application could produce diagrammatic architectural drawings with a spatial, geometric and compositional structure that loosely aligns with those of the reference images, (b) whether it could vary the reference plans or patterns in a meaningful way and (c) whether it could extrude three-dimensional spaces out of the reference images. The steps used are uploading reference images of architectural drawings of plans, (b) uploading both architectural drawings and art patterns, and (c) uploading art patterns. For each reference image, we typed a text prompt that requested the application to (a) create a diagrammatic plan using the basic geometric shapes and relations of the reference images, (b) to vary the plans or patterns of reference images, and (c) to draw three-dimensional spaces according to the reference images. For each run, Midjourney returns four images. We used different text prompts for each reference image, varying the phrasing or parameters. In Midjourney, parameters are options that can be added to the text prompt to exert control over the resulting images or change some of their aspects and features (like aspect ratios, style, and so on).

This research used three parameters for (a) and (b). The “image weight” parameter (`--iw`) determines the degree of influence the reference image has on the results. Its default value is 1, which assigns equal weight to the reference image and the text prompt. The “stylise” parameter (`--stylise`) influences the artistic style of the outcomes (default value: 100). Low values produce images that closely match the prompt but are less creative. The “style” parameter and, in particular, the value “raw” (`--style raw`) allow more control over the outcomes when a specific style is preferred.








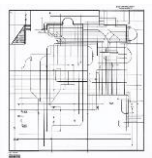







### 2.2.1. Diagrams

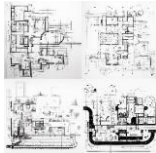

Four architectural drawings were used as reference image prompts: (d.A) first floor plan of Le Corbusier's Villa Savoye, (d.B) floor plan of Andrea Palladio's Villa Rotonda, (d.C) floor plan of Richard Meier's Atheneum, and (d.D) floor plan of the Pilgrimage Church at Banz. The images were uploaded in many instances, along with a text prompt requesting the generation of diagrammatic drawings that focused on geometric shapes and composition (Table 1). The free plan of Villa Savoye and Atheneum, as well as the classical layout of Villa Rotonda and the Pilgrimage Church, were chosen because they allowed us to see how the model responds to opposing versions of spatial arrangements.





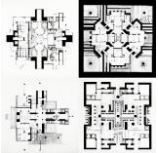
To determine the optimal use of the parameters, we conducted numerous trials with reference images (Villa Savoye and Villa Rotonda), sometimes omitting one or more parameters and sometimes using values other than their default settings. In all parts of this experiment, we specified the “image weight” parameter to 2, meaning the application prioritised the image over the text prompt. We mostly set the “stylise” parameter to 0 to produce more diagrammatic and abstract drawings, avoiding stylistic biases [37]. For the parameter “style”, we opted for the value “raw”, which returns results with less automatic beautification applied and more accurately resemble diagrammatic styles. We ran the text and image prompts in both the default version of the model (v. 6.1) and its older version (v. 5.2). Each run was evaluated according to the following criteria:

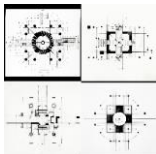
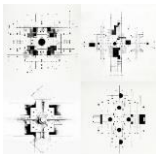
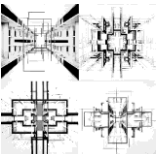
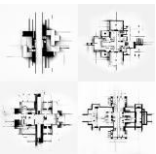
- **Alignment:** The extent to which outcomes loosely align with the reference images. The result should retain some basic geometric shapes and structural relationships but does not have to match the reference drawing. Values: Low, if there was no alignment between the outcome and the reference image, moderate, if there was some loose alignment, and high, if there was alignment in terms of overall composition.
- **Abstraction:** The extent of abstraction of the graphical makeup of the outcomes. Values: low, moderate, high.


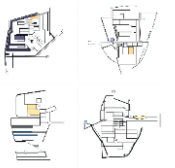
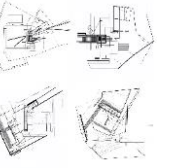
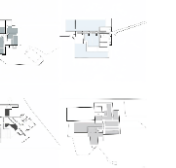

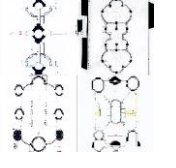
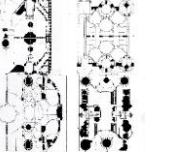
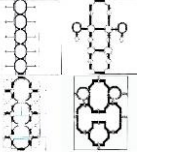
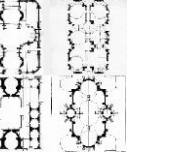
Table 1. Diagrams

Reference Image d.A. First Floor Plan of Villa Savoye					
<b>Prompts</b>	d.A1: Create diagram --iw 2 --6.1	d.A2: Create diagram --stylize 0 --iw 2 --6.1	d.A3: Create diagram --style raw --iw 2 --6.1	d.A4: Create diagram --style raw --stylize 0 --iw 2 --6.1	d.A5: Create diagram --style raw --iw 2 --6.1
<b>Output</b>					
<b>Evaluation</b>	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High
<b>Prompts</b>	A6: Create diagram that represents this plan --style raw --stylize 0 --iw 2 --6.1	A7: Create abstract line diagram --style raw --stylize 0 --iw 2 --6.1	A8: Line diagram -style raw --stylize 0 --iw 2 --6.1	A9: Create black and white line diagram out of the plan, keep main lines --style raw --stylize 0 --iw 2 --6.1	A10: Create diagram of this plan of Villa Savoye --style raw --stylize 0 --iw 2 --6.1
<b>Output</b>					
<b>Evaluation</b>	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: Low	Alignment: Moderate Abstraction: Low
<b>Prompts</b>	A11: Create diagram --style raw --stylize 0 --iw 2 --v 5.2	A12: Create diagram --style raw --stylize 0 --iw 2 --v 5.2	A13: Black and white line diagram --style raw --stylize 0 --iw 2 --v 5.2	A14: Black and white line diagram ::4 --iw 2 --v 5.2	A15: Black and white line drawing of plan, main patterns, basic geometric shapes --5.2
<b>Output</b>					
<b>Evaluation</b>	Alignment: Moderate Abstraction: Low	Alignment: Moderate Abstraction: Low	Alignment: Moderate Abstraction:	Alignment: Moderate Abstraction:	Alignment: Low Abstraction: Moderate

	Moderate	Moderate
Prompts	A16: Create black and white line diagram out of the plan, keep main lines, --no grids --5.2	A17: Create black and white line diagram, basic geometric shapes, main patterns --5.2
Output		
Evaluation	Alignment: Low Abstraction: Low	Alignment: Moderate Abstraction: Moderate

Reference Image d.B. Floor plan of Villa Rotonda					
Prompts	d.B1: Create diagram --style raw --stylize 0 --iw 2--6.1	d.B2: Create diagram according to the plan of the image --style raw --stylize 0 --iw 2 --6.1	d.B3: Create diagram of this plan of villa rotonda --style raw --stylize 0 --iw 2 --6.1	d.B4: Create diagram of this plan of villa rotonda --style raw --stylize 0 --6.1	d.B5: Black and white line drawing of plan, main patterns, basic geometric shapes --5.2
Output					
Evaluation	Alignment: High Abstraction: High	Alignment: High Abstraction: Moderate	Alignment: Moderate Abstraction: Low	Alignment: Moderate Abstraction: Low	Alignment: High Abstraction: Low

Prompts	d.B6: Black and white line diagram, main geometry, regulating lines -5.2	d.B7: Black and white line diagram, geometric structure --5.2	d.B8: Black and white line diagram, geometric structure, main walls are represented as think red lines, create symmetry axes along the main corridors --5.2	d.B9: Abstract black and white line diagram, represent the geometry of the plan with abstract diagram, --no circles --5.2
Output				
Evaluation	Alignment: High Abstraction:	Alignment: High Abstraction:	Alignment: Moderate	Alignment: Moderate

	Moderate	Moderate	Abstraction: Low	Abstraction: Low	
Reference Image d.C. Floor Plan of Athenaeum					
<b>Prompts</b>	d.C1: Create diagram --style raw --stylize 0 --iw 2 --v 6.1	d.C2: Create diagram --style raw --iw 2 --v 6.1	d.C3: Abstract black and white line diagram, represent the geometry of the plan with abstract diagram --style raw --stylize 0 --iw 2 --v 6.1	d.C4: Create diagram --style raw --stylize 0 --iw 2 --v 5.2	d.C5: Abstract black and white line diagram, represent the geometry of the plan with abstract diagram, --no circles --5.2
<b>Output</b>					
<b>Evaluation</b>	Alignment: Moderate Abstraction: High	Alignment: Moderate Abstraction: High	Alignment: Low Abstraction: Moderate	Alignment: Low Abstraction: Moderate	Alignment: Low Abstraction: Moderate
Reference Image d.D. Ground Floor plan of Pilgrimage Church at Banz					
<b>Prompts</b>	d.D1: Create diagram --style raw --stylize 0 --iw 2 --v 6.1	d.D2: Black and white line diagram of plan, main patterns, basic geometric shapes --style raw --stylize 0 --iw 2 --v 6.1	d.D3: Create diagram --style raw --stylize 0 --iw 2 --v 5.2	d.D4: Black and white line diagram of plan, main patterns, basic geometric shapes --style raw --stylize 0 --iw 2 --v 5.2	
<b>Output</b>					
<b>Evaluation</b>	Alignment: High Abstraction: High	Alignment: Moderate Abstraction: Moderate	Alignment: High Abstraction: Moderate	Alignment: High Abstraction: Moderate	

## Results

- Reference image d.A (Villa Savoye): Model version 6.1 returned more abstract drawings (score: high), which aligned loosely (score: low) with the reference images (d.A1-d.A8). Short text prompts, such as "Create diagram" or "Line diagram," were rated as high on both the alignment and abstraction criteria (d.A1-d.A8). Longer text prompts, especially those that contained the words "plan" and "Villa Savoye", returned results that scored low in the abstraction criterion (d.A9-d.A12, d.A16).
- Reference image d.B (Villa Rotonda): Both versions of the model returned results that aligned with the overall composition (score: high) of the plan of the reference image (d.B1-d.B2, d.B5-d.B7). No outcome scored low on the alignment criterion. Compared to the Villa Savoye example results, symmetrical and centrally organised spatial structures score higher on the alignment criterion. For the abstraction criterion, only d.B1 scored high. d.B2 and d.B6-d.B7 scored moderate abstraction. Long text prompts or prompts that included the name of the building of the reference image were



rated as low on the alignment criterion (d.B4, d.B8-d.B9) and as low on the abstraction criterion (d.B3-d.B5 and d.B8-d.B9).

- Reference image d.C (Atheneum): Model version 6.1 with shorter text prompts returned more abstract results (abstraction score: moderate), which were also more aligned with the initial image (alignment score: low) than those produced with model version 5.2. Yet, the results of both models did not manage a high level of abstraction or alignment. Longer text prompts in both models scored lower on both criteria (d.C3, d.C5).
- Reference image d.D (Pilgrimage church at Banz): Both versions of the model returned results that aligned with the overall composition (score: high) of the plan of the reference image which confirms once again (as also shown for reference image d.B) that symmetrical and centrally organised spatial structures score high on the alignment criterion. Again, shorter text prompts tend to score higher on both the alignment and the abstraction criteria.






### 2.2.2. Variations











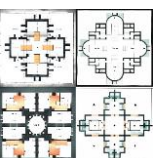
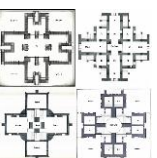
In this part of the experiment, we investigated whether the application could transform and vary architectural plans and patterns in a meaningful and creative manner. Our interest was not in creativity as an expression of absolute freedom but in results that exhibited variability within the confines of the geometric configuration and spatial arrangement of the reference plans and patterns. To this end, we uploaded three architectural plans and two patterns as reference images on Midjourney: (A) first floor plan of Le Corbusier's Villa Savoye, (B) floor plan of Andrea Palladio's Villa Rotonda, (C) floor plan of the Pilgrimage Church at Banz (D) the artwork Random Walk-Through Raster and (E) a Bauhaus Poster. Again, the architectural plans were chosen because they represent two opposing versions of spatial arrangement, while the patterns were selected because they emphasise two different pattern compositions, (D) with shapes and (E) with lines. These reference images were accompanied by text prompts requesting the generation of variations. We ran the application multiple times for each reference image, with changes in both the text prompts and the parameters. We used two text prompts: a short one and a more extended version (see Table 2). Again, for the most part, we set the "stylise" parameter to 0 because we wanted to produce less artistic drawings (although when we put the value to 1000, no significant changes occurred). Consistently, the results were rated higher when the "image weight" (-iw) parameter was set to a value of 2, ensuring that the reference image had a strong influence on the generated outcome.

The reference image prompts, the corresponding text prompts with the specified parameters, the iterations for each prompt and the evaluations are shown in Table 2. We ran the text and image prompts in both the default version of the model (v. 6.1) and its older version (v. 5.2). Each run was evaluated according to the following criteria:

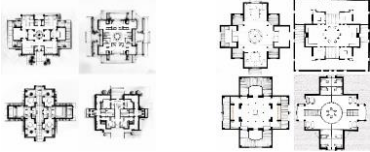
- **Immutability:** The extent to which the outcomes maintained the geometric configuration or spatial arrangement of the reference images—low, moderate, high values.
- **Variability:** The extent to which the outcomes varied the geometric configuration or spatial arrangement of the reference images in meaningful and creative ways—low, moderate, high values.

**Table 2.** Variations


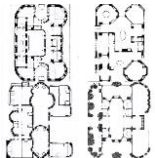
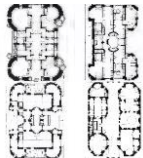
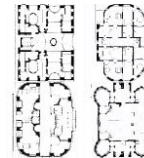
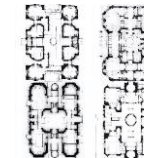
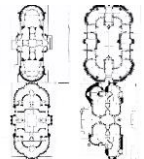
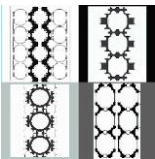
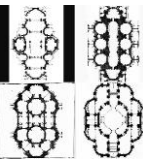
Reference Image v.A. First Floor plan of Villa Savoye					
Prompts	v.A1: Create variations --stylize 0 --iw 2 --v 6.1	v.A2: Create variations --style raw --stylize 0 --iw 2 --v 6.1	v.A3: Create variations, black and white line drawing, 2d floor plan, top view --iw 2 --v 6.1	v.A4: Create variations, black and white line drawing, 2d floor plan, top view --stylize 0 --iw 2 --v 6.1	v.A5: Create variations, black and white line drawing, 2d floor plan, top view --style raw --stylize 0 --iw 2 --v 6.1
Output					

<b>Evaluation</b>	Immutability: Moderate Variability: Low	Immutability: Moderate Variability: Moderate	Immutability: Low Variability: High	Immutability: Low Variability: High	Immutability: Low Variability: High
<b>Prompts</b>	v.A6: Create variations --style raw --stylize 0 --iw 2 --v 5.2	v.A7: Create variations, black and white line drawing, 2d floor plan, top view --style raw --stylize 0 --iw 2 --v 5.2			
<b>Output</b>					
<b>Evaluation</b>	Immutability: Low Variability: Moderate	Immutability: Low Variability: Moderate			
Reference Image v.B. Floor plan of Villa Rotonda					
<b>Prompts</b>	v.B1: Create variations --iw 2 --6.1	v.B2: Create variations --style raw --iw 2 --6.1	v.B3: Create variations --style raw --stylize 0 --iw 2 --6.1	v.B4: Create variations, black and white line drawing, 2d floor plan, top view --6.1	v.B5: Create variations, black and white line drawing, 2d floor plan, top view, --iw 2 --6.1
<b>Output</b>					
<b>Evaluation</b>	Immutability: High Variability: Moderate	Immutability: High Variability: Moderate	Immutability: High Variability: Moderate	Immutability: Low Variability: Moderate	Immutability: Moderate Variability: High
<b>Prompts</b>	v.B6: Create variations, black and white line drawing, 2d floor plan, top view, --style raw --stylize 0 --6.1	v.B7: Create variations, black and white line drawing, 2d floor plan, top view, --style raw --stylize 0 --iw 2 --6.1"	v.B8: Create variations --iw 2 --v 5.2	v.B9: Create variations --style raw --iw 2 --v 5.2	v.B10: Create variations --style raw --stylize 0 --iw 2 --v 5.2
<b>Output</b>					
<b>Evaluation</b>	Immutability: Low Variability: Moderate	Immutability: High Variability: High	Immutability: High Variability: Moderate	Immutability: High Variability: High	Immutability: High Variability: High
<b>Prompts</b>	v.B11: Create variations, black and white line drawing, 2d floor plan, top view, --iw 2 --5.2	v.B12: Create variations, black and white line drawing, 2d floor plan, top view, --style raw --stylize 0 --iw 2 --v 5.2			


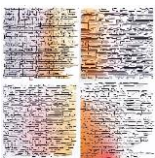





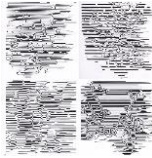


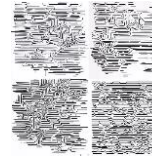

<b>Output</b>	
<b>Evaluation</b>	Immutability: High Variability: High



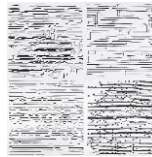
Reference Image v.C. Ground Floor plan of Pilgrimage church at Banz

<b>Prompts</b>	v.C1: Create variations --style raw --stylize 0 --iw 2 --v 6.1	v.C2: Create variations, black and white line drawing, 2d floor plan, top view --stylize 0 --iw 2 --v 6.1	v.C3: Create variations, black and white line drawing, 2d floor plan, top view --stylize 1000 --iw 2 --v 6.1	v.C4: Create variations, black and white line drawing, 2d floor plan, top view --style raw --stylize 0 --iw 2 --v 6.1	v.C5: Create variations, black and white line drawing, 2d floor plan, top view --style raw --stylize 1000 --iw 2 --v 6.1
<b>Output</b>					
<b>Evaluation</b>	Immutability: Low Variability: Moderate	Immutability: Moderate Variability: High	Immutability: Moderate Variability: High	Immutability: Low Variability: High	Immutability: Moderate Variability: High
<b>Prompts</b>	v.C6: Create variations, black and white line drawing, 2d floor plan, Baroque church, top view --style raw --stylize 0 --iw 2 --v 6.1	v.C7: Create variations --style raw --stylize 0 --iw 2 --v 5.2	v.C8: Create variations, black and white line drawing, 2d floor plan, Baroque church, top view --style raw --stylize 0 --iw 2 --v 5.2		
<b>Output</b>					
<b>Evaluation</b>	Immutability: Moderate Variability: High	Immutability: Low Variability: Moderate	Immutability: Moderate Variability: High		

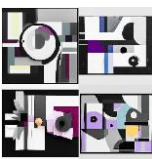

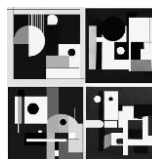
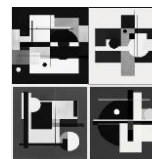
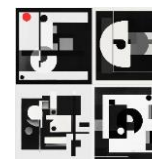
Reference Image v.D. Random Walk Through Raster

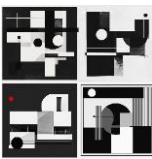

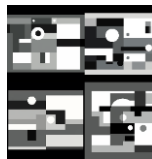
<b>Prompts</b>	v.D1: Create variations --style raw --stylize 0 --iw 2 --v 6.1	v.D2: Create variations --style raw --stylize 1000 --iw 2 --v 6.1	v.D3: Create variations --iw 2 --v 6.1	v.D4: Create variations --style raw --iw 2 --v 6.1	v.D5: Create variations --style raw --stylize 0 --iw 2 --v 6.1
<b>Output</b>					
<b>Evaluation</b>	Immutability: High Variability: High	Immutability: High Variability: High	Immutability: High Variability: High	Immutability: High Variability: High	Immutability: High Variability: High

Prompts	v.D6: Create variations, black and white line drawing --iw 2 --v 6.1	v.D7: Create variations, black and white --iw 2 --v 6.1	v.D8: Create variations, black and white --style raw --stylize 0 --iw 2 --v 6.1	v.D9: Create variations, black and white line drawing --stylize 0 --iw 2 --v 6.1	v.D10: Create variations, black and white line drawing --style raw --stylize 0 --iw 2 --v 6.1
Output					
Evaluation	Immutability: High Variability: High	Immutability: High Variability: High	Immutability: High Variability: High	Immutability: High Variability: High	Immutability: High Variability: High

Prompts	v.D11: Create variations, black and white line drawing --stylize 1000 --iw 2 --v 6.1	v.D12: Create variations, black and white line drawing --style raw --stylize 0 --iw 2 --v 6.1	v.D13: Create variations, black and white line drawing --style raw --stylize 0 --iw 2 --v 5.2		
Output					
Evaluation	Immutability: High Variability: High	Immutability: High Variability: High			

Reference Image v.E. Bauhaus Poster

Prompts	v.E1: Create variations --style raw --stylize 0 --iw 2 --v 6.1	v.E2: Create variations --stylize 0 --iw 2 --v 6.1	v.E3: Create variations, black and white bauhaus poster --style raw --stylize 0 --iw 2 --v 6.1	v.E4: Create variations, black and white bauhaus poster --iw 2 --v 6.1	v.E5: Black and white bauhaus poster --iw 2 --v 6.1
Output					
Evaluation	Immutability: Low Variability: High	Immutability: Low Variability: High	Immutability: Moderate Variability: High	Immutability: Moderate Variability: High	Immutability: Moderate Variability: High

Prompts	v.E6: Black and white bauhaus poster --v 6.1	v.E7: Create variations, 2d drawing, --iw 2 --v 5.2	v.E8: Create variations --style raw --stylize 0 --iw 2 --v 5.2		
Output					
Evaluation	Immutability: Moderate Variability: High	Immutability: Low Variability: High	Immutability: Low Variability: High		

## Results

- Reference image v.A (Villa Savoye): In terms of the immutability criterion, all results were rated as low (v.A3-v.A7) or moderate (v.A1-v.A2). On the variability criterion, those with the extended version of the text prompt from version 6.1 were rated as high (v.A3-v.A5). v.A1 scored low and v.A2, v.A6, v.A7 scored moderate. Besides maintaining the overall layout and rectangular plan, the application could not return results that retained the spatial arrangement of the plan.
- Reference image v.B (Villa Rotonda): There were no significant differences in the results from both model versions. In nearly all iterations that used the more extended version of the text prompt, the outcomes demonstrated high variability levels while preserving the plan's fundamental spatial arrangement (v.B5, v.B7, v.B11, v.B12). These iterations scored high on both evaluation criteria. Iterations that omitted the "image weight" parameter in the text prompt (v.B4 and B6) scored lower on the immutability criterion and achieved moderate scores for variability.
- Reference image v.C (Pilgrimage church at Banz): In both versions of the models, the short text prompt returned results that scored low and moderate on the immutability and variability criteria, respectively (v.C1, v.C7). The extended version of the text prompt yielded results with low (v.C4) to moderate (v.C2, v.C3-v.C6) scores on the immutability criterion. Yet, on the variability criterion, all results with extended prompts were rated as high (v.C2-v.C6, v.C8).
- Reference image v.D (Random Walk-Through Raster): All results scored high in both criteria and versions. The "stylize" parameter had to be set to 0 to avoid the generation of coloured graphic additions on the main image (v.D2-v.D4). Neither the short nor the extended versions of the prompt significantly affected the outcomes.
- Reference image v.E (Bauhaus Poster): All results in both versions of the model scored high on the variability criterion. Regarding the immutability criterion, results with the short text prompt ("create variations") scored low in both versions of the model (v.E1-v.E2 and E7-v.E8). On the same criterion, results with text prompts where the phrase "black and white Bauhaus poster" was added scored moderate (v.E3-v.E6).

### 2.2.3. Three-Dimensional Space

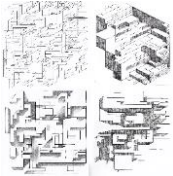
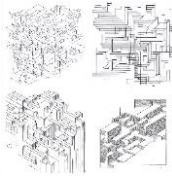
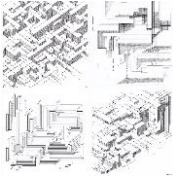
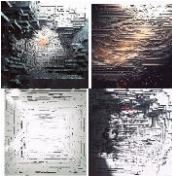
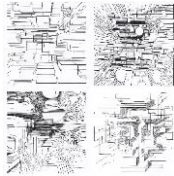
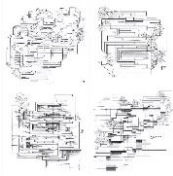













In this part of the experiment, we examined the application's capacity to transform two-dimensional drawings into three-dimensional space. We tested whether it could extrude three-dimensional spaces out of reference images of two-dimensional patterns. We uploaded two patterns as reference images on Midjourney: (A) the artwork Random Walk-Through Raster and (B) a Bauhaus Poster. Short and extended versions of the text prompt were used to generate three-dimensional spaces or axonometric drawings.

The reference image prompts, the corresponding text prompts with the specified parameters, the iterations for each prompt and the evaluations are shown in Table 3. We ran the text and image prompts in both the default version of the model (v. 6.1) and its older version (v. 5.2). Each run was evaluated according to the following criteria:






- **Depth:** The extent to which the outcomes depicted three-dimensional space with perceivable depth—low, moderate, high values.
- **Fidelity (to its original 2-dimensional configuration):** The extent to which the outcomes corresponded to the 2-dimensional configuration of the image prompt. Values: low, moderate, high

**Table 3.** Three-Dimensional Space




Reference Image 3d.A. Random Walk Through Raster					
Prompts	3d.A1: Extrude lines to create three-dimensional walls, axonometric line drawing --v 6.1	3d.A2: Extrude lines to create three-dimensional walls, axonometric line drawing --v 6.1	3d.A3: Extrude lines to create three-dimensional walls, axonometric line drawing iw 2, style raw, stylize 0 --v 6.1	3d.A4: Three-dimensional space iw 2, style raw, stylize 0 --v 6.1	3d.A5: Three-dimensional space, line drawing iw 2, style raw, stylize 0 --v 6.1

<b>Output</b>					
<b>Evaluation</b>	Depth: Moderate Fidelity: Moderate	Depth: Moderate Fidelity: High	Depth: Moderate Fidelity: High	Depth: High Fidelity: Moderate	Depth: High Fidelity: Moderate
<b>Prompts</b>	3d.A5: Axonometric line drawing iw 2, stylize 0, style raw --v 6.1	3d.A6: Create three-dimensional walls iw 2, stylize 0, style raw --v 6.1	3d.A7: Extrude this plan to create three-dimensional walls iw 2, stylize 0 style raw --v 6.1	3d.A8: Extrude lines to create three-dimensional walls, axonometric line drawing --v 5.2	3d.A9: Extrude lines to create three-dimensional walls, axonometric line drawing --v 5.2
<b>Output</b>					
<b>Evaluation</b>	Depth: Low Fidelity: High	Depth: Low Fidelity: High	Depth: Low Fidelity: Moderate	Depth: Moderate Fidelity: Moderate	Depth: Moderate Fidelity: Moderate
<b>Prompts</b>	3d.A10: Extrude its lines to look like a labyrinth, axonometric line drawing ::1 --v 5.2	3d.A11: Three-dimensional space --v 5.2	3d.A12: Extrude this plan to create three-dimensional walls --v 5.2	3d.A13: Extrude this plan to create three-dimensional walls --v 5.2	
<b>Output</b>					
<b>Evaluation</b>	Depth: High Fidelity: Low	Depth: Low Fidelity: Moderate	Depth: Low Fidelity: Moderate	Depth: Low Fidelity: Moderate	
<b>Reference Image 3d.B. Bauhaus Poster</b>					
<b>Prompts</b>	3d.B1: Extrude this plan to create three-dimensional walls, axonometric drawing, --style raw -stylize 0 --iw 2 --v 6.1	3d.B2: Three-dimensional space --iw 2 --v 6.1	3d.B3: Extrude the image to create three dimensional walls and spaces --v 6.1	3d.B4: Extrude this plan to create axonometric drawing --v 6.1	3d.B5: Extrude the image to create three dimensional walls and spaces --v 6.1
<b>Output</b>					
<b>Evaluation</b>	Depth: Low Fidelity: Moderate	Depth: Low Fidelity: Moderate	Depth: High Fidelity: Low	Depth: Moderate Fidelity: Moderate	Depth: High Fidelity: Low



<b>Prompts</b>	3d.B6: Extrude shapes to create three-dimensional space --v 6.1	3d.B7: Extrude shapes to create three-dimensional abstract spaces --v 6.1	3d.B8: Use shapes to create axonometric drawing --v 6.1	3d.B9: Use shapes to create axonometric drawing --v 6.1	3d.B10: Three-dimensional space --iw 2 --v 5.2
<b>Output</b>					
<b>Evaluation</b>	Depth: High Fidelity: Low	Depth: High Fidelity: Low	Depth: Moderate Fidelity: Low	Depth: Moderate Fidelity: Low	Depth: Moderate Fidelity: Low

<b>Prompts</b>	3d.B11: Extrude shapes to create three-dimensional space --v 5.2	3d.B12: Three-dimensional space --v 5.2	3d.B13: Axonometric drawing --v 5.2
<b>Output</b>			
<b>Evaluation</b>	Depth: High Fidelity: Low	Depth: High Fidelity: Low	Depth: High Fidelity: Low

## Results

- Reference Image 3d.A (Random Walk Through Raster): The highest depth was observed in results 3d.A4 and 3d.A5, both of which used "Three-dimensional space" and "line drawing" with IW 2. These outcomes successfully created a more pronounced sense of three-dimensionality but at the cost of moderate fidelity to the original two-dimensional configuration. Prompts 3d.A1 and 3d.A2 (both using "Extrude lines to create three-dimensional walls, axonometric line drawing" in v6.1) achieved moderate depth and moderate-to-high fidelity, indicating that while the outcome maintained a recognisable relationship with the original image, the three-dimensional transformation was limited. Image weight (iw2) in 3d A3 improved fidelity but did not significantly impact depth, maintaining a moderate three-dimensional effect.
- The older model (v5.2) yielded mixed results. Prompts 3d.A8 and 3d.A9, which attempted axonometric extrusion, achieved moderate depth and moderate fidelity. In contrast, prompts such as 3d.A12 and 3d.A13 exhibited low depth and moderate fidelity, indicating weaker spatial transformations. Notably, 3d.A10 ("Extrude its lines to look like a labyrinth, axonometric line drawing" in v5.2) had high depth but low fidelity, suggesting that it deviated significantly from the original structure but generated a pronounced three-dimensional effect. For 3d A, the application demonstrated better fidelity when prompts referenced extrusions or axonometric drawings, whereas depth was more substantial when emphasising three-dimensional space directly. The older model was less effective in achieving depth but sometimes preserved structural relationships better. The "labyrinth" prompt showed that the AI could generate depth, but at the cost of significant deviations from the reference image.
- Reference Image 3d.B (Bauhaus Poster): This reference image produced a different result trend, with a stronger emphasis on depth but generally low fidelity. Prompts 3d.B3 and 3d.B5 ("Extrude the image to create three-dimensional walls and spaces") produced high depth but low fidelity, indicating significant three-dimensional transformation but a loss of adherence to the original two-dimensional configuration. Similarly, 3d.B6 and 3d.B7 ("Extrude shapes to create three-dimensional abstract spaces") in v6.1 resulted in high depth but low fidelity, reinforcing the model's tendency to generate strong spatial effects at the expense of geometric accuracy.

Axonometric drawing prompts (3D.B8 and 3D.B9) produced moderate depth and low fidelity, indicating that while the transformation was limited, it deviated from the original image's structure. The older model (v5.2) was consistent in its approach, with 3d.B11, 3d.B12, and 3d.B13 achieving high depth but low fidelity, similar to the results in v6.1. The application produced more substantial depth for 3d.B than for 3d.A, but at the cost of poor fidelity. Axonometric prompts provided a balance between transformation and accuracy, while prompts requesting three-dimensional spaces led to significant distortions of the original structure. The older model (v5.2) favoured depth but struggled to maintain geometric fidelity.

### 3. OVERAL RESULTS AND DISCUSSION

#### 3.1. Diagrams

In this part of the experiment, we examined Midjourney's capacity to extract and reinterpret spatial, geometric, and compositional configurations from architectural plans and patterns. The experiment demonstrated that Midjourney can generate diagrammatic drawings from architectural plans; however, its ability to balance alignment with reference images and abstraction in representation depends on the prompt structure, parameter settings, and the spatial characteristics of the reference images. Symmetrical and centrally organised plans (Villa Rotonda, Pilgrimage Church at Banz) had the highest alignment scores across both model versions. More complex and irregular plans (Villa Savoye, Atheneum) struggled to retain alignment, mostly scoring moderately, particularly when long text prompts were used. These results suggest that Midjourney better recognises and preserves axial and radial geometric structures than more fragmented or asymmetrical compositions.

Short text prompts (e.g., "Create diagram" or "Line diagram") consistently yielded better results, scoring higher in abstraction and alignment across all reference images. Longer text prompts, especially those including specific building names or the word "plan," reduced abstraction and often led to looser alignment. This suggests the model responds more effectively to concise, general instructions when tasked with abstract and diagrammatic outputs. Version 6.1 consistently produced more abstract results than version 5.2, particularly when using short prompts (e.g., Villa Savoye and Atheneum cases). Setting the "stylise" parameter to 0 and the "style" parameter to "raw" helped maintain a diagrammatic quality, confirming their effectiveness in reducing unwanted artistic embellishments. Using "image weight" (--iw) at two ensured that reference images strongly influenced the outputs, preventing excessive deviation. The findings suggest that the application can engage in diagrammatic and abstract "understanding", but it does so in a manner that favours simplified spatial structure over complex organisational relationships and concise prompts. While it can produce meaningful abstractions, its capacity to maintain spatial integrity varies depending on the complexity and organisation of the reference plan, making it more suitable for conceptual explorations rather than precise architectural diagramming.

#### 3.2. Variations

Results in this part of the experiments showed that Midjourney can generate meaningful variations of architectural plans and patterns, but its ability to retain spatial organisation depends heavily on prompt structure and parameter settings. The application struggled to maintain spatial configurations, with Villa Savoye (v.A) showing the weakest immutability. Villa Rotonda (v.B) achieved the best balance between maintaining structure and allowing for meaningful variation. Extended prompts increased variability across all cases but did not constantly improve structural fidelity. Random Walk Through Raster (v.D) and Bauhaus Poster (v.E) demonstrated the highest consistency, suggesting that the model processes abstract patterns more effectively than structured architectural floor plans. Higher image weight (i.e., iw2) was crucial in maintaining the reference image's influence, but did not necessarily enhance spatial coherence. Extended text prompts increased variability but often at the expense of maintaining the core spatial composition. These findings suggest that while Midjourney can effectively generate spatial variations, its ability to maintain spatial fidelity is somewhat limited. It can function as a conceptual form-finding tool, but it does not operate as a precise architectural transformation tool.

#### 3.3. Three-dimensional space

The third set of experiments examined Midjourney's ability to generate three-dimensional spaces from two-dimensional patterns. In general, the depth of the generated spaces was higher when the



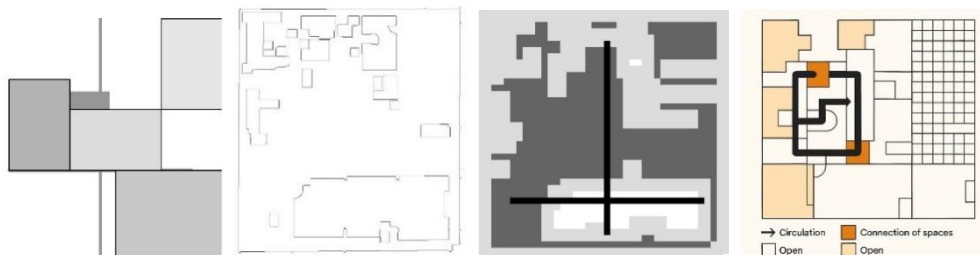
wording "three-dimensional" rather than "axonometric drawing" was used. However, fidelity to the original two-dimensional pattern was lower, which revealed a clear trade-off between depth and fidelity. Image weight at two improved fidelity in some cases (e.g., 3d A3) but did not always guarantee a stronger three-dimensional outcome. The Bauhaus Poster reference image yielded more extreme transformations than the Random Walk Through Raster, while maintaining a better balance between depth and fidelity. The application performed better with abstract patterns than with structured architectural plans, reinforcing the observation that Midjourney is more effective in generating conceptual and suggestive spatial compositions rather than precise architectural transformations. The older model (v. 5.2) tended to produce more abstract and less structured three-dimensional interpretations, often at the expense of fidelity. This analysis suggests that while Midjourney can generate three-dimensional interpretations of two-dimensional patterns, translations of graphic compositions into three dimensions are not precise. The outcomes are inclined toward abstraction rather than precise spatial extrusion and depend on prompt specificity and parameter adjustments. This highlights text-to-image generative AI's conceptual rather than operational nature in architectural design

### 3.4. Comparison between versions 6.1 and 5.2

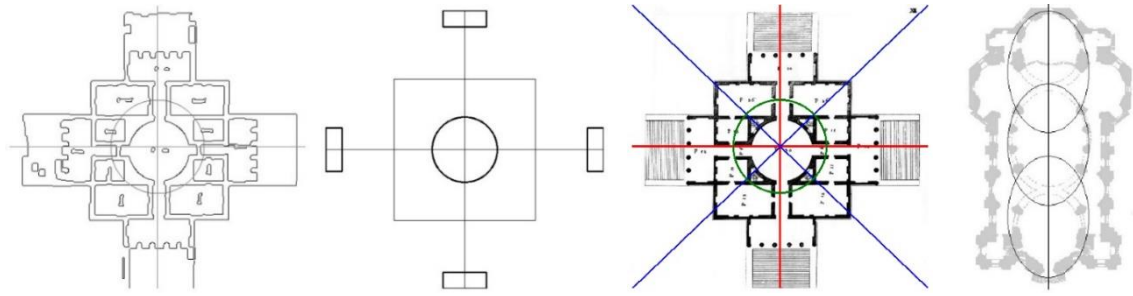
Version 6.1 consistently generated more abstract and expressive results, especially when short prompts were used, making it better suited for conceptual and diagrammatic representations. Version 5.2 demonstrated slightly improved performance in terms of spatial alignment when handling geometrically structured or symmetrical plans, albeit at the expense of abstraction and visual refinement. In the three-dimensional space experiments, version 6.1 produced outputs with more pronounced spatial depth, whereas version 5.2 often yielded flatter and less spatially articulated images, although it sometimes preserved geometric fidelity more effectively. These findings suggest that while version 6.1 is more responsive to exploratory and stylistically raw prompts, version 5.2 may still offer value in tasks where preserving core compositional logic takes precedence over creative transformation. Selecting between the two depends on the desired balance between abstraction and spatial fidelity.

### 3.5. Comparison with other Text-to-Image Generative AI tools

Although further research is needed to systematically compare Midjourney to other text-to-image AI tools (such as Dall-E, Stable Diffusion or Leonardo AI), some preliminary findings can be considered within the limits of the current study. Our experiment with Dall-E 3 (OpenAI) showed that, in terms of diagramming, the model struggles to combine alignment with abstraction, but when pressed (by explaining in more detail what we want) outcomes scored well in both criteria even when the original spatial layout is complicated (like that of Villa Savoye) (figure 1). When plans are geometrically simplified and have symmetrical layouts, abstraction and alignment to the initial drawing were even higher (Figure 2). This achievement involved back-and-forth conversations with the chatbot (ChatGPT 4) to balance abstraction and alignment, suggesting that integrated text-to-text and text-to-image models (like ChatGPT and Dall-E) might be more appropriate for our goals. Second, regarding the creation of variations, Dall-E did not yield significant outcomes when the plans were used as reference images (Figure 3). However, variations of the Bauhaus pattern were noteworthy and resembled those of Midjourney. These findings suggest that Dall-E better aligns its outcomes with the original drawings than Midjourney, although it can be creative when dealing with simple patterns (Figure 4). It reaffirms Midjourney's advantage in terms of innovative capacity, but at the expense of fidelity compared to other platforms. Nevertheless, the same cannot be said about Dall-E's ability to create three-dimensional space from two-dimensional drawings. The model attempted to extrude the original patterns into a three-dimensional space, but the outcomes lacked fidelity (Figure 5).



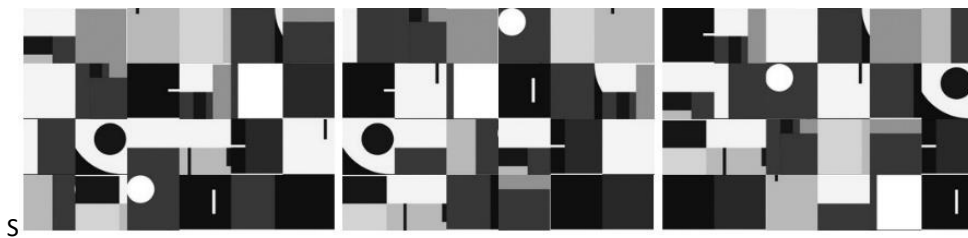
**Figure 1.** Diagrams of the first-floor plan of Villa Savoye generated using Dall-E



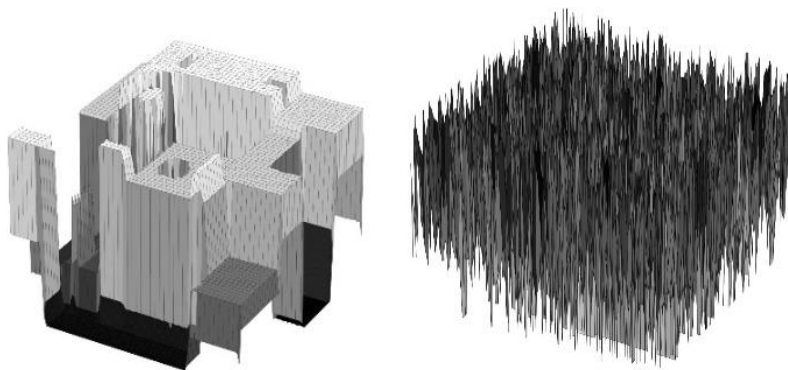
**Figure 2.** Diagram of the plan of Villa Rotonda and Pilgrimage Church at Banz generated using Dall-E



**Figure 3.** Variations of the plan of Villa Rotonda and Pilgrimage Church at Banz generated using Dall-E



**Figure 4.** Variations of the Bauhaus Poster generated using Dall-E



**Figure 5.** 3-dimensional spaces of the Bauhaus Poster and the Random Walk-Through Raster generated using Dall-E

#### 4. CONCLUSION

The findings of this study suggest that text-to-image AI applications, such as Midjourney, have significant potential as conceptual design tools but are not yet reliable for precise architectural representation. The ability of Midjourney to interpret, abstract, and transform architectural drawings highlights its value in early-stage design exploration, where creativity and conceptual thinking take precedence over accuracy. Dall-E aligned better with the original image and abstraction in our preliminary experiments. This shows that Dall-E understands the structure and composition of drawings better than Midjourney, and therefore, it can be employed as an architectural design assistant, not just for brainstorming. However, further research is needed. Also, the comparison of Midjourney's results to those of Dall-E highlights Midjourney's stylistic bias, indicating its commendable creative capacity.

The study identifies several concrete domains where text-to-image generative AI can assist architectural design: early-stage conceptual ideation and spatial experimentation through variation and diagrammatic abstraction. These tools prove most effective when employed not as precision instruments but as catalysts for creative divergence, particularly when dealing with preliminary drawings or sketches. As such, AI impacts architectural practice by augmenting—rather than replacing—human creativity, offering architects a semi-autonomous partner for speculative design thinking and brainstorming. However, its current limitations in maintaining spatial fidelity and user control suggest that AI's role remains largely conceptual. Future applications should prioritize tighter integration between AI and traditional CAD/BIM workflows [38], improved prompt engineering interfaces, and hybrid systems combining multimodal models (e.g., chatbots like ChatGPT with text-to-image models) to allow iterative dialogue for more nuanced output control [25], [36], [39]. Moreover, training generative models specifically on architectural datasets to overcome randomness [28] and stylistic biases [37], as well as enabling more interactive feedback loops, could lead to tools that not only generate but also understand design intent, pushing AI-assisted architecture beyond stylistic novelty toward informed spatial reasoning.

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