

# Visualizing Architectural Thought in Literary Heritage Through Combining Qualitative Analysis and Generative AI: The Case of Jorge Luis Borges

## Abstract

The utilization of generative artificial intelligence in architectural design has established a new paradigm in the relationship between the designer's mind and form. While current research predominantly focuses on optimization, AI's potential to decode theoretical discourses and transform abstract concepts into spatial outcomes remains understudied. This study investigates the correlation between textual perception and AI-generated imagery, using Jorge Luis Borges's literature as a case study to test the boundaries of digital rendering.

Adopting a qualitative approach, spatial descriptions were systematically extracted from six Borges short stories and inputted as prompts into Google Gemini. Both the generated images and primary texts were analyzed and coded using ATLAS.ti. To ensure methodological rigor, a comparative scenario-based evaluation evaluated visual fidelity across six distinct generation scenarios.

The findings demonstrate that the generative framework supports the visual representation of selected spaces codes by mapping textual descriptions into corresponding visual configurations. Consequently, rather than exhibiting cognitive awareness, the AI system operates as a pattern-matching and mapping tool, mapping verbal structures into spatial layouts.

**Keywords:** Visualizing Architectural Thought, Qualitative Analysis, Generative AI, Jorge Luis Borges.

## Introduction

The integration of artificial intelligence into architecture has significantly transformed the profession, sparking ongoing debates regarding automation and design workflows (Sabono, 2025; Picon, 2020). While the application of AI image generators has largely streamlined visualization tasks by accelerating rendering and production times (Enjellina et al., 2023), its

capability to decode theoretical discourses and bridge abstract concepts with physical artifacts remains underexplored (Uyan & Seyman Güray, 2025).

Conventionally, architectural representation served as a static design artifact (Sawyer, 2022). Generative AI introduces a novel intermediary layer between the subjective concept and the objective form, converting a traditionally qualitative process into a rapid generative workflow. Although existing studies predominantly examine AI for performance optimization and form-finding (Castro Pena et al., 2021; Seyman-Güray, 2023), there is notable potential for AI to collaborate with architects during the theory-oriented preliminary design phase (Anantrasirichai & Bull, 2021). Furthermore, limited research addresses how text-to-image tools translate conceptual ideas into early-stage spatial configurations (Karahana et al., 2023). Moreover, connecting theoretical discourse and design artifacts at the early stages is fundamental for the design of any architectural project, especially as AI tools become embedded within core design workflows (Leach, 2018).

The relationship between architecture and narrative is well-established (Psarra, 2003), as both fiction and built form rely on rigorous conceptual orders. Within this theoretical framework, the present study investigates the correlation between textual perception and AI image generation. The literary works of Jorge Luis Borges serve as an ideal locus for investigation, given their saturation with impossible spaces, infinite iterations, and conceptual geometries—characteristics that rigorously test the boundaries of intermedial conversion.

Accordingly, this research examines how automated systems process and map the spatial configurations of literature. By positioning architectural concepts as the subject and digital outputs as the object, this study addresses two core questions:

1. Can text-to-image AI systems function as mediating instruments that translate narrative descriptions into valid spatial configurations?
2. How do structured analytical prompts influence the conceptual fidelity of the resulting imagery compared to raw literary texts?

The novelty of this study stems from providing an exploratory approach to linking Borges's intellectual architecture with AI-generated forms, utilizing qualitative methods to map the correlation between the source text and the resulting AI-synthesized imagery.

To maintain analytical precision throughout this study, key terms are operationally defined as follows:

- **Visual Equivalents:** The specific geometric, material, and spatial configurations generated by the AI model that visually correspond to the textual codes extracted from the literary descriptions.
- **Conceptual Translation:** The algorithmic process of transforming abstract narrative tropes (such as infinite recursion or non-Euclidean layouts) into explicit spatial syntax without implying cognitive understanding by the AI.
- **Architectural Essence (Textual-Visual Alignment):** The underlying structural, proportional, and atmospheric qualities derived from a literary space that remain invariant and visually traceable when translated from text into visual form.
- **Fidelity:** The quantitative and qualitative degree of overlap between the unique textual codes extracted from the primary source and the visual features realized in the generated imagery, measured via the Code Coverage Rate.

## Literature Review

Translating textual discourse into tangible design artifacts remains a fundamental challenge and concern in architectural theory (Uyan & Seyman Güray, 2025). While text relies on conventional linguistic symbols and possesses high potency in conveying abstract concepts and immaterial values, images offer complete, unmediated informational representations of spatial reality's external appearance (Peirce, 1955; Schnotz, 2014). In the preliminary design phase—the most discursive stage in the architectural process—designers consistently utilize text to articulate concepts and project values, while employing visual drawings to visualize and externalize form (Goldschmidt, 2019; Somer, 2015; Tschumi, 1981). Nevertheless, the direct translation of complex narrative and abstract texts into spatial representations has perpetually been fraught with semantic gaps and obstacles stemming from subjective interpretations (Pallasmaa, 2012; Pérez-Gómez, 2016).

## AI-Assisted Visualization: From Photorealistic Rendering to Conceptual Translation

Although the technological evolution of representation tools—ranging from CAD and BIM to advanced rendering engines—has dramatically enhanced geometric precision and spatial modeling (Eastman, 1999; Fonseca et al., 2013), these workflows remain time-consuming and

labor-intensive. Furthermore, they primarily focus on physical accuracy in the later stages of design rather than conceptual exploration during the early phases (Azhar, 2011).

The recent emergence of Large Language Models (LLMs) and text-to-image (txt2img) diffusion models has introduced a new paradigm in architectural visualization; a phenomenon that transforms the traditional cognitive cycle of "seeing-drawing-seeing" into an AI-enhanced cycle of "writing-seeing-writing" (Karahana et al., 2023). These tools enable architects to rapidly test their textual manifestos and spatial ideas in the form of visual design artifacts (Cairns & Jacobs, 2014; Smith, 2013).

This historical evolution of media and technology in architectural visualization is summarized in Table 1. As demonstrated in this comparative evaluation, while traditional and digital paradigms have progressively improved geometric precision, they have consistently faced fundamental limitations in fluently and directly translating abstract textual discourses into spatial representations without requiring labor-intensive, manual interpretations.

**Table 1:** Summary of the Text-to-Image Evolution in Architecture and Conceptual Limitations

| Historical Era / Approach       | Primary Tools & Techniques | Key Features & Achievements                                                                             | Prominent Theorists / Architects      | Limitations in Conceptual & Discourse Translation                                                     |
|---------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------|
| Ancient Civilizations           | Text-Based Documentation   | Precise description of structure, materials, and techniques. Text functioning as a technical blueprint. | ...                                   | Complete reliance on verbal convention; inability to offer immediate spatial/visual feedback.         |
| Renaissance                     | Visual Drawings            | Emergence of perspective & orthographic projections. Overcoming linguistic barriers.                    | Leon Battista Alberti (Alberti, 1991) | Static visual form; difficulty in capturing abstract, temporal, or narrative-driven spatial concepts. |
| Early 20th Century (Crisis Era) | Futurist Manifestos        | Representation of unbuilt architectures (Utopias). The intersection of space and time.                  | Somer                                 | Gap between radical text-based discourse and limited traditional visual techniques.                   |

|                       |                                      |                                                                                                            |                                                       |                                                                                                        |
|-----------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Late 20th Century     | Design Artifacts                     | Transformation of drawing into an independent "architectural act". Synthesis of text and abstract imagery. | Tschumi, Hadid, Gehry, Koolhaas                       | Highly personalized, subjective spatial interpretations requiring labor-intensive manual translation.  |
| Digital Age (CAD/BIM) | Computational Modeling               | High precision, understanding of complex spatial relationships, and photorealistic rendering.              | Eastman, Al-Kodmany (Al-Kodmany,2001)                 | Focus on geometric and physical accuracy rather than translating abstract, qualitative text/discourse. |
| Contemporary Era      | Immersive Visualization Technologies | Utilization of VR/AR; Interactive experience and presence within virtual environments.                     | Han & Leite, (Han & Leite, 2022) Korkut (Korkut,2023) | High hardware/expertise dependency; limited capacity to directly process natural language concepts.    |

### Research Gap and Position of the Present Study

Recent studies on generative artificial intelligence in creative domains have predominantly focused on evaluating general platform capabilities, facade style transfer, or visual synthesis in post-occupancy evaluations (Jo et al., 2024; Oppenlaender, 2022; Ploennigs & Berger, 2023).

The evolutionary trajectory of AI integration into architectural workflows is categorized in Table 2. As this analytical matrix demonstrates, while the current Discourse-Driven Era enables the conversion of textual manifestos into visual sketches, the primary gap in existing research is the lack of rigorous, empirical methodologies to evaluate and validate the conceptual fidelity between abstract texts and AI-generated visual outputs. Furthermore, AI must act as a catalyst and complement to the architect's critical thinking, rather than a definitive cognitive replacement (Anantrasirichai & Bull, 2021).

To address this research gap, the present study utilizes the Google Gemini platform—selected for its high prompt adherence and interactive conversational capabilities—to structure and validate the spatial translation of abstract literary concepts (extracted from Jorge Luis Borges' short stories) into visual architectural representations, offering insights that hold strong potential for applications in the preliminary design phase.

**Table 2:** Summary of the Evolution and Integration of AI in Architecture and key Research Gaps

| Phase / Era                        | Key Instrumentation                                            | Role & Technological Integration                                                                   | Impact on Design Process                                                                             | Research Gap & Analytical Need                                                                                                                            |
|------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| I. Digital Precursor               | CAD / BIM                                                      | Transition from manual drafting to geometric precision and computational modeling                  | High-fidelity technical documentation and photorealistic rendering                                   | Overemphasis on physical $\square$ geometric accuracy; absence of $\square$ textual discourse interaction.                                                |
| II. Emergent Automation            | Optimization Algorithms                                        | Integration of AI for resolving complex engineering constraints and environmental analysis.        | Automation of labor-intensive, iterative tasks in computational and site analysis.                   | Limited to quantitative/functional parameters; $\square$ inability to process qualitative spatial concepts.                                               |
| III. Generative Era                | GANs & Early Image AI                                          | Capability to synthesize forms and facades based on existing visual datasets.                      | Augmentation of creative horizons through rapid multi-option design synthesis.                       | Visual-to-visual dependency; $\square$ lack of direct textual interpretation $\square$ or semantic control.                                               |
| IV. Discourse-Driven Era (Current) | Large Language Models (LLMs) & Diffusion Models (e.g., Gemini) | Synthesis of "Text" and "Image"; AI acts as a conceptual collaborator via text-to-image workflows. | Transmutation of manifestos and abstract concepts into digital sketches (The Write-See-Write cycle). | [Current Research Focus]<br><br>Lack of rigorous $\square$ methodologies to validate conceptual fidelity $\square$ between abstract texts and AI visuals. |
| V. Integrated Future               | Multimodal Generative AI                                       | Seamless AI presence from preliminary schematic design to post-occupancy evaluation.               | Ensuring optimal design performance and streamlining stakeholder communication.                      | Theoretical projections lacking standardized $\square$ frameworks for $\square$ empirical cross-domain evaluation.                                        |

## Research Methodology

Grounded in an interpretive paradigm, this study employs a systematic qualitative methodology combined with generative artificial intelligence to evaluate textual-visual semantic alignment. The methodological framework is structured across four sequential phases: corpus selection,

qualitative coding via ATLAS.ti, prompt engineering and image synthesis, and objective quantitative validation.

## **1. Corpus Selection Criteria and Case Studies**

The textual foundation comprises six short stories by Jorge Luis Borges: *The Library of Babel*, *The House of Asterion*, *Death and the Compass*, *The Aleph*, *The Garden of Forking Paths*, and *There Are More Things*. Rather than random sampling, these narratives were prioritized based on three strict criteria: (i) the presence of dense, explicit, and non-Euclidean architectural descriptions; (ii) the structural complexity of spatial systems (such as labyrinthine configurations and infinite recursions); and (iii) the functional role of space as a primary narrative-generating element (Psarra, 2003). Works lacking concrete spatial organizations or relying solely on abstract temporal metaphors were excluded to ensure sufficient morphological data. The unit of analysis was defined as textual excerpts containing explicit or implicit spatial descriptions (encompassing form, scale, geometry, materials, and spatial organization), as illustrated in Figure 1.

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| <p><b>Death and the Compass</b></p> <p>"Night was falling when he saw the rectangular belvedere of the villa of Triste-le-Roy rise from among the black eucalyptus trees. A rusted iron fence defined the villa's irregular perimeter. The main gate was closed. Lönnrot walked through the eucalyptus trees, treading upon confused generations of dry, brittle leaves. Seen from up close, the house of the villa of Triste-le-Roy abounded in pointless symmetries and in maniacal repetitions: a glacial Diana in one gloomy niche was complemented by another Diana in a second niche; one balcony was reflected by another; double stairways led to double balustrades. A two-faced Hermes cast a monstrous shadow. Lönnrot circled the house as he had the garden. He examined everything; beneath the level of the terrace he saw a narrow shuttered door."</p> <p>"He pushed it: a few marble steps descended to a cellar. Lönnrot, who had already divined the architect's preference, conjectured that there would be a second stairway on the opposite wall. He found it, climbed it, raised his hands, and lifted a trapdoor."</p> <p>"A streak of light led him to a window. He opened it: a yellow, round moon defined the two clogged fountains in the melancholy garden. Lönnrot explored the house. Through antechambers and galleries he passed into duplicate courtyards, and several times he emerged into the same courtyard. He climbed dusty stairs and came out into a circular chamber; in the diametric mirrors, he was multiplied infinitely. He grew weary of opening or half-opening windows which revealed the same desolate garden from different heights and different angles. Inside, the furniture was wrapped in yellowing covers and the chandeliers in tarlatan. A bedroom caught his attention; in that bedroom, a single rose in a porcelain vase at the first touch the ancient petals crumbled. On the second floor, on the top floor, the house seemed infinite and expanding. 'The house is not this large,' he thought. 'It is only the shadows, the symmetries, the mirrors, the years, my ignorance, and the solitude that magnify it.'"</p> <p>"By a spiral stairway he reached the observatory. The evening moon shone through the diamond-shaped panes of the windows; they were yellow, red, and green."</p> <p><small>Text Translated From Spanish to English by<br/>Andrew Hurley</small></p> | <p><b>There Are More Things</b></p> <p>"At dawn I dreamt of an engraving in the style of Piranesi, which I had never seen before or perhaps had seen and forgotten; it represented a labyrinth. It was a stone amphitheater fringed with cypresses and rising higher than their tops. There were no doors or windows, but it was pierced by an endless row of narrow vertical slits."</p> <p><small>Text Translated From Spanish to English by<br/>Norman Thomas di Giovanni</small></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><b>The Aleph</b></p> <p>"...in the cellar, there is an Aleph. An Aleph is one of the points in space that contains all other points. It is the only place on earth where all places are—seen from every angle, each standing clear, without any confusion or blending. If all places in the universe are in the Aleph, then all starry skies, all lanterns, all sources of light are also in it."</p> <p>"I saw the Aleph. I saw, in that single, unbounded moment, millions of delightful and horrific acts; none amazed me more than the fact that all of them occupied the same point in space, without overlapping or transparency. What my eyes saw was simultaneous, but what I shall write is successive, because language is successive."</p> <p>"On the back part of the step, toward the right, I saw a small iridescent sphere of almost unbearable brilliance. At first I thought it was revolving; then I realized that this movement was an illusion created by the dizzying world bounded within it. The Aleph's diameter was probably little more than an inch, but all space was there, actual and undiminished. Each thing was infinite things, because I could clearly see it from every point in the cosmos. I saw the teeming sea; I saw daybreak and nightfall; I saw the multitudes of America..."</p> <p><small>Text Translated From Spanish to English by<br/>Andrew Hurley</small></p>                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>The House of Asterion</b></p> <p>"The doors of the house stand open day and night to men and also to animals. Anyone who wishes may enter. One will find here no feminine finery or the strange pomp of palaces, but rather a quiet and a solitude."</p> <p>"There is not a single piece of furniture in the house."</p> <p>"I run through the stone galleries... I hide in the shadow of a cistern or in the curve of a hallway... There are balconies from which I cast myself."</p> <p>" 'Now we return to another courtyard' or 'I told you you would like this water channel' or 'Now you will see a cistern filled with sand' or 'You will see how the cellar forks.' "</p> <p>"I meditated on the house. All parts of the house are repeated many times; any place is another place. There is no one pool, no one courtyard, no one drinking trough, no one manger; the mangers, drinking troughs, courtyards, pools are infinite in number. The house is the same size as the world—or rather, it is the world. However, weary of courtyards with a pool and dusty galleries of gray stone..."</p> <p>"Their bodies help me distinguish one gallery from another."</p> <p><small>Text Translated From Spanish to English by<br/>Andrew Hurley</small></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <p><b>The Library of Babel</b></p> <p>"The universe (which others call the Library) is composed of an indefinite, perhaps infinite number of hexagonal galleries, with enormous ventilation shafts in the middle, encircled by very low railings. From any hexagon the upper or lower floors are visible, in an interminable series. The distribution of the galleries is invariable. Twenty shelves—five long shelves per side—cover all sides except two; their height, which is that of the story itself, barely exceeds that of an average librarian. One of the free sides gives upon a narrow entrance way, which leads to another gallery, identical to the first and all the others. To the left and right of the entrance way are two miniature rooms. One allows standing sleep; the other, the satisfaction of fecal necessities. Through this section passes the spiral staircase, which plunges down into the abyss and rises up to the heights. In the entrance way there is a mirror, which faithfully doubles appearances. Men are accustomed to infer from this mirror that the Library is not infinite (if it were so, why this illusory duplication?); I prefer to dream that the polished surfaces feign and promise infinity... Light comes from some spherical fruits called by the name of lamps. There are two, running horizontally, in each hexagon. The light they emit is insufficient, incessant."</p> <p><small>Text Translated From Spanish to English by<br/>Andrew Hurley</small></p> | <p><b>The Garden of Forking Paths</b></p> <p>"I thought of that lost labyrinth: I held it to be intact and perfect as it stood among the secret crests of a mountain; I imagined it crased by rice fields or beneath the sea; I imagined it infinite, no longer composed of octagonal kiosks and returning paths, but of rivers and provinces and kingdoms... I thought of a labyrinth of labyrinths, of one sinuous spreading labyrinth that would encompass the past and the future and in some way involve the stars."</p> <p>"The Garden of Forking Paths is an enormous riddle, or parable, whose theme is time... The Garden of Forking Paths is an incomplete, but not false, image of the universe."</p> <p>"He believed in an infinite series of times, in a growing, dizzying net of divergent, convergent and parallel times. This network of times which approached one another, forked, broke off, or were unaware of one another for centuries, embraces all possibilities of time. In most of those times, we do not exist; in some you exist, and not I; in others I, and not you; in others, both of us."</p> <p>"In all fictional works, each time a man is confronted with several alternatives, he chooses one and eliminates the others; in the fiction of Ts'ui Pên, he chooses simultaneously all of them. He creates, in this way, diverse futures, diverse times which themselves also proliferate and fork."</p> <p>"In that work, all possible outcomes occur; each one is the point of departure for other forkings. Sometimes, the paths of this labyrinth converge: for example, you arrive at this house, but in one of the possible pasts you are my enemy, in another, my friend."</p> <p><small>Text Translated From Spanish to English by<br/>Andrew Hurley</small></p> |

**Figure 1:** Selected textual excerpts containing rich spatial, geometric, and architectural descriptions extracted from Borges' six short stories as input prompts.

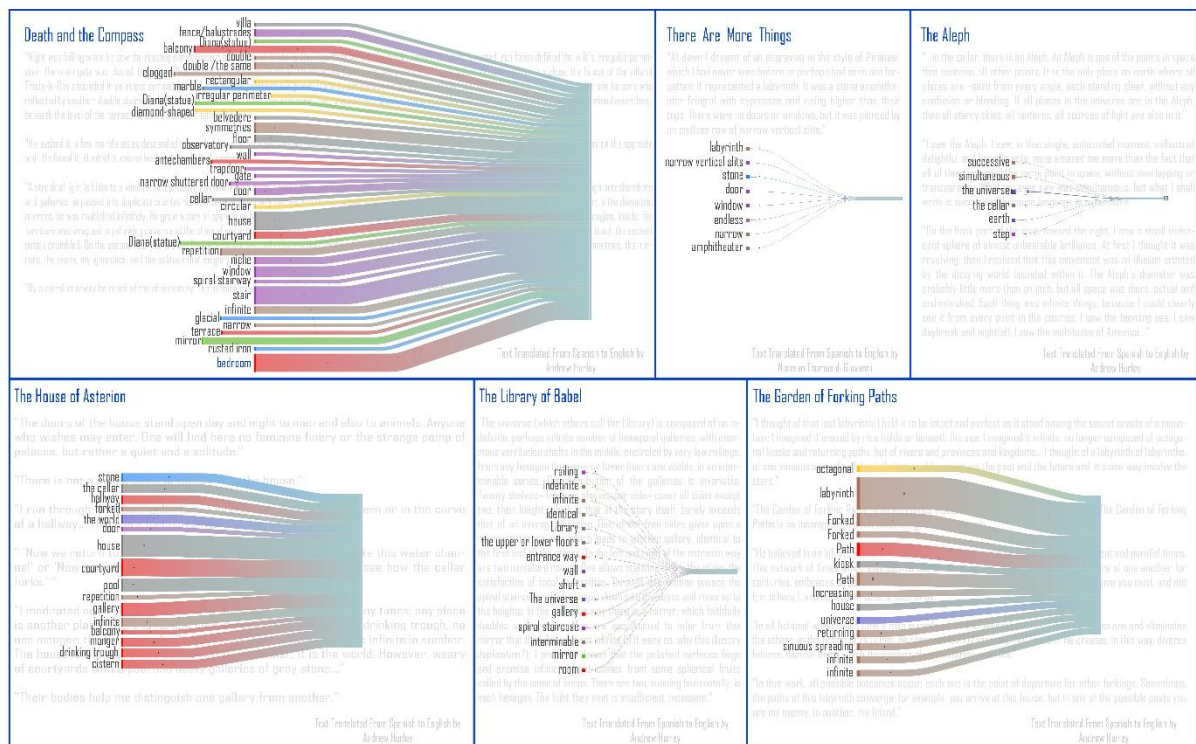
## Qualitative Coding Protocol

The qualitative analysis and thematic coding were executed systematically using **ATLAS.ti** across three rigorous stages:

- Stage 1 (Initial Open Coding): All terms and phrases imbued with architectural significance were designated as codes, yielding 150 initial codes across the corpus (The Library of Babel: 15, The House of Asterion: 35, There Are More Things: 8, Death and the Compass: 65, The Aleph: 6, and The Garden of Forking Paths: 21 codes).
- Stage 2 (Axial Coding & Reduction): To ensure data transparency, the transition from 150 to 64 codes followed a two-step filtering protocol. First, through data cleaning and cross-story deduplication, the dataset was refined to 98 distinct textual codes ( $N_t = 98$ ), serving as the primary evaluation benchmark. Second, synonymous or conceptually overlapping terms were consolidated.
- Stage 3 (Selective Coding & Thematic Clustering): The resulting 64 unified codes ( $N_{u64}$ ) were categorized into seven major architectural clusters: Architectural Space, Micro-spaces, Architectural Elements, Materials, Objects/Accessories, Qualitative Spatial Features, and Spatial Geometry (detailed in Table 3).

**Table 3:** Supplementary Coding Reduction and Consolidation Matrix

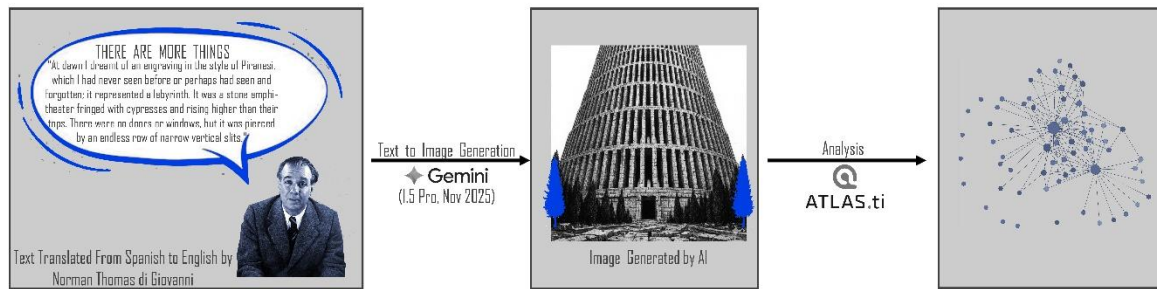
| Coding Stage                              | Number of Codes (N) | Operational Criteria & Filtering Rationale                                                                                                                                                                                                 | Specific Examples of Modifications                                                                                        |
|-------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Stage 1: Open Coding (Initial Extraction) | 150                 | Extraction of all explicit/implicit spatial phrases from the 6 stories (The Library of Babel: 15, The House of Asterion: 35, There Are More Things: 8, Death and the Compass: 65, The Aleph: 6, and The Garden of Forking Paths: 21 codes) | Extracting raw descriptors such as "labyrinth", "basement", "six-sided rooms".                                            |
| Stage 2: Axial Coding (Code Reduction)    | 98 ( $N_t$ )        | Elimination of identical duplicate codes appearing across multiple stories and filtering out non-architectural noise (redundant generic tags like isolated "house" instances).                                                             | Removing cross-story semantic redundancies to establish the primary evaluation benchmark of 98 distinct codes.            |
| Stage 3: Selective Coding (Consolidation) | 64 ( $N_u$ )        | Merging synonymous and highly overlapping conceptual terms into unified codes, followed by categorization into 7 macro thematic clusters.                                                                                                  | Consolidating "infinite", "boundless", and "endless" into a unified spatial code; grouping into 7 architectural clusters. |



**Figure 3:** Sankey diagrams from ATLAS.ti illustrating the initial open-coding process and extracted spatial codes across the six selected texts

## Prompt Engineering Protocol and AI Settings

To preserve Borges' literary authenticity and minimize researcher bias, the extracted architectural textual excerpts were utilized as direct input prompts without content modification. Visual outputs were generated using the Google Gemini model (Gemini 1.5 Pro version, November 2025). To ensure an unbiased evaluation of the model's native interpretive capacity and maintain methodological accessibility for broader architectural research, no specialized custom generation parameters (such as aspect ratio constraints, seed numbers, or negative prompting multipliers) were artificially imposed; the default operational settings of the platform were utilized. For each literary case study, a variable number of visual outputs were generated depending on semantic complexity (ranging from 1 to 10 iterations per prompt, specifically: 6 for The Library of Babel, 3 for The House of Asterion, 2 for The Garden of Forking Paths, 10 for Death and the Compass, 2 for The Aleph, and 1 for There Are More Things). While some iterations exhibiting immediate alignment with textual codes were prioritized, the final selections were strictly filtered based on the highest conceptual and code-level correspondence. The overall structure of this multi-stage workflow is summarized in Figure 3.



**Figure 3:** Schematic representation of the research workflow using Google Gemini (1.5 Pro, Nov 2025) for text-to-image synthesis and ATLAS.ti for qualitative code extraction and validation (demonstrated via "There Are More Things").

To eliminate ambiguity in determining whether a textual code was visually represented in the generated outputs, an explicit Evaluation Rubric was established. Each extracted code was evaluated against the selected image using a clear three-tier verification standard: Full Correspondence (Score 2), where the architectural element or spatial property is distinctly and directly visible in the image; Partial Correspondence (Score 1), where the property is metaphorically or implicitly suggested through forms, lighting, or compositional arrangement; and Non-Correspondence (Score 0), where the code is entirely absent or contradicted. Only codes achieving a score of 1 or 2 (verified presence) were counted toward the final conceptual representation coverage rate (table 4).

**Table 4:** Evaluation Rubric Table

| Verification Tier             | Score | Definition & Criteria for Visual Correspondence                                                                                                                                                 | Example from Borgesians Corpus                                                                                   |
|-------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Full Correspondence</b>    | 2     | The architectural feature, geometry, material, or spatial element is explicitly, directly, and unambiguously discernible in the generated image.                                                | Code: "Hexagonal rooms" → Explicitly visible six-sided compartment layouts in the image of The Library of Babel. |
| <b>Partial Correspondence</b> | 1     | The spatial quality, atmospheric feature, or structural concept is implicitly or metaphorically represented through lighting, shadow, or compositional massing, even if not literally detailed. | Code: "Endless or boundless depth" → Represented via deep, receding perspective corridors or vanishing points.   |
| <b>Non-Correspondence</b>     | 0     | The code's descriptive attributes are entirely absent, omitted, or directly contradicted by the visual elements in the generated output.                                                        | Code: "Dark subterranean cellar" → Visually rendered as a brightly lit, open-air modern pavilion.                |

## Objective Selection Framework and Analytical Validity

To eliminate subjective and arbitrary preferences, an objective evaluation framework based on the **Code Coverage Rate** was adopted. All generated visual outputs were imported into ATLAS.ti, where the textual codes extracted for each narrative (based on the **98 distinct codes** identified in the initial reduction phase) were mapped onto the corresponding images. The image that manifested and embodied the highest proportion of extracted textual codes within its spatial composition was selected as the final representation.

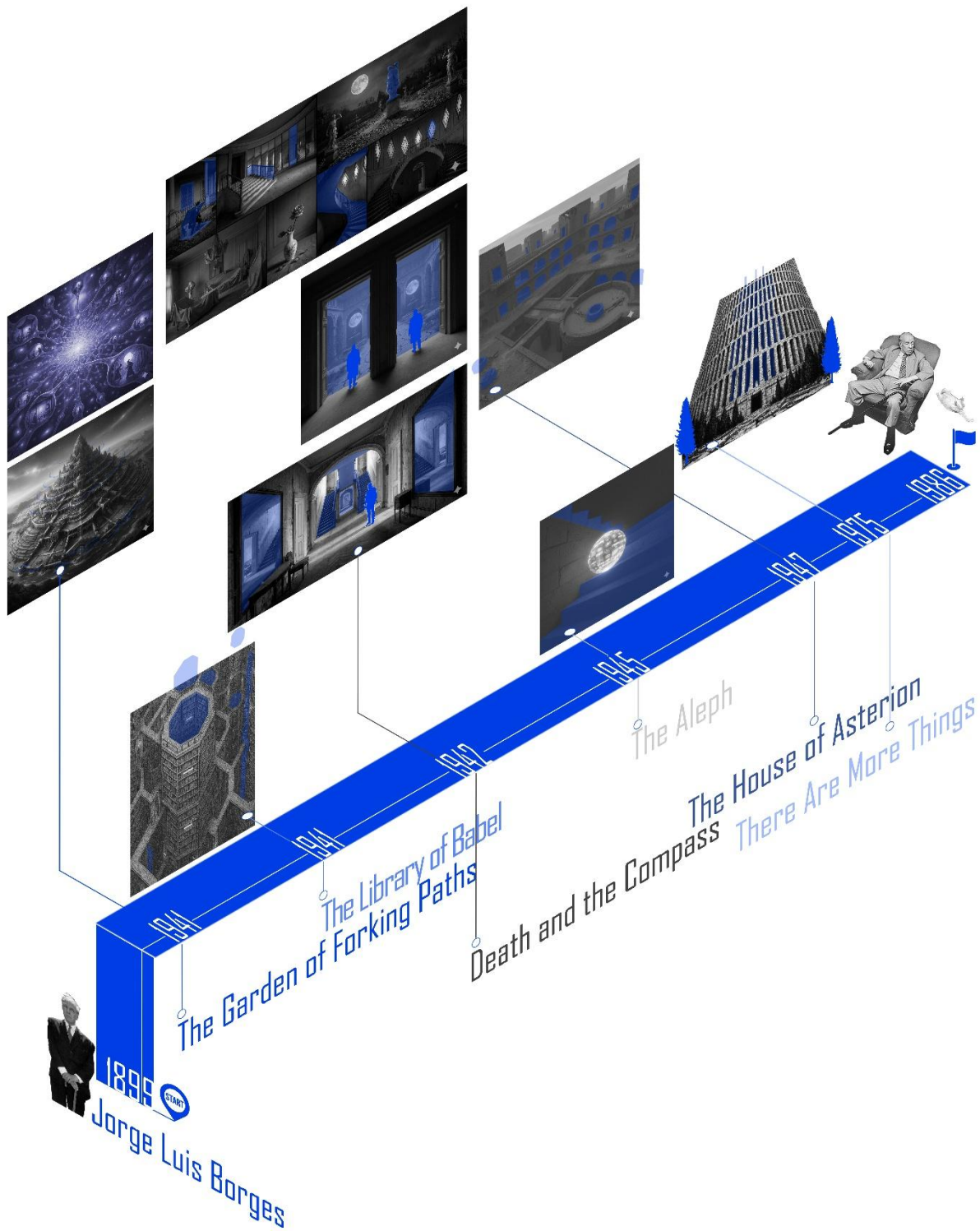
Additionally, in instances requiring further spatial refinement, the image-to-image feedback capability was utilized. The final selected images for each story are presented in Figure 2, where the extracted textual codes are annotated across the visual representations using a distinct color-coded analysis.

**Table 5:** Quantitative Synthesis of Textual Code Extraction and Visual Representation Coverage

| Case Study (Story Title) | Initial Textual Codes (Nt) | Unique Extracted Codes (Nu98) | Visually Verified Codes in Selected AI Image (Nv) | Conceptual Representation Coverage Rate (%) | Unified Thematic Codes (Nu64) | Primary Represented Architectural Categories |
|--------------------------|----------------------------|-------------------------------|---------------------------------------------------|---------------------------------------------|-------------------------------|----------------------------------------------|
| The Library of Babel     | 15                         | 15                            | 14                                                | 93.33%                                      | 12                            | Spatial Geometry, Architectural Space        |
| The House of Asterion    | 35                         | 16                            | 16                                                | 100%                                        | 10                            | Qualitative Features, Micro-spaces           |
| There Are More Things    | 8                          | 8                             | 8                                                 | 100%                                        | 5                             | Architectural Elements, Materials            |
| Death and the Compass    | 65                         | 39                            | 33                                                | 84.62%                                      | 27                            | Architectural Geometry, Objects/Accessories  |
| The Aleph                | 6                          | 6                             | 6                                                 | 100%                                        | 5                             | Qualitative Features, Architectural Space    |
| The Garden               | 21                         | 14                            | 14                                                | 100%                                        | 5                             | Micro-spaces, Architectural Elements         |

|                      |     |    |    |        |    |                                   |
|----------------------|-----|----|----|--------|----|-----------------------------------|
| of Forkin<br>g Paths |     |    |    |        |    |                                   |
| Total /<br>Average   | 150 | 98 | 91 | 96.33% | 64 | 7 Major Architectural<br>Clusters |

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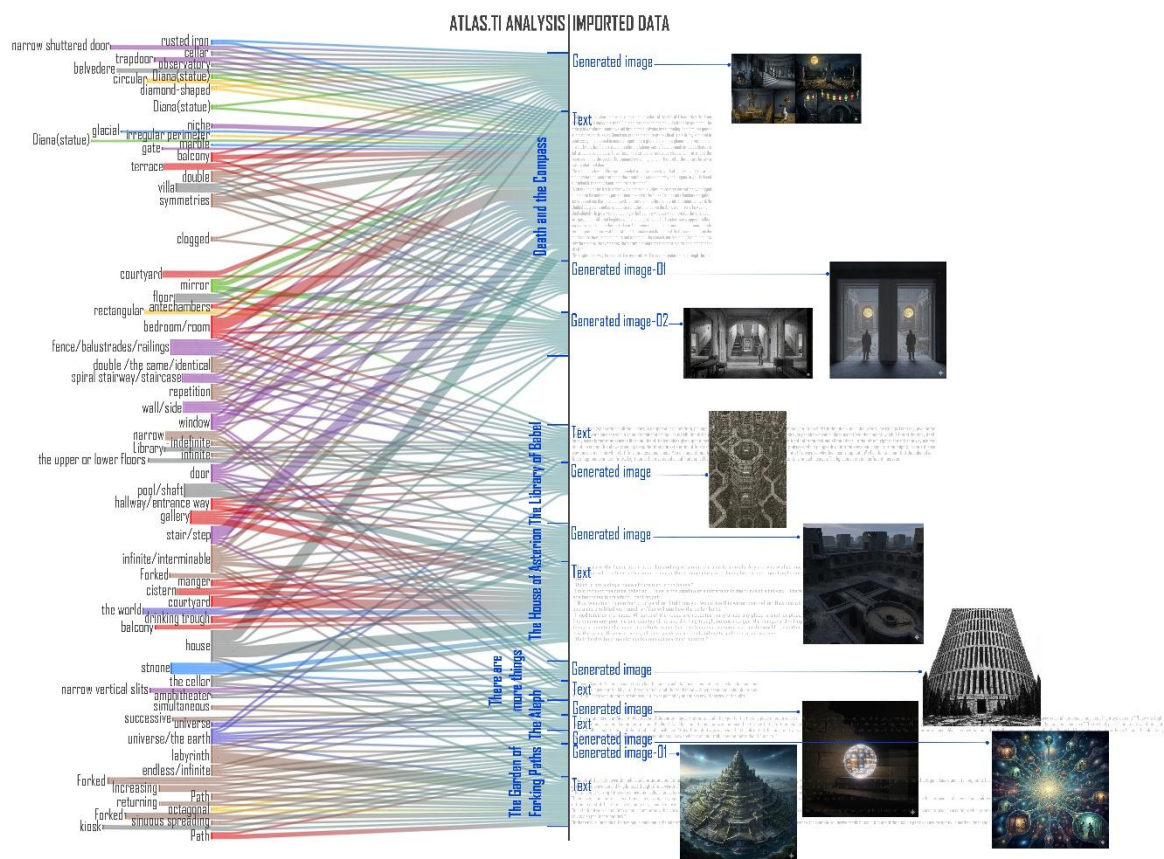
**Figure 4:** Timeline of Borges' stories and the final selected AI-generated architectural representations exhibiting color-coded spatial code analysis and high conceptual fidelity.

## Findings and Analysis

Simultaneous qualitative analysis of textual and visual data in ATLAS.ti reveals that generative artificial intelligence tools, rather than exhibiting "cognitive understanding or perception of text," demonstrate a high capacity for precise pattern matching and visual recreation aligned with verbal codes.

### Overlap of Textual Codes and Visual Representations

To ensure high evaluation accuracy, architectural codes were mapped onto the selected images based on the 98 distinct codes. Figure 5 illustrates the cross-domain mapping and network connection between the textual codes and visual elements within the software environment.



**Figure 5:** Cross-domain mapping in ATLAS.ti demonstrating the structural overlap and semantic alignment between extracted textual codes and AI-generated image entities.

To further elucidate the empirical pathway from textual description to spatial visualization and address the traceability of intermedial conversion, Table 6 provides a granular breakdown of a

representative case study from The House of Asterion. By utilizing direct literary excerpts as prompts, the cross-mapping process traces how specific spatial codes—such as infinite and forked—are translated into digital imagery. The quantitative evaluation confirms a high conceptual representation coverage rate (100%), demonstrating that the generative model effectively converts textual data into verifiable visual equivalents while maintaining structural fidelity to Borges's metaphorical framework.

Table 6: Empirical Traceability and Visual Fidelity Matrix for The House of Asterion

| Selected Literary Excerpt from Borges's Text<br>(Used as Direct Prompt)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Extracted Spatial Codes from Text<br>(Based on ATLAS.ti Coding Protocol)                                                                                                   | Generated AI Image Output                                                          | Visually Verified Codes in<br>Selected AI Image (Nv)                                                                                                                       | Conceptual Representation<br>Coverage Rate / Fidelity (%)                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| "The doors of the house stand open day and night to men and also to animals. Anyone who wishes may enter. One will find here no feminine finery or the strange pomp of palaces, but rather a quiet and a solitude."<br>"There is not a single piece of furniture in the house."<br>"I run through the stone galleries... I hide in the shadow of a cistern or in the curve of a hallway... There are balconies from which I cast myself."<br>"Now we return to another courtyard' or 'I told you you would like this water channel' or 'Now you will see a cistern filled with sand' or 'You will see how the cellar forks.'"<br>"I meditated on the house. All parts of the house are repeated many times; any place is another place. There is no one pool, no one courtyard, no one drinking trough, no one manger; the mangers, drinking troughs, courtyards, pools are infinite in number. The house is the same size as the world—or rather, it is the world. However, weary of courtyards with a pool and dusty galleries of gray stone..."<br>"Their bodies help me distinguish one gallery from another." | door house<br><br>stone gallery<br>cistern hallway<br>balcony courtyard<br><br>the cellar forked<br>repetition<br>drinking trough pool manger<br>infinite<br><br>the world |  | door house<br><br>stone gallery<br>cistern hallway<br>balcony courtyard<br><br>the cellar forked<br>repetition<br>drinking trough pool manger<br>infinite<br><br>the world | 100%<br><br>(16 verified codes out of 16 unique extracted textual codes) |

Analytical and quantitative evaluation of the alignment between textual and visual codes (based on the 98 initial distinct codes and the 64 final thematic codes) for each narrative is summarized in Table 7.

Table 7: Quantitative Synthesis of Textual Code Extraction and Visual Representation Coverage

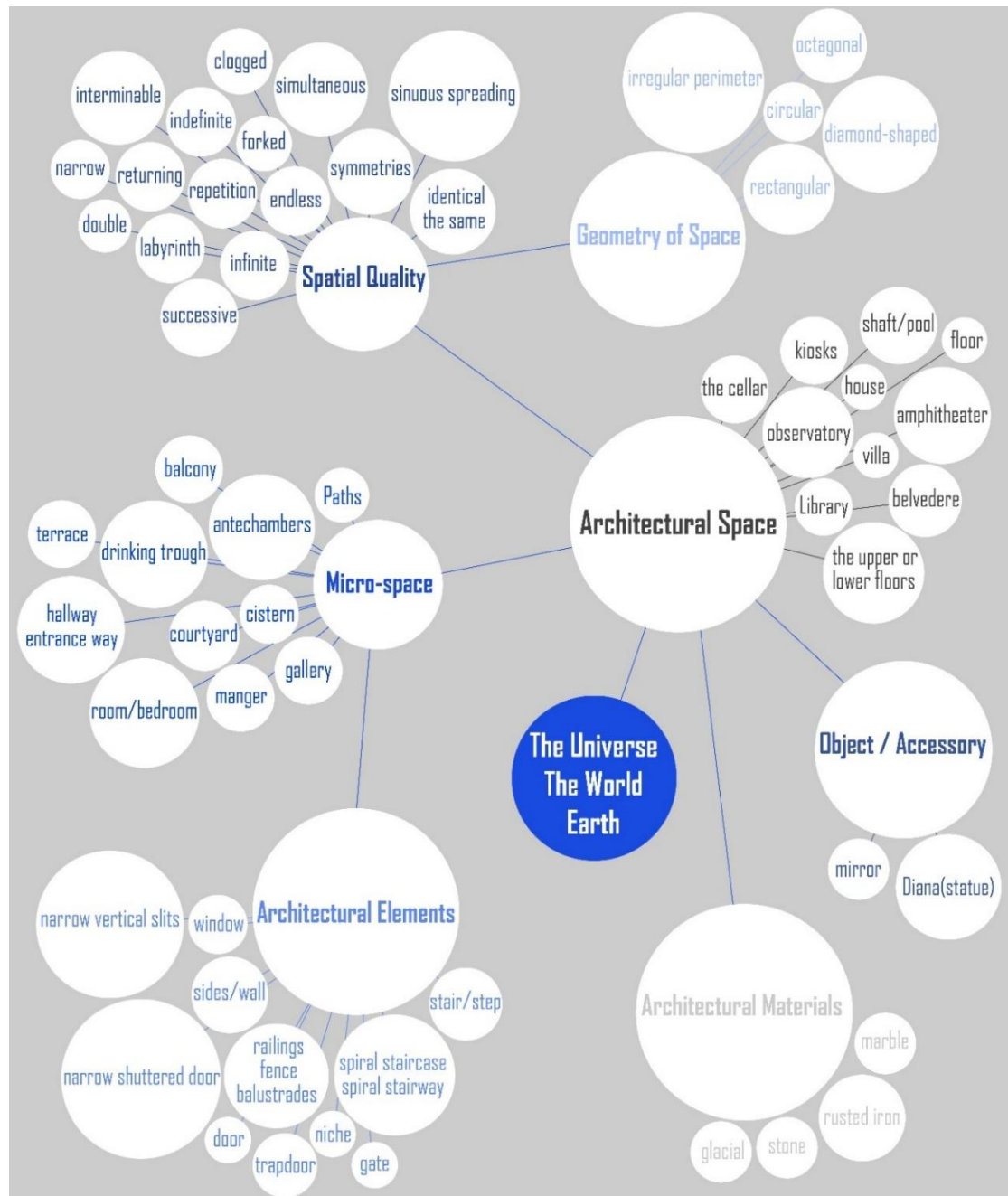
| Case Study (Story Title) | Initial Textual Codes (Nt) | Unique Extracted Codes (Nu98) | Visually Verified Codes in Selected AI Image (Nv) | Conceptual Representation Coverage Rate (%) | Unified Thematic Codes (Nu64) | Primary Represented Architectural Categories |
|--------------------------|----------------------------|-------------------------------|---------------------------------------------------|---------------------------------------------|-------------------------------|----------------------------------------------|
| The Library of Babel     | 15                         | 15                            | 14                                                | 93.33%                                      | 12                            | Spatial Geometry, Architectural Space        |

|                                       |     |    |    |                                                |    |                                               |
|---------------------------------------|-----|----|----|------------------------------------------------|----|-----------------------------------------------|
| <b>The House of Asterion</b>          | 35  | 16 | 16 | 100%                                           | 10 | Qualitative Features, Micro-spaces            |
| <b>There Are More Things</b>          | 8   | 8  | 8  | 100%                                           | 5  | Architectural Elements, Materials             |
| <b>Death and the Compass</b>          | 65  | 39 | 33 | 84.62%                                         | 27 | Architectural Geometry, □ Objects/Accessories |
| <b>The Aleph</b>                      | 6   | 6  | 6  | 100%                                           | 5  | Qualitative Features, □ Architectural Space   |
| <b>The Garden of □ Forkin g Paths</b> | 21  | 14 | 14 | 100%                                           | 5  | Micro-spaces, Architectural Elements          |
| <b>Total / Overall Metric</b>         | 150 | 98 | 91 | Global Ratio: 92.86%<br>(Mean Average: 96.33%) | 64 | 7 Major Architectural Clusters                |

As demonstrated in Table 7, out of the 98 distinct unique codes extracted across the corpus ( $N_t = 98$ ), a total of 91 codes were visually verified within the selected images, yielding an overall global coverage rate of **92.86%** (91/98). Furthermore, calculating the arithmetic mean of the coverage rates across the six individual case studies yields an average scenario-specific coverage rate of **96.33%**. Both metrics confirm a high degree of overlap, demonstrating that the transition from textual discourse to visual representation via Gemini constitutes a coherent pattern-matching process through which verbal codes are effectively translated into tangible formal elements.

### Network Structure of Architectural Codes in Borges' Universe

Cluster analysis in ATLAS.ti revealed that the 64 extracted codes are structured across seven major architectural categories. Figure 6 illustrates the conceptual network of these codes; within this network, the category of "Architectural Space" functions as the central node, around which other categories such as "Micro-spaces," "Qualitative Features," and "Geometry" are organized. This network topology demonstrates that Borges' literary metaphors, when routed through controlled textual inputs, possess the capacity to be translated into measurable design parameters within generative AI outputs.



**Figure 1:** The hierarchical network and thematic clustering of the 14 unified spatial codes representing the architectural cosmos in Borges' narratives.

### Expansion of Representation Process & The Six Prompting Scenarios

To refine the findings, evaluate algorithmic behavior, and adopt a systematic approach, the image generation process in this study was developed based on a multi-perspective scenario-based validation strategy. In this context, this approach does not denote methodological triangulation or cognitive awareness by the AI; rather, it is employed as a comparative

validation framework to examine algorithmic behavior when confronted with diverse textual and visual inputs.

Accordingly, visual outputs were organized across six distinct scenarios to evaluate formal correlation, the layers of input influence on physical outputs (interiors vs. exteriors), and the generative system's capacity for the "algorithmic completion of unwritten spaces":

1. Scenario 1 (Representation Based on Aggregated Extracted Codes): Inputting all extracted unique textual codes as a coherent input network.
2. Scenario 2 (Representation Based on Selected Final Outputs - Image-to-Image): Feeding previously selected image outputs as visual inputs alongside textual prompts to evaluate formal stability and visual evolution across iterative steps.
3. Scenario 3 (Representation Based on Focal/Recurrent Codes): Focusing specifically on key motifs and recurring codes (e.g., mirrors and labyrinths).
4. Scenario 4 (Representation Based on Code Frequency & Weighting): Applying analytical weights to prompts based on code occurrences in text and visual outputs.
5. Scenario 5 (Direct Representation from Raw Text / Unprocessed): Providing direct literary excerpts to the AI to compare raw algorithmic outputs against researcher-refined outputs.
6. Scenario 6 (Macro Representation of Borgesian World Structure): Supplying thematic descriptions of the holistic spatial-conceptual world of each narrative as strategic prompts.

### **Methodological Implication of Iterative Dependency in Scenario 2**

Acknowledging the design workflow, it is important to note that Scenario 2 introduces a degree of methodological dependency, as the visual inputs rely on previously selected researcher outputs rather than raw text alone. Consequently, later iterations in this scenario are not entirely independent of prior selections. However, rather than acting as a strict limitation, this controlled feedback loop purposefully simulates an iterative architectural design process—akin to how a designer refines a concept through successive sketches—allowing the evaluation of how spatial stability and code retention behave under continuous visual-textual coupling.

## **Algorithmic Evaluation and Pattern Completion of Unwritten Spaces**

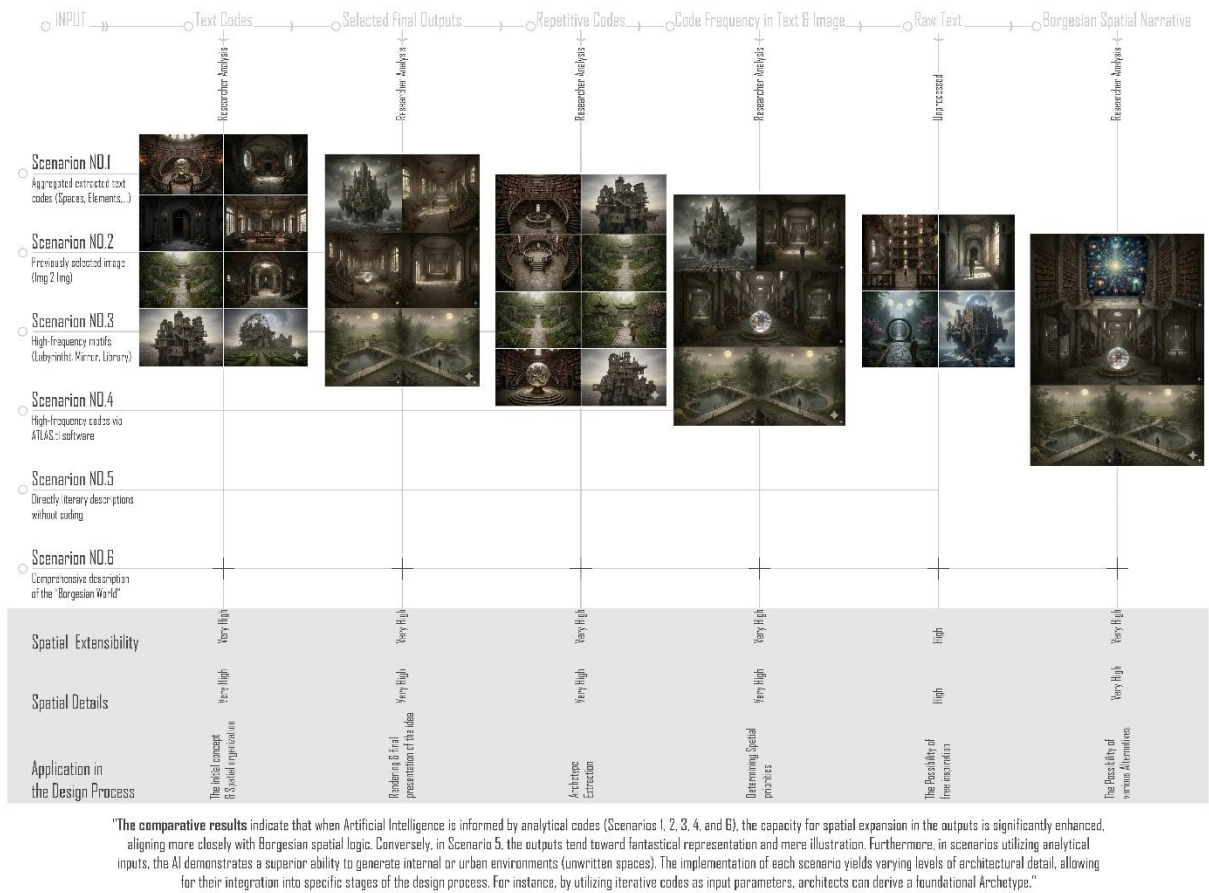
The execution of these six scenarios aimed to address a fundamental question in the design process: "Can the AI algorithm, beyond verbatim word-by-word representation, recognize the structural patterns governing the text and extrapolate them to explicitly unwritten spaces (e.g., interior versus exterior views or urban scales)?"

Results from these scenarios indicate that AI lacks "cognitive understanding" or "theoretical comprehension"; nevertheless, it demonstrates a high capacity for pattern completion based on input data. Supplying categorized analytical codes allows the AI, within its trained statistical models, to replicate geometric relationships aligned with the text across unseen angles or macro scales.

### **Controlling Interpretive Divergence & Qualitative Validation (Validation & Reliability)**

To ensure validity and reliability in qualitative analysis and to minimize researcher bias, comparing outputs derived from "raw text" (Scenario 5) against "analytical codes" (Scenarios 1–4 and 6) clarified the boundary between "random/fantastic algorithmic generation" and "structured representation of literary codes."

A matrix comparison of the six scenarios—mapping spatial extensibility, architectural detail levels, and scenario applications within the design process—is presented in Figure 7 (Diagram 7).



**Figure 7:** Comparative Matrix Analysis of Image Generation Scenarios mapping input prompting strategies against spatial extensibility, detail levels, and design process applications.

Additionally, a qualitative evaluation, ranking of spatial extensibility, and the analytical application of each scenario within the architectural design process are summarized in Table 8:

**Table 8:** Analytical Synthesis of Prompting Scenarios and Architectural Design Utility

| Scenario No.         | Prompt Strategy / Input Type | Output Architectural Quality & Alignment                                            | Spatial Extensibility & Unwritten Space Capacity                                   | Primary Design Utility                 |
|----------------------|------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------|
| <b>Scenario No.1</b> | Unified Textual Codes        | High (Coverage >90%)<br>Clear structural alignment and defined geometric hierarchy. | Very High<br>effectively extends to interior/exterior variations                   | Initial Concept & Spatial Organization |
| <b>Scenario No.2</b> | Image-to-Image Feedback      | High (Fidelity Index >85%)<br>Refined material textures and formal stability.       | Very High<br>Maintains consistent spatial logic through iterative visual coupling. | Rendering & Final Presentation         |

|                      |                         |                                                                                                     |                                                                                                        |                                     |
|----------------------|-------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Scenario No.3</b> | Recurrent Focus Codes   | High (Target Accuracy >90%)<br>Strong emphasis on archetypal elements (labyrinths, mirrors).        | Very High<br><br>Isolates and deepens specific architectural motifs.                                   | Archetype Extraction                |
| <b>Scenario No.4</b> | Weighted Code Prompts   | High (Proportional Score >85%)<br>High proportion of key structural components and balanced zoning. | Very High<br><br>Provides a balanced distribution of core spatial attributes.                          | Determining Spatial Priorities      |
| <b>Scenario No.5</b> | Raw Unprocessed Text    | Low (Coverage <60%)<br>Low structural predictability; high fantasy and pictorial bias.              | High (with high variance)<br>Prone to semantic divergence and literal/metaphorical misinterpretations. | Possibility of Free Inspiration     |
| <b>Scenario No.6</b> | Macro Spatial Worldview | High (Holistic Coverage >85%)<br>High atmospheric fidelity; coherent macro-scale concepts.          | Very High<br>Generates consistent urban-scale and systemic geometries.                                 | Possibility of Various Alternatives |

To ensure methodological rigor and operationalize the qualitative labels (Very High, High, and Low) presented in Table 8, a comparative evaluation rubric was established. The performance ratings are directly derived from the ATLAS.ti code-mapping matrix, evaluated against three defined criteria: Structural Alignment Ratio (percentage of successfully verified textual codes), Spatial Extensibility (capacity to generate coherent variations without semantic distortion), and Predictability (resistance to pictorial or fantasy bias). Accordingly, Very High indicates a code coverage rate above 90% with strict geometric fidelity; High denotes a coverage rate between 80% and 90% with minor stylistic variations; and Low signifies unpredictable semantic divergence or high reliance on generic pictorial generation.

The comparative findings from this alignment (Figure 7 and Table 8) indicate that when generative AI is driven by analytical codes (Scenarios 1, 2, 3, 4, and 6), the capacity for spatial extensibility in the outputs is significantly enhanced, aligning more closely with Borgesian spatial logic. Conversely, in Scenario 5 (raw unprocessed text), the outputs tend toward fantastical representation and mere pictorial illustration. Furthermore, in scenarios utilizing

analytical inputs, the AI demonstrates a superior capacity to regenerate interior or urban environments (unwritten spaces) with higher fidelity.

## **Conclusion**

Aiming to explore the bridge between theoretical discourse and architectural representation, this study evaluated the performance of generative AI tools (specifically Google Gemini) in conjunction with qualitative analytical software (ATLAS.ti). The findings demonstrate that generative AI should not be construed as a "cognitively aware entity" or an "architecturally conscious intelligence"; rather, this technology operates as a cross-modal pattern translator capable of establishing structural bridges between verbal language and geometric forms.

The key insights of this research are summarized across four core dimensions:

### **Overlap of Textual and Visual Coding (Subject-Object Alignment)**

Qualitative cross-mapping in ATLAS.ti revealed a high alignment rate (96.33%) between architectural codes extracted from Borgesian texts and the visual elements realized in the selected generated images. The findings suggest that the generative image algorithm can support the visual interpretation of selected spatial and atmospheric codes by translating textual inputs into visual and geometric counterparts (e.g., converting the metaphor of "infinite repetition" into recursive perspectives and modular grids). This indicates that AI acts not as a simple drafting tool, but as a structural spatial translator driven by algorithmic pattern-matching.

### **The Architect as an Analytical Curator**

Findings across the six prompting scenarios demonstrated that AI operating in isolation without human mediation is highly prone to semantic divergence. The occurrence of irrelevant or purely fantastical outputs in Scenario 5 (unprocessed raw text) proves that generative AI requires a human perceptual and analytical filter. Indeed, the conceptual coherence of the generated visual spatial worlds is the byproduct of a dialectical workflow between the AI (functioning as a rapid option generator) and the architect (acting as a qualitative analyst and curator).

### **Pattern Completion and the Extrapolation of Narrative-Driven Spatial Configurations**

Evaluations of Scenarios 1 and 6 revealed that supplying coherent structural codes enables the AI to extrapolate new spatial variations (e.g., unprompted interior/exterior perspectives or urban-scale layouts) that were not explicitly detailed in the literary text, yet remain aligned

with the governing spatial logic. This process stems not from "conscious machine foresight" or the reconstruction of unwritten mental structures, but from the algorithm's statistical capacity to replicate and extend input patterns across expanded dimensional parameters.

### **Transformation of the "Writing–Coding–Seeing" Workflow**

This study proposes a refined metaphorical-to-spatial design workflow wherein literary text elevates from mere description to a generative structure. Merging systematic qualitative coding with generative AI offers a potential methodology with future implications for design studios and academia, suggesting that spatial ideation for complex, narrative-driven projects could commence through the extraction and structuring of spatial codes rather than manual initial sketching.

### **Limitations**

To maintain scientific transparency and scholarly balance, the generalizability and scope of this study's findings should be interpreted within the context of several inherent limitations:

1. **Reliance on a Single AI Platform:** This research exclusively utilized a single AI platform (Google Gemini 1.5 Pro). Given variations in neural network architectures and dataset training across platforms, employing alternative tools (such as Midjourney or DALL-E 3) may yield differing spatial coverage rates and visual outputs.
2. **Model Sensitivity and Generative Variations:** The generative model's outputs are heavily dependent on prompt formulation, while possible variations across model versions, training datasets, or repeated runs may introduce fluctuations in the visual syntax.
3. **Visual and Cultural Biases:** The potential presence of visual and cultural biases embedded within the underlying architecture of the generative model must be acknowledged, as these may unconsciously shape the aesthetic and spatial outcomes.
4. **Qualitative and Interdisciplinary Nature of Interpretation:** Although objective criteria (ATLAS.ti cross-mapping based on 98 distinct codes and 64 final thematic codes) were implemented to minimize subjective bias, the processes of literary coding and visual feature mapping inherently retain an interpretive qualitative dimension.
5. **Corpus Limitation and Generalizability Boundaries:** The empirical findings of this study are derived exclusively from six short stories by Jorge Luis Borges, a literary

corpus characterized by uniquely complex, non-Euclidean, and metaphorical spatial structures. Consequently, the applicability and generalizability of this hybrid methodology are inherently bounded by the specific characteristics of this corpus; broad claims regarding standard architectural design workflows or conventional literary texts should be interpreted with caution. Extending this framework to more realistic architectural programs or alternative literary styles requires further empirical validation.

6. **Methodological Clarification on Selection Circularity:** We acknowledge that selecting final visual outputs based on code coverage and subsequently using those outputs to measure code alignment introduces an inherent circularity in performance evaluation. In a strict quantitative framework, this could potentially overestimate algorithmic efficacy. However, this iterative selection protocol is intentionally aligned with architectural design studio practices, wherein a designer progressively filters, selects, and refines design artifacts based on predefined criteria rather than treating all iterations as final products. Future research should implement blinded or completely independent evaluation procedures (such as blind expert reviews by external architects) to corroborate these automated code-coverage metrics.
7. **Methodological Note on Baseline Comparison:** We acknowledge that comparing the proposed qualitative coding workflow with a simpler baseline—such as direct text-to-image generation from raw literary excerpts—would provide additional empirical metrics regarding conceptual fidelity. In our preliminary explorations, direct prompting of Borges's abstract and non-Euclidean descriptions frequently resulted in generic or literal misinterpretations by the AI, as raw literary prose often contains stylistic metaphors that obscure geometric spatial data. While a rigorous side-by-side comparative benchmark against a direct raw-text baseline is beyond the current scope due to corpus scale, we explicitly frame this comparative validation as a vital direction for future research to further quantify the exact efficiency of intermediate coding layers.

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