Generative Artificial Intelligence and Reconstruction of House Interiors from 19th Century

Dimitrina Popova[0000-0001-6063-8055]

Institute of Art Studies, Bulgarian Academy of Sciences, 21, Krakra Str., Sofia, Bulgaria
dimitrina_p@abv.bg

Abstract. The paper explores the new creative opportunities introduced by the generative artificial intelligence for the architectural practice. Specifically, the study refers to the realm of architectural heritage. The reconstructed visions of interiors from a 19th century house are result of two input data models: from-text-to-image and from-image-to-image. It considers the collaborative artwork between human and artificial intelligence.

Keywords: Digital Heritage, Reused Traditional Architecture, Balkan Old House, Wooden Building

1 Introduction

The paper explores the creative challenges of the generative artificial intelligence through a definite task to reconstruct historical residential interiors. The study is positioned into two current trends regarding cultural heritage and more specifically architectural heritage. The first one stands on the premise that saving heritage is a process of reuse. The concept is implemented in various initiatives regarding new architectural visions about ruins or abandoned buildings. One remarkable example is the platform *Reuse Italy*, where competitions are held, projects with the names *Reuse the Fortress* and *Reuse the Tower* are published and developed (www.reuseitaly.com). Another significant example for reused heritage but into the digital realm is launched by *Europeana* – one of the biggest platforms for digital art. In a study regarding the use of its digitized and published artifacts, the authors make the conceptual distinction between use and reuse of heritage. According to them the use corresponds to passive interaction with digital object, while the reuse signifies more complicate activity between an external user and the artefact (Vasileva & McNeilly, 2024).

The research tasks of my work to great extend overlap with the defined activities regarding the reuse of digital heritage: to build new ideas upon created digital object, to add new functionality and to verify a previous study's methods or results. Most essentially it is the transformation which means 'to change or alter a digital object substantially, resulting in a new, distinct entity, including, but not limited to artistic recreations, versions, and fusions (Vasileva & McNeilly, 2024)'.

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The second trend where this study takes place is the generative artificial intelligence (GAI). It is well known and practiced to different degrees in the entire spectrum of creative industries in Bulgaria. My research on recently published and peered reviewed texts on the topic indicates that some of the authors address theoretical questions on the emergence and development of the GAI technology in the creative industries (Blazhev, 2023) (Kosev, 2024). Others place greater emphasis on the changes and challenges within the artists' professions regarding the broad application of artificial intelligence, for instance in video simulations (Astrukov, 2025) or for the translation of fiction literature (Kirov & Melamin, 2023). A recurring theme among most researchers is the issue of authorship of the art products created by GAI. There are very few studies where the theoretical questions are derived from co-work with GAI, and the authors' observations are supported by created art products by themselves, such as Svetoslav Kosev (Kosev, 2024). My research stays very close to this last methodological approach though in the entirely different realm of architectural heritage. It involves in-depth research through work with GAI, while addressing the launched topics from a different perspective.

Fig. 1. The 3D digitally reconstructed house in Berkovitsa with the sofa in foreground.

2 Essence of Historical Interior Reconstruction

2.1 The House from the Town of Berkovitsa

A key component in the reuse of heritage is participatory or bottom-up methodologies. This applies to the reuse of digital heritage data about a house from the 19th century, which was located in Berkovitsa, a town in the North-West of Bulgaria. At present, the house no longer exists. However, I collected data about its architecture: a set of archive drawings documenting it in 1953, old photographs of the house with its inhabitants,

panoramic images of the town that include the building. I found important information about its architecture recorded into textual descriptions by prof. architect Todor Zlatev. The house was very special in its configuration of open and interior spaces. It had been inhabited by notable individuals including the monarch of Bulgaria - Prince Alexander Battenberg. Though his stay was very short, it is significant that he selected this house to be his home among others in the prosperous town of Berkovitsa at the end of 19th century. A recognizable feature of the house exterior is the central element of the sofa (fig. 1).

Later, this small chateau-like building of oriental stylistic was also of interest to researchers and architects due to its precise design and elegance. However, it was removed because of undertaken large urban developments around 1970 in the center of the town. In my previous project, I digitally and three-dimensionally reconstructed the house, making it possible to explore it through various media including virtual reality (Popova, 2022).

2.2 The House Interior

In the next phase, the digital reconstruction of the house from Berkovitsa continues with its interiors' recreation. In this paper the process is illustrated with the house reception hall, called the divana room. It is an elongated interior vestibule measuring 3.50 by 6.70 meters. Inside, it visually merges with the space of the sofa. Together they form a common representative hall with depth of about 10 meters. These two rooms create the axis of symmetry along which the house internal composition is assembled. There are two visual positions for the reconstruction. The first one is a view towards the sofa, where in the far distance it is its glass structure (fig. 2 first row). The second position is a view towards the inner end of the vestibule, where three doors are connected to other rooms (fig. 2 second row).

It is necessary to underline that the boundary between architecture and interior is not clearly defined. There is understanding that in contrast to architecture, the interior is more changeable and materially modified through the building existence. The 19th century house architecture is entirely integrated within the geographical context in which it is located while the interior is a combination of fixed and movable elements. Some of these may have originated from totally different cultures and context. Therefore, the reconstruction of historic interiors sets conditions of high variability. Because of the enormous number of optional combinations, the task opens stage for the application of GAI. It is important to point out as well that authenticity is the leading conceptual direction in this process. It means to achieve interpretative design visions that stay very close to what once might be the domestic interior of this high standing architecture in the first decades of its existence.

2.3 The Methodological Elements

The aim of research is to explore the qualitative features of the GAI interpretive models in the context of heritage reuse. It is the Midjourney platform, which allows data input to work in both text-to-image and image-to-image models. The self-training features of

this artificial intelligence are well-developed, and with the help of the Editor functionality, it becomes possible to add detailed adjustments and refinements during the image generation process. The analysis evaluates and compares the visual outcomes with other tested indicators of human creative interpretive results in the arts and creative industries, ranging from fiction literature and visual arts to theater. The collected and launched data into the GAI platform is divided into textual and visual information sets:

Fig. 2. Variations of Interior of the house reception hall (vestibule-divanà). Prompts and Selection: Dimitrina Popova. Generative Artificial Intelligence: Midjourney v.6.

The first group of collected data consists of textual descriptions of the house's rooms, provided by prof. architect Todor Zlatev around 1930 in his monograph dedicated to the architecture of Berkovitsa. He presents a walk through the old house spaces in a series of conceptual and to some extent poetic descriptions. Prof. Zlatev pays special attention to the vestibule, which gives the interior a perspective with great depth. According to him, the view from the inner dark wall of the vestibule towards the sofa, creates a beautiful and strongly impactful effect in this space with cascading rays of light (Zlatev).

The second group consists of images of interiors from houses that are synchronous in time and region with the house from Berkovitsa. To great extend the collections are composed on the prof. Zlatev thesis that this house typology belongs to the group of representative houses from the town of Plovdiv. For the study I collected a big number of images including interior components: wooden ceilings, doors, wall painting decoration, and textile patterns. These are interior elements represented in museums or published in albums and research books for identical houses in the towns of Plovdiv and Koprivshtitsa. The input data forms collages of images, called mood boards whose purpose is to frame and to direct the interior recreation (fig. 3).

3 Discussion

3.1 Edit and Select

The process of creating the interior visions is a communication process between the architect and the artificial intelligence. The data input is organized into the mood boards which are thematically composed into groups referring to ceiling, floor finishing, arrangement and size of fixed furniture, material culture artifacts from the home interior. To complete the design task the artificial intelligence generates hundreds of images (fig.4) while the role of the architect consists of continuous series of edition of new instructions and series of selection among the suggested interpretations. The selection process includes rejecting proposals in situations when the final outcome is not accepted. The reasons might range. For example, when the generated images of old house interiors include conceptual blending of contemporary pieces with the house's original materials and interior elements or in other cases when the GAI rearranges and relocates architectural elements such as doors and windows or substitutes their type and position.

3.2 The Architectural Dialogue with the Generative Artificial Intelligence

The generative artificial intelligence constantly improvises, to the extent every image is different even in cases of same prompts. The results might range and define the GAI creative output limits on an axis. On the first edge stands the GAI feature of missing a clear-cut influence or impact when solving architectural design assignments. In order to solve the design intention, it is a must for the human operator to have an in-depth knowledge of the context, architectural concept, previous research experience, and fundamental principles about the architecture. On the other edge, it is the advantageous work of GAI to quickly visualize conceptual ideas or generate photorealistic images from sketches or rough drawings. Besides speed it provides opportunities for experimentation with different styles and drawing techniques, light and shadow.

Specifically in the architectural heritage, the creative collaboration with the GAI allows reusing data processed in innovative mode, namely to explore untouched spaces of the houses. In the presented case study, it is demonstrated its role to fill gaps because of shortage data to the level that it reinvents data. Generally, the GAI advantage is when

on demand are graphic solutions at a conceptual level and options for interior not imagined completely by the operator-architect.

Fig. 3. Moodboard of wooden ceilings. Collection by Dimitrina Popova.

The question concerning the interpretative opportunities of GAI in its complexity goes beyond the simple idea of translation, of transposition of textual description into image and of image into new image. It is well known from other studies in the arts that artistic translation occurs for example, from one language to another, from text to image, from image to image but what is the most important is that the 'Interpretation always gives differences, deviations (Màrtonova, 2024)'. The process intensifies when the semiotic systems between which the translation occurs are different.

Two contradictive oppositions are on focus that have apparently important impacts on the artistic interpretative results of GAI. The first one identified is its inability to cross well-known boundaries, and the second one is the undefined sense of balance or of human dimension in its interpretative models. There are risks associated with excessive play with free interpretations in the heterogeneous semiotic systems of architecture. If too many changes are introduced, the foundation might be lost or destroyed (Màrtonova, 2024). Fantasy might turn into an incomprehensible mutation, and the new creation risks remaining beyond the possibility of recognition and understanding. There is no standard for a correct, comprehensive, and sufficiently correct transfer between cultural systems. The only measure is the talent of the author according to prof. Martonova (Màrtonova, 2024) or the creative intuition according to the artist Svetoslav Kosev (Kosev, 2024).

On these assumptions through the prompts and selection, architect is in dialogue with the GAI and thus conveys design concepts with his human edits, and interference into artificial intelligence suggestions. The role of the GAI operator is that of someone who critically observes the GAI's work, evaluates, and selects. On the other side the artificial intelligence demonstrates autonomy in design and thus turns into creative companion in architectural creativity. In the monologic form of an imaginary colaboration, new conceptual images are generated through conversation between the archi-

tect and the algorithms of artificial intelligence. Therefore, the images of the architectural interior spaces are products of shared ideas between human and artificial intelligence. In my opinion, it can be considered a new form of art based on 'the belief that different forms in art appear and develop precisely in a specific place and at a specific time (Spassova-Dikova, 2024)'.

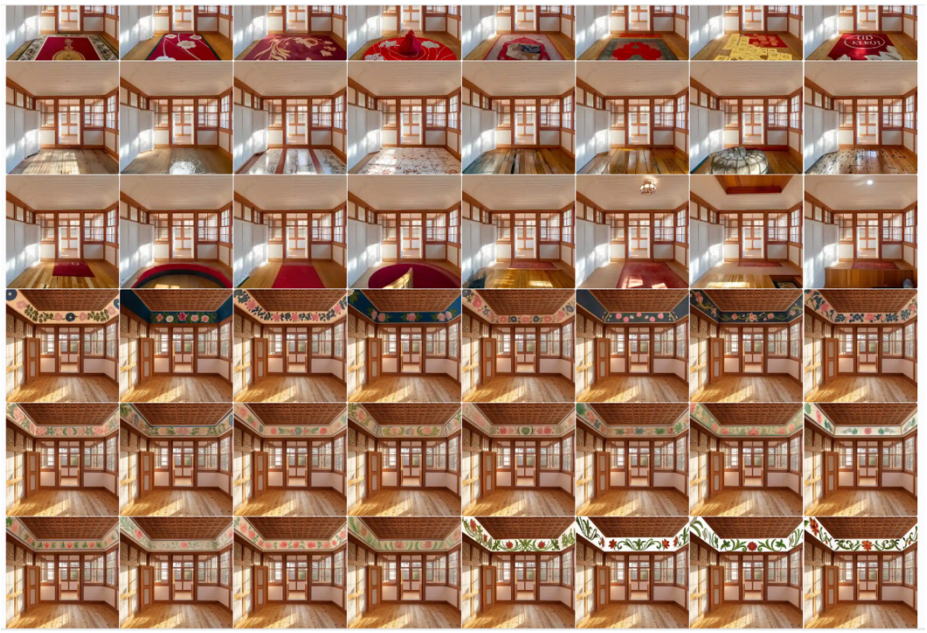

Fig. 4. Variations of the reception hall interior (vestibule-divanà). Generative Artificial Intelligence: Midjourney v.6. Before selection.

3.3 Conclusion

The main focus of this study is on the generative artificial intelligence. It explores its role in the architectural design and defines its limits and advantages for creative interpretations. They are demonstrated through the specific study of architectural heritage house. Exploring the complicate dialogue between architect and technology, the study evaluates the transformations from input to output data. Finaly, it finds out that the created conceptual images of the historic interiors are new forms of art, of creative expression in the realm of architectural heritage.

There is some time between the emergence of the technology and its understanding, definition, classification, and its transformation into everyday practice. Because digitalization and artificial intelligence are deeply integrated into daily life, it is difficult to separate the generative artificial intelligence from culture and from its application in the art studies. Anxiety of technology highlights the role of the humanities and specifically of the arts in translating and finding ways to understand the innovative technological changes, and ensuring they have a positive impact on society.

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