Artificial Connections: Finding the Architect's Role in Text-to-Image Tectonics

NICK SAFLEY
Kent State University

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> AI doesn't construct buildings;
> it generates images for buildings.
>
> —Chat GPT-3.5, Oct. 5th 2023

PREMISE

Architects create images and representations of buildings to communicate construction and fabrication information. Construction necessitates utilizing mediating technologies to compress and communicate design information about material organization across space and time.[1] Successful architectural design images embed material and construction knowledge needed to translate an idea into material. Whether joint lines in hand-drafted elevations imagining stone blocks or walls in a Revit model with embedded construction layers, the images architects produce for building require knowledge of complex material construction cultures and an idea of construction's aesthetic implication. Images of this sort maintain the professional and disciplinary position of the architect as an organizer of the materials, processes, and labor needed to actualize building in the contingencies of the physical world.

Artificial intelligence, especially text-to-image generation platforms, enables the rapid creation of images depicting forms, scenes, and objects with an unprecedented speed and a notable absence of embedded knowledge from the architect. The rapidly emerging capacity of AI posits a unique and changing role for the architect in the design and construction process. AI allows anyone to generate compelling images with high resolution and photorealism. However, current AI-generated images lack embedded knowledge related to construction, often featuring illogical or impractical material connections or assemblies. This project researches how architects can execute material connections as depicted by undisciplined artificial intelligence and explores how apparent failures or errors in AI-generated material connections can challenge and expand the tectonic boundaries of architectural thinking.

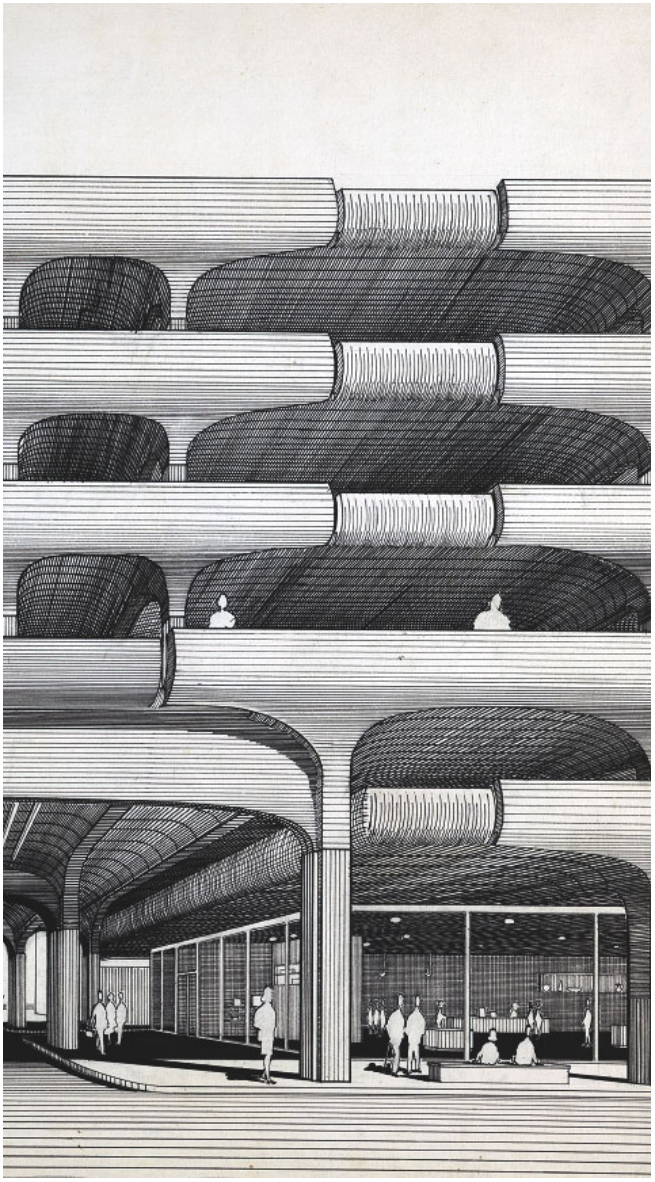

Figure 1. Ink on mylar lines show the orientation of scale of the rough timber to be used in the concrte formwork for the Temple Street Parking Garage, by Paul Rudolf.

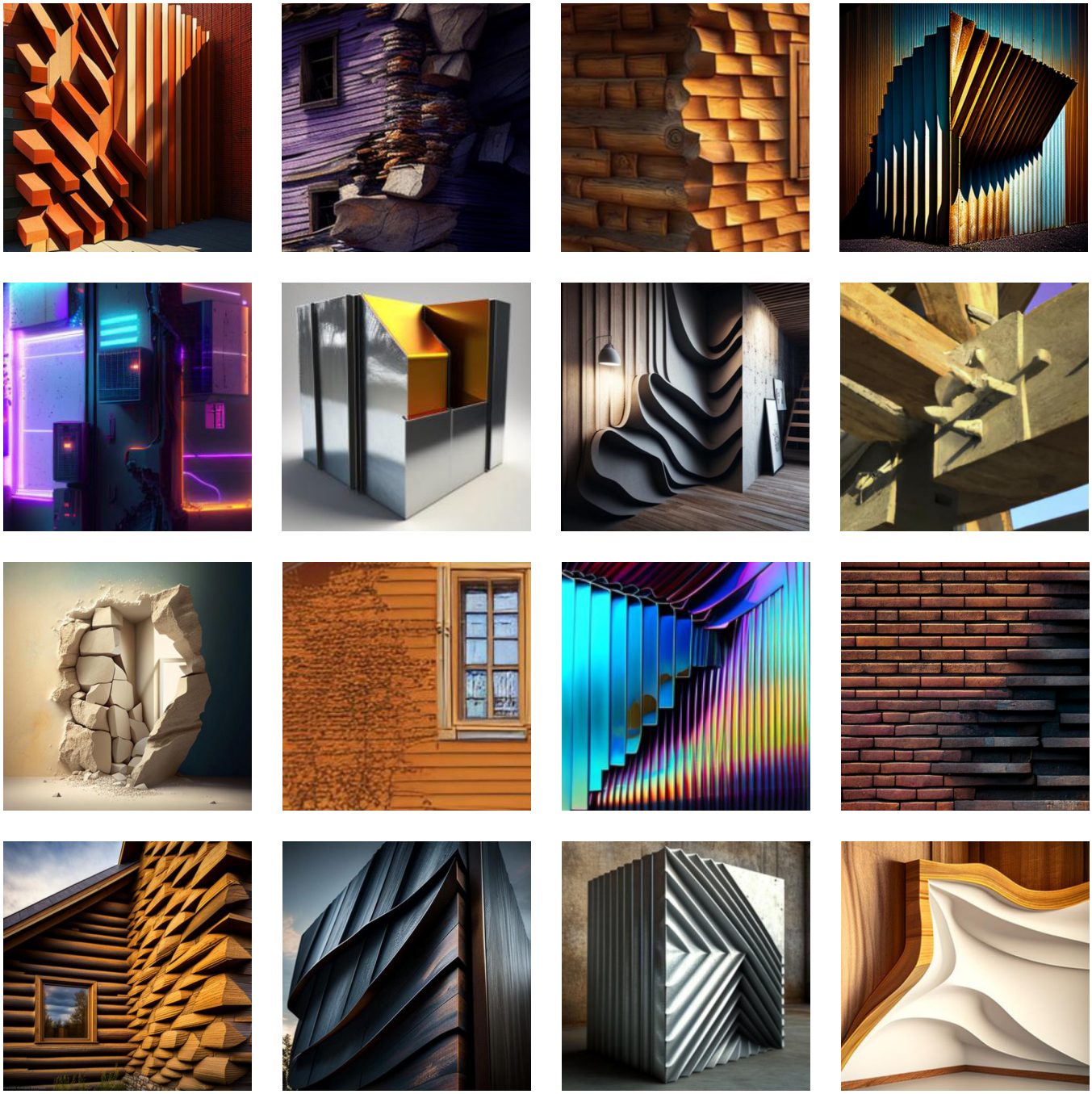

Figure 2. An array of images generated as connections between common materials. Images by seminar students using Midjourney.

COURSE DESCRIPTION

A graduate fabrication seminar in the spring of 2023 explored materializing images created in Artificial Intelligence (AI). In this course, eleven students forefronted material and construction knowledge in collaboration with Midjourney, a text-to-image artificial intelligence, to build full-scale tectonic mockups of materials connected and created via AI images. Three student groups translated images of material tectonic joints developed in Midjourney into mockups constructed from common exterior material assemblies readily available at local big box suppliers. Most students experimented with cladding materials during initial image studies, knowing that most images the AI created could be built without impacting the weatherproofing of these systems due to their laminar nature, which separates the image capacity of the cladding from environmental functions.[2] Complex and ambiguous material connections were digitally fabricated when required, and custom finishes were applied as needed.

HOW AI WAS USED

The imprecision of details created by image-making AI, such as Midjourney, is well-published. When producing human body details, most notably human hands, text-to-image generators often fail to make convincing images, often with confusing and monstrous results.[3] For architects, parallel imprecision can be found when asking an AI to generate material details and connections. Bricks morph onto corrugated metal siding seamlessly, shingles become logs of impossible depth, and vinyl siding takes on rocklike protuberances. The AI only learns to synthesize images from a data set, producing equally confusing and monstrous material connections. As architects, unclear and uniformed image-based material connections hold projective implications for design simply because they are transgressive of known connection assemblies.

The seminar course focused on exterior wall assemblies and traditional areas of tectonic intensity, such as interior wall corners, exterior wall corners, and column base connections to the ground. These locations of architectural detail often merge known systems in ways that appear unbuildable or counterintuitive to the material qualities of the underlying systems the architect has asked the AI to connect. Students generated images of this sort using AI. Then, they reasserted the architect's expert role as an organizer of material to translate these images into digital models for fabrication and construction.

Figure 3. Monstrous AI Hands. Image by @wcollen.

TRANSLATING IMAGE TO MATERIAL CONSTRUCTION

In the translation process, each group had to propose a position and method for using the AI-created image to create a material mockup. The three groups confronted the material behavior, environmental control layers, available tools, budget, and material images incongruous with the architectural image created by the AI. Students used the undisciplined AI images as a creative starting point to test methods of working with the AI toward a physical mock-up. Each group's stance set forth a working theoretical and disciplinary model for future discussion and exploration.

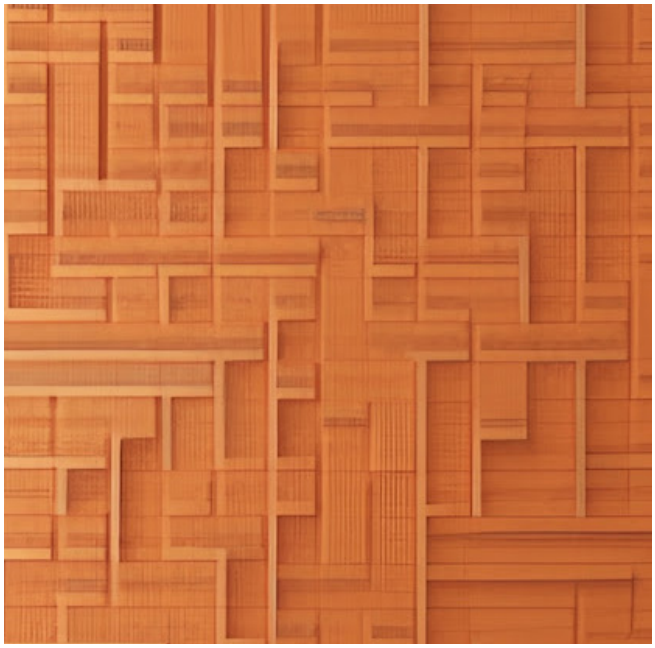

Image as Inspiration - Group 1 used the AI-generated image as an inspiration from which the physical material changed the design. Group 1 generated an AI texture with expressed joints between terracotta tiles. These irregular tiles were milled from MDF and stained to resemble a terracotta, a material technically outside the course's capability. Stained cedar was inlaid into enlarged joints between tiles to hide screw connections to the backup wall sheathing. In the mockup, students wrapped the initially flat texture over an outside corner, and the thicknesses of the MDF and milled wood texture were resolved in 3D, outside the scope of the AI image.

Figure 4. Material Texture Image. Image by Group 1 and Midjourney.

Figure 5. Exterior Wall Corner Mockup. Image by Group 1

Recreation of Image Effect - Group 2 attempted to create a mockup that maintained the appearance of the initial image to as high of a degree as possible. This group used AI assistance to create a novel connection between a steel and wood face. The AI image used a reflective metal to softly wrap the interior corner, and it was unclear if the material was reflective or contained a wood grain on its surface. This group focused on material type and orientation while taking liberty from the initial image's color. Instead of a simple mirrored metal that reflected an actual wood adjacent, students stained a faux wood texture over the reflective stainless steel and the actual wood siding. This camouflage-stained texture obscures each materiality under a physical version of a texture map that mimics the reflective nature of the curved metal in the AI image.

Figure 6. Wood to Steel Corner. Image by Group 2 and Midjourney.

Figure 7. Interior Wall Corner Mockup. Image by Group 2

Figure 8. Column Base Image. Image by Group 3 and Midjourney.

Figure 9. Column Base Mockup. Image by Group 3

Image as Construction Document - Group 3 used AI to design a column-to-ground joint between a wood column and a concrete floor. The ambiguity of materiality between wood and concrete in the initial AI image was replicated as closely as possible in the construction. Paint color and material texture matching were most important for this group as they faithfully materialized the AI image one-to-one. Interestingly, the group located their mockup not at a joint between surfaces but at the location of a historic disciplinary issue, namely how a column meets the ground. This choice put the project into dialogue with structural capacity, material weathering, and construction installation order, all issues the students could address as human agents and disciplined architectural thinkers.

CONCLUSION

Architects must be able to adeptly address the discrepancies in images depicting material connections by aligning them with the precision and contingency inherent in material construction. Exploring the productive and projective potential of applying construction and fabrication expertise to undisciplined material images prompts architects to challenge assumptions about conventional assembly and envision innovative tectonics.

Before the era of AI, tectonic thinking historically focused on various issues such as originary myths, material behavior, linguistic meaning, the embodiment of gravity, and tool-based techniques, to mention just a few trajectories. However, today, AI can generate numerous images of material connections and tectonic conditions without disciplinary knowledge or an understanding of material reality. It compels architects to reconsider their approach to creating images for material construction in a world of endless undisciplined tectonic possibilities.

This seminar reconnects with tectonic thinking by bridging AI image generation with the material realities of construction. The student projects showcased here utilize AI-generated images in diverse ways, envisioning a multifaceted future relationship with AI and proposing an alternative disciplinary role for architects as experts in both material construction and image efficacy. By exploring artificial intelligence through Midjourney as a design tool without inherent knowledge of material construction, this seminar underscores the enduring relevance of tectonic thinking for future architects.

ENDNOTES

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