Embodiment in haptic architectural diagrams
Esen Gökçe Özdamar

Introduction: architectural diagrams
Historically, architects have used technical drawings to represent their architectural ideas, not only to refine their thoughts but also to convey their ideas to others. Architectural drawings and representations, whether technical or surreal, have enabled designers to enrich their design thinking, processes, and products, and have enabled architects to experiment, reflect, and scrutinize their ideas. Architectural design thinking is a complex process that is primarily shaped in the mind of the designer and simultaneously rendered by a complex milieu, comprising the problem context, limitations, expectations, program, content, users or participants, and the moment in time. It is within this context that architects express themselves freely and openly and generate their ideas. In this complex design context, the designer uses their physical body to varying degrees in sketching, modeling, prototyping, diagramming, and animating. From sketches and scribbles to model making, from digital design to 3D immersive environments, designers communicate through the environments they are embedded in. With the widespread use of computer technologies, designers use tactile paper and pen far less than before, and instead use digital screens, mixed reality, 3D printers, or 3D pens.

Drawings are tools of translation between design and building. They have several typical traits. They are “evocative” in that they convey the experiential qualities of the design, or are “instructional” in that they may be “notational drawings” which convey precise dimensional and material information. Among architectural representations, diagrams are “imaginative devices” which convey “powerful metaphors.” They can be figurative or non-figurative representations and can contain quantitative and qualitative information that can be transformed into physical designs, or which can convey intense visual information relating to tone, context, and a myriad of other ideas. Diagrams convey and refine information in the design process, capturing measured and geometric data, and guiding the creative processes. They enable designers to explore the potentialities of design elements such as form, space, materiality, scale, light, and use. As Andrew Chaplin argues, in the design process a diagram is “a visual language—a medium between thoughts and reality.” Diagrams clarify relational knowledge, elements of the design, the process of construction, and the spatial relations in an architectural problem. The interplay between real-world objects and the spatial relationships between them. In his book Space is the Machine, Bill Hillier argues that architectural diagrams are more than just a representation and “the designer is in effect a configurational thinker.” He argues that an architect’s attitude towards architecture is at once a thing and an activity, certain attributes of buildings and a certain way of arriving at them” in which product and process are not independent of each other. Product and process converge in Hillier’s work. An architectural diagram serves both as “an embodiment of the designer’s intent in itself and as an ‘interchangeable artifact.’” Therefore, a diagram can embody both the relationship between physical form and spatial form and the relationship between “bodily function and socio-cultural function.”

In the design process, architects produce diagrams for two primary purposes. The first is to design “more pictorially” to “record[...] the preconceived idea of the building.” The second and more important purpose is to draw and “interact with their diagrams” in order to design spatially. To design pictorially refers to a representative and descriptive process, while the latter refers to the embeddedness of the designer in the space of the design problem and context. The second purpose offers a more effective and internalized approach due to its physicality. According to Riahi, diagrams, as well as other sorts of drawings and representations reveal the creative process. Diagrams, on the other hand, not only demonstrate ingenuity, but also generate visual, kinesthetic, and tactile effects in their process of creation, which can orient the designer.

There are different classifications of architectural diagrams used by designers. Fraser Shields sees diagrams as a tool for architects and speaks of their “open” and “generative” nature as they free the process from “formal considerations.” Analysis, datascape, organizational, operational, conceptual, and abstract diagrams are some examples of this type. Depending on the environment in which they are produced, architectural diagrams can be conventional, digital, or hybrid. Conventional environments involve tools and media such as drawing, collage, and assemblage and can involve the traditional use of ink and paint on surfaces such as parchment, tracing paper, mylar, cardboard, glass, metal, wood, and fabric. An example of this type of diagram is Guy Debord’s map of Paris (Guide Psychogéographique de Paris, 1957), which is a mapping of the fragmented city, discovering new ways of moving through the city, drifting, and thinking about places in which the spatiality of difference emerges as a tactic for re-reading the relationship between experience and the built environment. More mathematical or cinematographic diagrams include Christopher Alexander’s organization charts, Lebbeus Woods’ surreal works, Bernard Tschumi and Peter Eisenman’s montage works, and Zaha Hadid, Rem Koolhaas, and UNStudio’s generative diagrams made for productive processes. By contrast, some diagrams are built during the design process and bring complex data together to find emerging parameters. These diagrams include sensory maps, network maps, and data that grows or transforms through immersive environments.

However, many diagrams are realized in two-dimensional media and are not haptic or have less tactile traits. Modernist examples of haptic diagrams and experiments are mentioned in Henri Focillon’s In Praise of Hands and include the influence of haptic education in Montessori, haptic collages of the Dada movement, Le Corbusier’s formal investigations with transparent cellophane sheets of superposing Zip-a-tone patterns in The Modulator II, Bauhaus corporeality and anthropomorphic diagrams, Sol LeWitt’s 3D diagrammatic installations, and Alvar Aalto’s phenomenological haptic wood reliefs. In the 1960s and 1970s, handcrafted visualization tools were widely used in experimental representations in fanzines and in the works of Archigram.

Haptic diagrams can enhance the process and approach of the designer to challenges in design methodology. Therefore, this article investigates how haptic diagrams can improve the efficiency and embodiment of the design process by embedding the designer’s experience in the design problem. Diagrams can be essential to both the production and acquisition of knowledge as they might allow the designer to discern possible ideas. Diagrams incorporate the perceptions of the designer and the audience, incorporate operational norms, and may make it easier to unravel the mysteries which these contain. The study of haptic diagrams in this article is limited to postmodern practices. Many contemporary works of art are characterized by “appropriation, site specificity, impermanence, accumulation, discursivity, [and] hybridization,” distinguishing them from their modernist forebears. As Owen argues, allegorical imagery is appropriated imagery. In these contemporary works, the allegorist does not create images, rather, they seize them. In their hands, the Image changes into something else. Allegory is related to the “fragmentary, the imperfect, the incomplete,” and “affirms its own arbitrariness and contingency.” In these works, designers generate images through the reproduction of images.

Hapticity in architectural diagrams
Haptic diagrams are spatial models or representations that demonstrate the concept underpinning them by stimulating a sense of touch and bodily connection beyond visual sensory data. They can also be thought of as layered or fractured juxtapositions of diverse parts that are sensorily tactile due to the material and textural properties of the surface on which a diagram or drawing is rendered, and are a layered or fragmented juxtaposition of various elements. A diagram’s tactility is enhanced by its thickness, depth, and fragmentary juxtapositions.
The haptic relates to one’s sense of touch or to tactile sensations. According to Papale et al., this relates both bodily and temporally, as compared to vision.34 As Pallasmaa argues that it affords an important role for tactile-based perception and imagery in the architectural experience. Tactility can emotionally integrate inanimate and imagery in the architectural experience. An example of an earlier haptic architectural diagram is volvelles (from the Latin word volvēllus, a puzzle-like integration to the process, and productive to the design process and temporality.30 The combination of collage with axonometric representations is intriguing, as is Daniel Libeskind’s conversion of handcrafted collages into three-dimensional shapes, and the haptic installations of artist Katsumi Hayakawa [Fig. 04]. Another example by SANAA demonstrates how an Euclidean layout of the Glass Pavilion at the Toledo Museum of Art can capture haptic representation and how diagrams act as catalysts for reimagining space [Fig. 05].

Complexity and transparency in the enhancement of visual acuity in architectural diagrams

The layering, fracturing, or transparency of the elements of architectural diagrams can result in the perceiver moving to process the data physically. These diagrams create a sense of playfulness, intervention, exploration, and bodily interaction between the designer and the environment. The intricate structure of architectural diagrams, as well as the transparency and traceability of physical media such as paper and acetate or digital media, are helpful in creating layered and tactile knowledge. The perception of the superposition of shapes, is heightened by shape relations and their lightness.35 The tracing paper and the medium used to draw or transfer diagrams have similar effects.

Tracing allows designers to combine diverse elements into a composition using cinematic techniques like montage.8 As stated by Olcott Price, tracing paper is used in the drawing process, and in the reading of drawings. Tracing is a type of knowledge production in architecture that has shown remarkable persistence in the face of significant changes in dominant modes of architectural production. It allows for both copying and innovation through line selection and omission, variety, and invention. The layering of materials such as paper or other media introduces a plurality and a layering that can be manipulated, repositioned, and repositioned to create variation or unity in the design thinking process. In tracing paper representations, there are “continuities and discontinuities, flows and abrupt halting,” which include “a depth and thickness.”8 This understanding of tracing is reminiscent of Gibson’s (1986: 22) ideas on the distinction between “medium, substances, surfaces.”15,16

In these diagrams, the tactile features become more visible, or this effect may be achieved by digital manipulation, creating the effect of depth. Shaw Murray’s ENIGATION diagrams can be given as an example of a transdisciplinary reading methodology. Murray proposes a notational system for the relationship of context, design, and communication. Based on the 26-rule and a contextualism-based notation system, Murray’s diagrams can be associated with Gregory Bateson’s recursive vision. Murray demonstrates the interconnections between the environment and human behavior that translate into space in this system. The notation sets and drawings initiate a dialogue that reveals potential interactions and existing environmental conditions. “Affective touch” (no. 21) and “tactile insertions” (no. 22) are two of these rules.28 He conveys...
shamanistic intensities of creativity as well as empirical and scientific registers of diagramming in his other exploratory mapping. Mirror Curtain (2021). He methodically manages and embodies the material while claiming bodily independence from such constraints.60

Many analog architectural collages are haptic due to their partial transference, transparency, and material layering, which foster haptic interaction, evoke a visceral response, and suggest several interpretations. Many designers believe that “tangible qualities of space and form are heightened and revealed” through the creation of collages, and that the collage enriches the perception of the spatial and material experience of the architecture60 [Fig. 06].

In the above Figure 6, the diagrams are multi-layered cut-out drawings printed on tracing paper and acetate and are re-readings of contemporary urban residential spaces in Istanbul, Vienna, and Amsterdam. They are ontological, epistemological, and logic of the middle axioms, and are derived from the transdisciplinary methodology of Basarab Nicolescu.62 The superimposed layers depict the temporal span of the re-reading process, merging fragments of urban dynamics such as speed and flexibility, as well as an installation art project and in-depth interviews with various participant groups. Transparency in the superimposed layers, as described by Rowe and Robert Slutzky, displays implicit knowledge and tangible properties in the signified system. It represents more than simply optical information; instead it represents a higher level of spatial organization. Transparency refers to the simultaneous awareness of many spatial locations. The position of the transparent figures conveys an ambiguous message.44

Geometrical distortion in the enhancement of visual acuity in 3D architectural diagrams

Physical models allow architects to create tangible, tactile representations of their designs that can be touched and manipulated, providing a more direct and immediate sensory experience. Virtual reality simulations make use of computer graphics and advanced technology to create immersive, interactive environments that simulate the physical sensation of inhabiting space. Interactive digital interfaces allow users to manipulate digital representations of a design, providing a more flexible and dynamic way to explore and understand the design. Many three-dimensional visualizations realized with two-dimensional architectural media contain information about the distorted and oblique view and depth. This information is conveyed with exploded perspectives or axonometric perspectives. These architectural diagrams can facilitate a fused sense of involvement in both the optical and tactile senses of the viewer.

Digital diagrams can be created when manual drawings are digitized or through electronic 3D modeling. Such diagrams give the impression of morphing and movement.

Examples of such representations include UNStudio's flowcharts, musical notes, electrical circuit diagrams in technical books, reproduction pictures, datascapes, and randomly selected images which replace reconstruction devices. These diagrams may not only evoke the viewer's visual bodily involvement, but also the body's tactile and physical involvement.

While the precise spatial and temporal information provided by vision and auditory senses are well understood, the haptic system is particularly effective at processing the material properties of surfaces and objects. While coming through active investigation, the body tends to direct the observer's attention to aspects of the external environment, passive touch tends to focus the observer's attention on their subjective physical experiences.

With the popularization of VR, 3D pens, 3D printing, and data visualization, diagrammatic representations of digital data are becoming increasingly haptic and tangible in day-to-day human experience.66

As Blackwell argues, diagrams are increasingly being used in human-computer interaction. Furthermore, improved publication technologies (particularly the Postscript language) have enabled consistent reproduction of diagrams.67 Furthermore, VR technologies with 3D audio or tactile haptic feedback mechanisms improve the sophistication of diagrammatic communication.67 Diagrams created with VR headsets in digitally generated or immersive worlds can also be accompanied by sound, sight, scent, or can be drawn by hand in the air using technologies such as 3D pens. 3D-printed data visualizations and code-based graphics (such as Mapzilla) are examples of these new techniques and tools [Fig. 07].

Due to the physicality of material, the materiality of a 3D diagram or model that is hand-crafted and manufactured with a 3D printer necessitates different perception than analog diagrams. Touch is important in “communicative and emotional” senses.68 Through an encounter with a design diagram, we perceive a quality of being-in-its-presence and because we engage with it to such an extent, we experience a depth of sensory engagement. The “embodiment and embodied knowledge approach to drawing” might be the reason for this.69 Given the increasing usage of three-dimensional haptic diagrams in new and immersive technologies, the design process will likely be increasingly replaced by more haptic and inclusive environments and approaches.

Final words

While diagrams have been a means of conveying measurable data and universal knowledge (particularly in the ancient and medieval eras), they have evolved into more expressive, generative images in the postmodern era. In some cases, this has been achieved through the replication of multiple images extracted from the original context and given new value. As a result, these diagrams become difficult-to-decipher representation of tacit information. The objecthood of haptic diagrams can be tactile and informative, stimulating ways of thinking to bridge the gap between intuition and reality and better engage with the designer’s embeddedness in the act of thinking and designing. They act as intermediaries between the designer, the architectural product, its representation, and the perceivers. Touch as a design thinking interface in architectural diagrams can help the designer to be more physically immersed in the process, both methodologically and in terms of the result.

Diagrams are ocular because they first establish their own universe of knowledge and experience, whether through a representational, a design or inquiry tool, or the result of a clearer and explicit mapping (such as dreamscapes). The combined effects of linearity, contrast, perspective, and distortion or fragmented linkages is perceived visually. On the other hand, Haptic diagrams correspond with a combination of sight and touch. They are physical at the same time, not only because they are created by hand using diverse interfaces in traditional or digital media, but also because they manipulate the physiological reality of touch. As with volvelles, knowledge is only extended through the body, and its embodiment comes through face-to-face encounters. In digital or immersive environments, this takes the form of information articulation via a pseudo-haptic interface or interaction. The haptic refers to tactility only for those who can physically touch the diagram. If contact is not possible, a perceiver experiences it as a pseudo-haptic experience.

Diagrams produce meaning allegorically through abstract and incomplete relations of meaning. The necessity for touch in haptic diagrams encourages the perceiver to gather information via experience and to follow impulse rather than picturing spatial information and numerically deciphering the forms conveyed in diagrams. This experience is transformed into a puzzle when transparent, tactile, or fragmented elements are included in diagrams. Meaning emerges both in the middle and at the end of a path through a diagram. The viewer must uncover and synthesize diagrammatic information between representations and multiple sources.71

Instead of increasing the vividness of visual communication in the design process, 3D haptic architectural diagrams might increase the spatiality of the design methodology. The digitization of transparent or superimposing layers or diverse materials can also boost the efficacy of diagrams. What advantages does the tactility of diagrams offer designers? Architects can investigate and comprehend the spatial and sensory qualities of their designs by developing haptic diagrams. This can help them better embody their designs and comprehend how others will interact with them physically. Haptic diagrams can also help architects communicate with those perceiving their diagrams by offering a tangible, tactile representation of the design. Cognitive and other somatosensory testing is required to understand the extent of this communication.
23. Taxonomically different from Shields's "Contemporary Urban Architecture Projects" (Master's Examination of Diagram Based Design Methods in Architecture, 2020).


14. As cited by Tenbrink, Dalton, and Williams, "The Allegorical Impulse: Toward a Generative, Topological, Euclidian, Pertaining to a New Type of Reality," but rather constructed a real that is yet to come, a new type of reality (Deleuze and Guattari, A New Type of Reality, 1990).


4. In philosophical contexts, Deleuze and Guattari mentioned a diagram as something that "does not function to represent even something real, but rather constructed a real that is yet to come, a new type of reality" (Deleuze and Guattari, A New Type of Reality, 1990).


ESEN GÖÇEĞE ÖZDAMAR