Graphic Notation as Generative System: Visual Logic in Composition and Improvisation

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ABSTRACT

This paper explores the concept of visual-logic-led notation, examining how graphic scores can function not as representations of sound but as autonomous systems that encode and generate musical behavior. Drawing from Mark Applebaum's theory of *logic congruence*, the study investigates how visual structures—such as repetition, symmetry, and sequence—embody compositional logic, allowing performers to derive musical meaning through perceptual and cognitive interaction rather than symbolic decoding. By reframing notation as a system, the paper proposes that improvisation within such frameworks becomes a structured activity: free yet guided by internal visual logic.

Two original case studies illustrate this theoretical framework. *Graphic Duologue* presents a graphic score in which visual cues operate as relational logic, guiding performers in real-time improvisation. *Transcending Boundaries* extends this concept into a physical installation, where marbles navigating a structured environment produce sound through material interaction, functioning as an automated compositional system. These examples demonstrate how notation can transition from static image to dynamic system—becoming performative, interactive, and even autonomous.

1. INTRODUCTION

Graphic notation in contemporary music continues to explore how visual form can shape, suggest, or structure sonic interpretation—transforming images into frameworks for performance and musical meaning. From the early experiments of Earle Brown [1] and John Cage [2], graphic scores have evolved as open-ended systems that invite performer agency and visual reasoning, challenging traditional notation's prescriptive function. As Cat Hope notes, graphic notation "offers composers the opportunity to create a new visual logic" [3] that can communicate performance information in ways not bound

by conventional music symbols. Theresa Sauer's

Notations 21 (2008) further documents this diversity, illustrating how contemporary composers develop individualized visual vocabularies to encode gesture, structure, and musical interaction [4]. These approaches often shift the function of notation from sonic transcription to conceptual invitation. As Michael Nyman observed, "the score no longer represents sound" [5], highlighting a broader transformation wherein the score functions less as a fixed script and more as a generative space for interpretation.

Mark Applebaum's *The Metaphysics of Notation* (2008) exemplifies this departure. A twelve-foot-long visual score composed entirely of abstract symbols and exhibited in a gallery setting, the work offers no sonic instructions or performance guidelines. Crucially, Applebaum admits, "I heard no sound in my head while composing the piece" [6], emphasizing that the work is not rooted in sonic imagination but in visual logic. To address the skepticism that such a score might not constitute music at all, Applebaum published a companion document, *Handbook for The Metaphysics of Notation* (referred to as the *Handbook* hereafter), in which he articulates the concept of logic congruence. He argues that the visual glyphs are organized according to rhetorical and formal devices traditionally associated with music—repetition, inversion, augmentation, sequence, canonicity, and others. He writes: "there is a deliberate analogy between notational shape and musical discourse" [7, p. 285]. Even the disappearance of a shape is framed in musical terms, likened to "Beethovinian atomization" or Messiaen's "skeletonization" [7].

Traditionally, even within experimental and graphic notation practices, scores have remained largely *sound-led*—mapping specific pitches, rhythms, or dynamics—or *action-led*, functioning as instructions for performers to realize sonic outcomes preimagined by the composer. As Cornelius Cardew notes in his *Treatise Handbook*, performers often default to interpreting graphic scores as sonic blueprints, searching for a one-to-one correspondence between shape and sound [8]. Similarly, Leah Kardos critiques the tendency to treat graphic notation as merely "a stylized abstraction of a sonic result," rather than as a system of logic or interaction [9]. This performance-centered approach aligns with what Stephen Davies identifies as the historical role of notation: to fix musical works for consistent realization [10].

By contrast, The Metaphysics of Notation proposes a third model of musical notation. Here, visual forms do not represent sound directly; instead, they encode abstract musical logic. Performers engage not by decoding symbols into predetermined sounds, but by navigating visual structures, patterns, and relationships. Performance becomes a form of logic-based discovery—grounded in perception, interaction, and interpretive reasoning. This is *visual-logic-led notation*, where musical meaning arises through the performer's engagement with visual syntax rather than through sonic prescription.

Having outlined the conceptual terrain of visual-logic-led notation—particularly through Applebaum's *The Metaphysics of Notation*—this essay now turns to the perceptual and cognitive mechanisms that make such notation musically meaningful. If these scores no longer prescribe sound, how do they structure musical thinking? What kind of logic do performers follow when sound is not mapped but inferred? To answer these questions, the next section explores how visual perception—especially shape cognition and the organization of visual information over time—can operate as a compositional structure in its own right. Drawing on theories from music cognition and perceptual psychology, this section examines how visual elements in a score engage the performer's cognitive and temporal faculties, laying the groundwork for improvisation based on form rather than sonic memory.

2. VISUAL LOGIC

2.1. Shape Cognition and the Temporality of Vision

Contemporary visual-logic-based graphic notation engages a fundamental divide between two perceptual domains: the instantaneous recognition of shape and the temporally unfolding nature of music. As Rolf Inge Godøy observes, "audible sound is essentially invisible, whereas 'shape' primarily pertains to the visual domain" [11, p. 3]. This highlights a central cognitive tension—while shapes are apprehended in a single glance, sound must be processed sequentially, across time. Then, Godøy further proposes that bodily movement offers a conceptual bridge between these domains. He likens the scanning of a visual score with the eyes to walking through physical space—a temporal experience initiated by spatial cues [11]. This act of eye movement creates what he calls an embodied visual rhythm: a dynamic, time-based flow of perception constructed through the traversal of visual paths. Lines, curves, clusters, and densities within a graphic score are not merely decorative—they serve as time-dependent stimuli. As performers "walk" through these structures with their eyes, they construct musical time through the organization of visual elements. In this way, visual forms begin to function as compositional structures, not by recalling specific sonic memories, but by shaping perceptual and temporal flow.

This logic underpins Mark Applebaum's concept of "logic congruence"in *The Handdbook* through formal visual relationships such as inversion, repetition, symmetry, and sequence. These rhetorical devices resemble those found in traditional music composition, but

crucially, they are not tied to any specific sonic content. The performer's role is not to decode symbolic instructions, but to discover musical potential through visual navigation. The score thus becomes a compositional field in which visual logic—not sonic prescription—acts as the primary generator of musical meaning[7].

2.2. Gestalt Principles and Musical Logic

The interpretive framework of these visual systems is deeply aligned with Gestalt perceptual psychology, which explores how humans organize and extract meaning from visual input. Pioneered by Wertheimer [12] and expanded by Arnheim [13], Gestalt theory identifies principles such as proximity, similarity, continuity, and common fate—rules by which the brain perceives patterns and relationships between visual elements.

Applied to graphic notation, these principles function as cognitive scaffolds for musical interpretation. Proximity groups nearby elements, suggesting simultaneity or phrase structure. Similar shapes invite analogy, leading to motivic development or variation. Curved lines and flowing shapes engage the principle of continuity, guiding performers toward musical gestures such as crescendos, accelerandi, or legato phrasing. The principle of common fate—where elements appear to move or orient together—can imply ensemble synchronization or unified action. These perceptual cues do not specify sound but suggest behavior, inviting the performer to infer logic and enact sound accordingly.

In this framework, Applebaum's "logic congruence" becomes perceptually grounded. Performers are not "reading" in the symbolic sense, but perceiving structured relationships and responding to them musically. Musical structure, in this sense, arises from perceptual engagement—not from a pre-imagined sonic template but from the visual affordances of the score.

2.3. Logic Congruence and Improvisation

The performer's engagement with visual scores structured by logic congruence involves improvisation that is guided, not freeform. The shapes on the page operate as visual triggers—formal artifacts that imply musical processes. Repetition, inversion, and sequence appear not as compositional instructions but as patterns to be recognized and enacted in sound. These patterns carry internal consistency; they invite interpretation because they suggest structure, even if they lack sonic content.

Godøy's notion of "gestural-sonic objects" is especially useful here. He describes mental models where gesture and sound coalesce in the mind—a swell, a burst, a pulse. In visual notation, abstract shapes can stimulate these gestural-sonic responses. A wave-like curve might suggest dynamic fluctuation; a cluster of shapes might evoke a dense texture. The performer doesn't translate the visual into a specific sonic image, but rather engages in embodied exploration—enacting musical gestures through the logic of form [14].

This perspective aligns with Mariusz Kozak's theory of "enacted musical time", which proposes that musical temporality is not abstractly tracked, but performed

through bodily interaction with structure. In visual-logic scores, this structure is spatial: time is inferred from shape placement, size, repetition, and orientation. The performer's motion through the score—scanning, reacting, associating—constructs musical time through perceptual logic [15].

These systems thus challenge conventional notions of musical form as static or predesigned. Instead, form becomes emergent: a result of navigating a visual field of possibilities, where musical meaning is not prescribed but discovered. Graphic scores of this kind operate not merely as notation, but as metaphorical systems—environments for structured improvisation based on perceptual reasoning.

3. IMPROVISAITON IN A SYSTEM

3.1. Navigating Graphic Scores: The Improviser as System Interpreter

Once a graphic score is established—particularly one like Applebaum's notation, which avoids direct sonic prescription—it no longer functions as a fixed script. Instead, it becomes a performative system, a visual environment structured by internal logics and visual relations. For improvisers, engaging with such a score does not mean translating image to sound, but rather exploring how visual forms suggest behaviors, trajectories, or constraints. The performer is not executing instructions, but navigating a space of opportunities—a system of visual reasoning that invites sonic realization.

This perspective aligns with Russell Wimbish's observation that performers often treat graphic scores as environments to explore visual spaces that cue timing, gesture, and interaction [16], and Todd Winkler's concept of interactive music systems, where composers design environments defined by mappings, constraints, and parameters rather than fixed outcomes [17]. In both cases—whether visual or computational—the system functions as a field of affordances rather than instructions. Performers respond not by decoding sound, but by engaging with structured opportunities for behavior. The score, like a patch or interface, becomes a performative system: open-ended, rule-based, and generative.

Thus, the graphic score can be understood as a form of non-verbal programming—a structured, visual logic that functions like a metaphorical interface. Shapes, placements, and spatial relations operate as instructions written in a logic language, and performers must interpret this language dynamically, through sound. George Lewis discusses this kind of logic-driven improvisation in relation to interactive systems, noting how behavior, rather than outcome, becomes the focus: performers improvise through navigating constraints, not through exercising total freedom [18].

In this light, the distinction between "composed" and "improvised" becomes less relevant. What graphic and computational scores share is a logic-mediated framework, where composition is relocated from note-writing to system design, and performance is redefined as real-time system engagement. The composer defines a field of structured affordances—whether on paper or in software—and the performer realizes music by traversing it.

3.2. Visual Scores as Compositional System: from Logic Cues to Sonic Generativity

This relationship between performer and graphic score closely parallels interactive and generative music environments, such as Max/MSP or SuperCollider, where sound emerges through interaction with parameter-based systems rather than from direct instruction. As Todd Winkler explains, composers in these contexts shift their role from specifying outcomes to designing interactive frameworks—rule-based environments in which performers generate music through engagement with conditions and mappings [17]. Thor Magnusson expands this notion by describing such systems as "epistemic tools"—interfaces that embody compositional logic and shape musical thinking through interaction [20], [21]. In this view, notation becomes not merely a visual prompt but a cognitive system: a space where formal properties such as repetition, symmetry, or spatial hierarchy encode potential musical structures. David Borgo likewise frames improvisation as real-time decision-making within structured constraints, reinforcing the idea that system-based scores, like Applebaum's, foster improvisation grounded in logic rather than free expression [22]. Together, these perspectives support a shift in focus— from scores as sonic representations to scores as performative systems, where behavior and process are central.

Importantly, these visual systems are not closed or deterministic. Like well-designed interactive patches or procedural algorithms, they balance control and openness. The shapes may suggest flow, density, interaction, or sequence, but they leave timbre, technique, and nuance to the performer. This distributed agency aligns with Gurevich and Treviño's concept of "shared control" in interactive systems: the system provides structure, but the performer provides interpretation, action, and meaning [23].

In this sense, visual logic scores become metaphorical computer systems: frameworks that generate music through structured freedom. They do not give answers but provoke questions—what does this grouping suggest? How might this symmetry resolve? Where does this direction lead? The performer navigates, tests, reinterprets—just as a coder probes the output of a generative script.

This interaction creates a unique blend of logic-driven creativity: improvisation that is not random, but rooted in visual structure; composition that is not fixed, but embedded in systemic relations. Whether the performer follows a wave-like shape through dynamics, mimics visual inversion through instrumental dialogue, or traces rhythmic logic through spatial density, they are engaging with notation as a thinking system. The score, in this view, is not a snapshot of the composer's sound world—it is a platform for musical reasoning.

In the following sections, this theoretical foundation is explored through case studies of two original works: *Graphic Duologue* (2025) and *Transcending Boundaries*

(2023). These pieces demonstrate how visual logic—grounded in shape cognition and organized through compositional reasoning—can become the engine for improvisational music-making. Through their distinct modes (score and installation), each work reveals how graphic systems can function as performative ecologies: spaces in which music is enacted through vision.

4. CASE STUDY

4.1 Graphic Duologue (2025)

4.1.1 Introduction and Visual Framework

Graphic Duologue (2025) explores the evolving relationship between composer, performer, and score, using graphic notation not as a fixed set of instructions, but as a field of interaction and interpretation. The work challenges the conventional role of notation as a sound-based recording system by proposing a logic-led, performance-centered approach. Rather than encoding specific sonic outcomes, the score encourages performers to navigate, respond to, and negotiate visual logic, engaging with the material through personal or collaborative improvisation.

Visually, *Graphic Duologue* is composed of eleven outlined pages that use a wide range of abstract shapes—circles, diamonds, wave-like lines, tapering curves, and sinuous forms (Fig. 1). These visual elements do not function as symbols for specific sonic gestures; instead, they provoke interpretive responses, offering a logic of spatial form rather than temporal instruction. The score unfolds through two distinct visual-structural modes, which alternate across its eleven outlines. The odd-numbered pages are organized according to a more linear visual logic, in which shapes are arranged to suggest formal continuity or sequential gestures. In contrast, the even-numbered pages shift the focus away from progression and toward relational dynamics between the two performers. This case study focuses particularly on the even-numbered pages, as they most clearly demonstrate the score's role as a notational system that invites improvisation through logic, not prescription. The shapes here are not just aesthetic markers or narrative cues, but components in a system of visual reasoning—designed to be interpreted in context and in dialogue. Performers are encouraged to redefine these elements sonically through internal musical logic, developing their own structured improvisational responses based on visual position, density, transformation, and interaction.


Figure 1. The shapes as examples from the score of *Graphic Duologue* (2025).

4.1.2 Llogic System – from Eyes to Ears

As previously discussed, the even-numbered pages of *Graphic Duologue* are constructed not merely to generate sonic outcomes but to provoke performers into discovering auditory logic through visual form. These pages function as interactive systems, in which spatial relationships between shapes encode cues for imitation, mirroring, divergence, or conversational interplay. The musical result does not arise from a fixed symbolic code but from the visual suggestion of relational dynamics, interpreted through the performer's musical reasoning.

This process aligns with the Gestalt principles of perceptual organization, particularly those governing grouping and continuity. According to visual cognition theory, our perception organizes shapes not randomly but through proximity, similarity, symmetry, and continuity (Wertheimer, 1923; Palmer, 1999). Such principles guide not only how we see, but how we make sense of what we see — a process that performers extend into aural reasoning. As Godøy (2010) has argued, performers often rely on motor-mimetic schemas to interpret graphic materials, mapping visual logic into sonic or gestural continuity. In this case, the arrangement of shapes—such as converging curves or repeating circles—serves as a suggestive structure, which the performers interpret in real time through their internalized sense of musical form.

For instance, in outline 2 of the score (Fig. 2), the visual relationship between a series of rectangular frames and wave-like curves establishes a leading-following structure between performers. A prominent circle, placed at the center of one frame, serves as a focal or initiating element, functioning almost like a visual "attack." This is followed by tapering and undulating lines that visually suggest motion away from a center, implying a musical response that diffuses or echoes the initial gesture. Such implied causality resonates with Michotte's (1963) theory of visual causation, in which spatial positioning and movement cues are perceived as directional or sequential triggers.
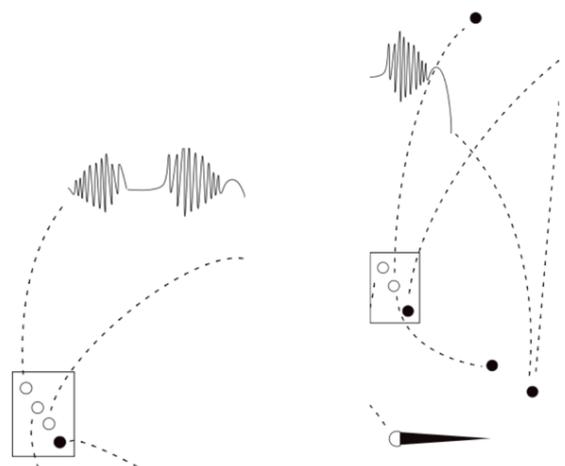
Figure 2. Some parts of outline 2.

In outline 10, the score presents more intricate pairwise combinations. Here, shapes appear in duos, visually mapped as performer-pair interactions. A pair of circles

aligned with fragmented waveforms may suggest sliced or stuttering sonic material (Fig. 3), while a combination of a taper-in/out shape (Fig.4) with a sinuous line evokes the impression of dynamic swells or short fluctuations within a quiet register. Each visual unit operates not as a one-to-one cue, but as a modular element within a broader logic system, where one visual relationship leads into or activates another, forming a recursive compositional structure.
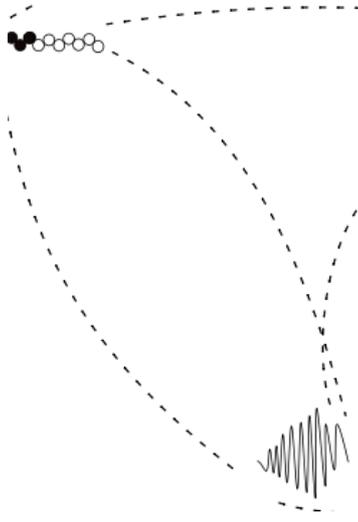

Figure 3. A paired shape in outline 10.

Rather than prescribing exact sounds, this visual setup can be understood as a kind of "implied motion", in which performers perceive one element as initiating a musical gesture that is then diffused or mirrored by the other performer — a dynamic supported by research in shape perception and visual causality [23], [24]. These visual cues do not determine exact sounds, but rather define the shape of interaction between performers. As such, the score operates like a visual choreography, translating the spatial logic of the page into temporally unfolding musical gestures.
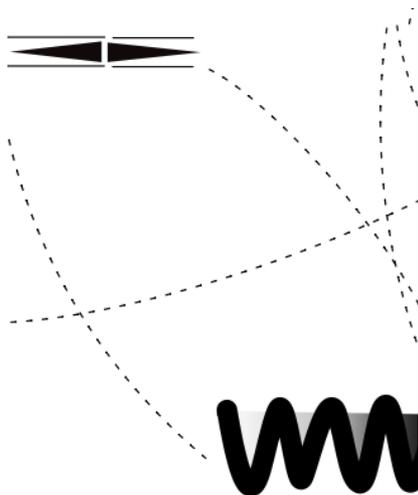

Figure 4. A paired shape in outline 10.

4.1.3 Logic Position and Interaction: Notation as A System for Improvisation

The use of visual logic in *Graphic Duologue* invites performers into a systematic, but non-prescriptive environment. Rather than assigning specific sonic outcomes to each shape or position, the score presents a relational framework — a visual topology in which musical decisions arise from the logic of spatial relationships. In this way, performers are not following instructions but engaging with a system, one that defines possible interactions and sonic behaviors without fixing them in advance.

This design echoes the logic found in interactive and generative music systems—such as Max/MSP, SuperCollider, and live coding platforms—where structured environments produce emergent sonic behavior through real-time interaction. As previously noted [17], [20], such systems prioritize condition-based frameworks over fixed scripts, enabling improvisation within compositional constraints. In this context, system design itself becomes a compositional act, embedding musical thought directly into the mechanics of interaction.

Graphic Duologue functions in much the same way: its logic is embedded not in sound, but in visual configuration. The score acts as a kind of non-verbal interface, where shapes and positions define the "rules" of the interaction, but the musical output emerges only in performance. Just as in computer systems, where code sets parameters but performers (or algorithms) determine how those parameters unfold, this score allows musicians to explore sonic behaviors that emerge from visual logic — repetition, imitation, fragmentation — through their own interpretive frameworks.

Crucially, the interaction fostered by *Graphic Duologue* is not arbitrary but structurally guided. Visual elements—repetition, symmetry, proximity—serve as navigational cues, enabling performers to interpret and respond without relying on fixed sonic instructions. Rather than decoding symbols, performers engage with the score's internal logic, transforming visual relationships into musical behavior through improvisational dialogue.

This redefines the score as a notational system—a visual framework that supports emergent performance through logic rather than prescription. As Hahn notes, such systems act as "living interfaces," shaped by embodied interaction rather than static commands [25]. Similarly, Walshe and Toop describe scores as "habitats" for creative exploration [26], reinforcing the idea that notation can structure behavior without determining it. In this sense, *Graphic Duologue* functions as a logic field: an open system in which performers improvise by navigating visual form, translating its structure into sonic reasoning.

4.2 Transcending Boundaries (2023)

4.2.1 Introduction – From Graphic to Physical Notation

Transcending *Boundaries* (2023) expands the concept of graphic notation by moving beyond the two-dimensional page and into the spatial, tactile environment of a physical

installation. The work reimagines the score not as a symbolic or visual reference, but as a set of material conditions that guide and generate sonic output. In this work, marbles move freely across a tilting board—functioning simultaneously as agents of performance and as interpreters of structure. (Fig. 5) The logic of the system is embedded in the physical construction: the arrangement of obstacles, materials, and inclines all encode elements of musical form. Here, notation becomes physical architecture, and performance emerges from the interaction between gravity, material, and motion.

Figure 5. Transcending Boundaries (2023). Photographed at BarbaraHepworth Building, University of Huddersfield.

Rather than introducing an entirely new model, *Transcending Boundaries* can be understood as a three-dimensional extension of the visual-logic notation explored earlier. Like the graphic scores in *Graphic Duologue*, it operates as a system of affordances: shapes and structures define possible interactions without prescribing fixed outcomes. But unlike two-dimensional scores, this installation shifts agency to physical matter. The marbles act as autonomous agents navigating a spatial logic, turning visual notation into kinetic behavior. This aligns with earlier discussions of system-based music [17], [20], where performers—or, in this case, objects—generate sound through the traversal of structured environments.

By delegating musical decision-making to a physical system, the work echoes the compositional logic found in computer music environments such as Max/MSP or algorithmic sound generation frameworks [17], [18]. It furthers Cage's conception of indeterminacy toward automated generativity, where the composer shapes a field of constraints, and sound emerges from real-time interaction with those constraints—not unlike live-coded or parameter-based systems. In this way, the installation acts not as a performance of a score, but as a living system—a logic-based structure for emergent sound.

4.2.2 Material Logic and Physical Placement as Notation

As aforementioned, the sound in *Transcending Boundaries* is not generated through symbolic instruction but through the material arrangement of objects on a tilting board. Materials such as ceramics, metal nails, and china serve as timbre generators, while the spacing between them encodes temporal patterns. For instance, clusters of closely placed objects produce dense, rapid sonic events,

suggesting quick rhythmic textures; wider separations introduce silence, space, and deceleration. Rather than using abstract symbols to represent time and timbre, the installation embeds musical logic directly into physical space, transforming the spatial layout into an enacted score.

This transformation aligns closely with Mariusz Kozak's concept of *enacted musical time*, which challenges the view of time as a passive metric. Instead, Kozak suggests that musical time is performed through bodily interaction with structure [27]. In *Transcending Boundaries*, this theory is extended from human performers to mechanical motion: the marbles enact temporal form by traversing the installation's affordances. Rhythm, pacing, and articulation are not predetermined—they are realized through movement, resistance, and interaction with the system's materials. Time, in this context, is not represented but physically performed.

This reading also resonates with affordance theory, which proposes that the physical features of an environment suggest or invite particular actions. Gibson's original formulation [28], later developed by Gaver [29], emphasizes how design shapes behavior through material form. While *Transcending Boundaries* offers no explicit instruction to the marble, its design affords specific sonic outcomes: ceramic tiles produce crisp resonance; gaps imply silence or rest; slopes increase momentum and dynamic flow. Donald Norman's concept of *perceived affordances* deepens this notion, suggesting that form communicates function even without verbal instruction [30]. In this case, the marble—substituting for a human performer—responds to a network of performative cues embedded in the installation's physical design.

Here, the score no longer directs a performer but acts as an environment where sonic behavior is conditioned by material constraint. Marc Leman's theory of *embodied music cognition* reinforces this view: musical meaning arises not just through listening, but through embodied interaction with space and resistance [31]. Though the body is absent, the marble enacts a kind of automated embodiment—its motion shaped by force, friction, and material topology.

This approach redefines the role of the score. No longer a symbolic script to be read, it becomes what Cecilia Arditto describes as a *performative object*—a system that generates sound through interaction rather than interpretation [32]. In this light, *Transcending Boundaries* functions as a form of three-dimensional notation: a tactile logic system where sound emerges through physical traversal. Each marble's path becomes a kind of algorithmic improvisation—a journey through structure shaped by both logic and chance. The result is not a fixed composition, nor entirely indeterminate, but a generative sonic environment grounded in material design.

4.2.3 Notation as System: Automation and Compositional Delegation

Building on the idea that *Transcending Boundaries* encodes musical behavior through physical affordances, we may now understand the work as a three-dimensional, autonomous notation system—a composition engine in

which sound emerges without human interpretation. Rather than serving as a traditional graphic score to be read, the installation enacts notation through material interaction: every obstacle, incline, and surface becomes part of a spatial script that shapes sonic outcomes.

This model aligns with principles found in generative computer music, where composers design rule-based environments—whether in software or physical form—within which behavior unfolds. As Winkler notes, interactive systems are not free improvisations but carefully composed frameworks, where sound is produced through structured mappings and conditional input [17]. In *Transcending Boundaries*, the marbles' kinetic motion acts as input, while the board's layout encodes the compositional logic. Like an algorithm, the installation converts physical data into emergent sound.

Thor Magnusson describes such systems as epistemic tools—interfaces that embed compositional thought into their structure [20]. Here, the score is no longer symbolic but architectural; it doesn't instruct, it behaves. Agency is delegated to the system, collapsing the distinction between notation, instrument, and composition.

In this light, *Transcending Boundaries* becomes a radical extension of graphic notation: not just visual but material and procedural. It transforms the score into an activated environment—not something to interpret, but something to engage. This shift reframes notation as a form of automated composition, where logic is enacted through motion, interaction, and constraint, pointing toward a future of fully embodied, system-driven musical expression.

5. CONCLUSIONS

This paper has explored how visual logic can serve not merely as a representational aid but as a generative foundation for musical thought. Drawing on Mark Applebaum's concept of *logic congruence*, the study repositions graphic notation as a system of internal relationships—where visual form is not translated into sound through conventional mapping, but instead *becomes* musical logic itself. In such visual-logic-led notation, structure, behavior, and meaning emerge from the performer's engagement with spatial and perceptual cues, rather than from prescriptive sonic instructions.

This approach opens a broader understanding of notation as a system—a designed environment in which improvisation occurs not as free play, but as *structured navigation* through visual, physical, or procedural logic. The two case studies demonstrate this progression. *Graphic Duologue* exemplifies how performers interpret visual forms as compositional cues, transforming score logic directly into sound. *Transcending Boundaries*, by contrast, pushes this model further into the physical domain: an installation in which material arrangement functions as a self-operating score, enacting compositional behavior without performer intervention.

Together, these examples trace a conceptual arc—from notation as symbolic representation, to notation as perceptual system, and finally to notation as autonomous compositional engine. In this context, improvisation becomes a mode of interaction with systems—whether visual or physical—where music is realized through logic, affordance, and emergent behavior. This reframing of notation aligns with contemporary paradigms in computer music and generative art, offering a vision of composition not as fixed content, but as dynamic system design.

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