Title: Artificial Synaesthesia Between Sonic And Architectural Composition: Intelligent Computational Infrastructure and Stochastic Redundancy

Yidi Wang

Abstract

Meandering among concepts and practices, this article tries to reveal the entanglement between them instead of advocating for any single perspective. It is structured into three interrelated analyses. First from computation to global infrastructure, the analysis covers geopolitical meanings and regional development based on systematic planning. Then, their shared empirical abstractness and composition behind leads to and echoes with the discussion of correlation between music and architecture, initially analysed by musician and architect Iannis Xenakis, according to whom a stochastic system accommodating order, and disorder emerge elevated into aesthetics. Third, I argue the stochastic system contains anxiety from disorder and noise, reassembling artificial aesthetics' effect. This sense of anxiety attach to redundant objects having physical presence and actors' role proven by sonic-urban events and projects intervening the existing infrastructure culturally, technologically, planetarily, and intellectually by examples. The planetary way differs from occurred globalism, as it allows for contextual adaptations allowing redundancy and noise desired as friction in music production.[1] Philosophical reflection and literature reviews are the main methodologies here. From a holistic perspective, threads of thinking across disciplines are recorded preparing for future research on nuanced systems and new philosophy involved.

Keywords: Sonic Architecture, Artificial Aesthetics, Synaesthesia, Noise, Probability, Stochastic Composition, Object-Oriented Philosophy, Planetary Thinking, Global Infrastructure, Computation and Planning

From Synthetic Computational Modelling to Global Infrastructure

The emergence of discussion towards infrastructure has made it a convenient tool to bridge the abstract architectural theories and empirical, sometimes futuristic speculation based on the condensed reality. In Sven Opitz's and Ute Tellmann's analysis appeared in Limn journal on European infrastructure, they mentioned that the process of defragmentation and intentional collectivity of energy infrastructural integration constitutes "a space with both topographical and topological feature" within which borders of nation states are moving.[2] More specifically, European energy system has claims to adopt an intelligent integrated grid system to accommodate renewable energy base on and gradually replacing nuclear and fossil fuel-based energy sources. The decentralized pattern of integrated grid system enables more parties into play. This echoes with Web 3 format and AI-aided industrial revolution ongoing.

Artificial intelligence is embedding itself into such geopolitical gestures showing how technology and politics interplay in a constituted world which is becoming more and more tangible. How does such tangibility coexist with planetarity? How does technology reach both theory and empirical development? Andreas Folkers argued, there is "a lack of ideas for smart and politically progressive uses of it", and "they are full of gaps, unpredictable currents, and channels that allow for all kinds of electric and political forms of resistance".[3] It also seems that the force to enable such gestures thanks to big political and tech bodies have been in charge of this industry.

Deleuze's concept rhizome[4] uses biological metaphoric form not just to describe bodies which could be political, economic, and societal and expand outwards into a system but as Foucault summarised,

> "a phantasmaphysics…in the reversal that causes every interior to pass to the outside and every exterior to the inside, in the temporal oscillation that always makes it precede and follow itself."[5]

Transportation infrastructure can also be read as such a rhizome enabling urban interconnectedness in Ole B. Jenson's writing on urban mobility. He marked how culture and human everyday life flow inside of this giant urban infrastructure of transportation.[6] This vivid flow inside of an artificial world.

Sven Opitz's work on pandemic also reveals that the world falls into a self-observed and self-simulating mode,[7] inspired by Richard Grussin's concept of premediation[8] which reveals how plural futures are created by medias. This article gives a spontaneous idea on the relation and transition between the pre-computational era that inspires a priori creational theory such Xenakis's music and architecture, and the current cultural urge to create a planetary reality though augmented and embodied with everything including politics, and the shared catastrophic integrated imagination based on events and scientific speculations. Such

events have global impacts, and their activism on social media dominates a generation's vision on how to access the world. The changing way of engaging with the system echoes with how the latter constantly adjusts itself to risks, and even failure of common imagination.

Comparing to the beginning of an interconnected computational world based on infinite simulation and fabrication, our global infrastructures in the present rooted in the abstract theories tend to deal with more concrete geopolitical contexts and issues "consolidate and distribute power",[9] counting itself has been viewed as a scientific methodological root of political surveillance of control and care. There is "a system of systems"[10] in contextualization to situate and the accelerated simulating plurality real-time in the fields of urban operating, and agricultural, forest, ocean monitoring "from GPS to machine sensors, along with automation, robotization, augmented reality, remote operations…".[11] Everything is "colliding, mingling or separating bodies" talking to us through quasi-physics.[12]Yet synaesthesia as the haunting voice between sound and 3D form is more than simulacrum or illusion besides metaphysics but illusion as metaphysics itself that carries innumerous redundancy, undefined as objects, and the contradicted relations caused by the undefined, the in-between.[13]


Sonic Architecture: Object-Oriented Musical and Architectural Synaesthesia

While "geometry is physical, topology sensual",[14] following Foucault's thought, "events then require a more complex logic". In the linked sonic and architectural studies originated in the 20th century from Iannis Xenakis, computation as a method and revolutionary way of interacting with and building worlds impacted both musical and architectural industry in the last century. In his book *Formalized Music: Thought and Mathematics in Composition*, the concept of causality and mathematical logic was mentioned before discussing musical composition.

3

"It is therefore not surprising that the presence or absence of the principle of causality, first in philosophy and then in the sciences, might influence musical composition. It causes it to follow paths that appeared to be divergent, but in which, in fact, coalesced in probability theory and finally in polyvalent logic, which are kinds of generalization and enrichments of the principle of causality."[15]

Though it is not merely a coherence which "situates accidents in the entangled nexus of causes and effects", comparing the Foucault's linguistic organization composed for "events",[16] the concept of stochasticity was directly introduced by Xenakis as the expansion of probability theory in the process of digital musical formation dealing with "conflicts and knots".

"The composition was tailored to interact with the Pavilion's distinctive acoustics and geometric structure, reflecting Xenakis's interest in merging mathematical and physical models across different fields. The architecture's unique shapes and surfaces influenced the diffusion of sound within the space, making Concrete PH an early example of spatialized sound design that integrates music with its physical environment."[17]
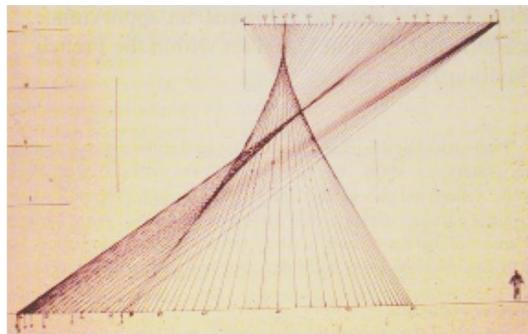
French Pavilion's Elevation Designed by Xenakis.[18]

Instead of purely leaning towards a parametric computation, this marriage would rather be a balance between the stochastic and the systematic. The is question is, how do we know our system thoroughly and how do we make sure our understanding of it is correct? If the system itself is always changing as it is now, as Grahan Harman suggested, our enclosed understanding towards a simulated solidified system will blind us from knowing anything other than such a system, such as the remaining peculiar objects, but lead us to fall into the fatalism of catastrophe.[19]
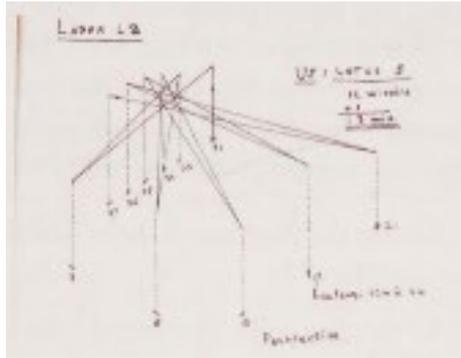
Scoring: Xenakis' design for laser configuration within the Diatope.[20]

Such mere emphasizes on solidified system, Graham criticized, has made architectural creation believe in measuring the environment based on algorithmic parametric.[21] And in Christopher M. Kelly's essay in Limn number 9 on the theme of little development devices, participatory entity as

"…an enormous, amorphous, yet nevertheless intimate collective that represents itself to itself constantly", recalls the importance of "the reflexive practitioner whose 'algorithm' is human judgment, memory, and discernment" versus "an automatic, machine learning, artificial intelligence".[22]

I argue that the analogue and the algorithmic could combine, spontaneous emotion and evolving abstract system could merge in one situatedness of synaesthesia. The value of narrative formation does not merely lie in its theoretical relation to ANT, but in the liberating fictions that reevaluate the role of actors, objects, and environments. Each of these is an abstract entity that could be rearranged and function actively. Bodies, brains and objects do not only interact with and become infrastructure by repetition.

"The algorithmic approach to sound creation in the 20th century was not about programming computers to create variations of Bach or Debussy. Instead, it was about advancing sound composition by handling vast amounts of information on a microscopic level"[23]

While more recently, the linkage between musical and architectural expression is explored more through different tools shared by both, such as scoring and mapping. By comparison, besides the methodologies of analysing, signifying, and layering which indicate spatial and objective features that are deeply connected to human living entangling with

5

power, diverse ethnicities, and communities, the original scoring's abstractness might just represent how human life is now inseparable from such a thinking of notation, modelling, representation, and objectification. After all, transformed into a "intelligible" system itself actively instead of passively, far beyond what Lefebvre's initial argument on the spatial politics. Such system and its agents are not linguistic-oriented system either, but object-oriented, which redefines what is intelligence in infrastructural and industrial contexts interacting with both human and objects stretching locally and planetarily.

Different from the "most engineering application needs to be removed as a source of noise and instabilities, friction, the tangible force between objects in contact is a desirable component in musical applications."[24]

> "The constant flux of natural processes is a fertile ground for developing sonic morphology and timbral movement as elements of a continuous composition. Aleatoric, or random processes in music have long been a focus of avant-garde composers exploring the boundaries of unpredictability."

Though mapping, scoring, installing in different scale constituting an intelligence of redundancy, opening up practical possibilities for a shared future among human, objects, human-objects (non-binaries), and smart systems. Besides developing these systems, multiple artists and researchers in this conjunctive field has proven the complex contexts lead to failure of simplified system, and redundant objects such as noise has always existed within them waiting to become part of the ouroboro.
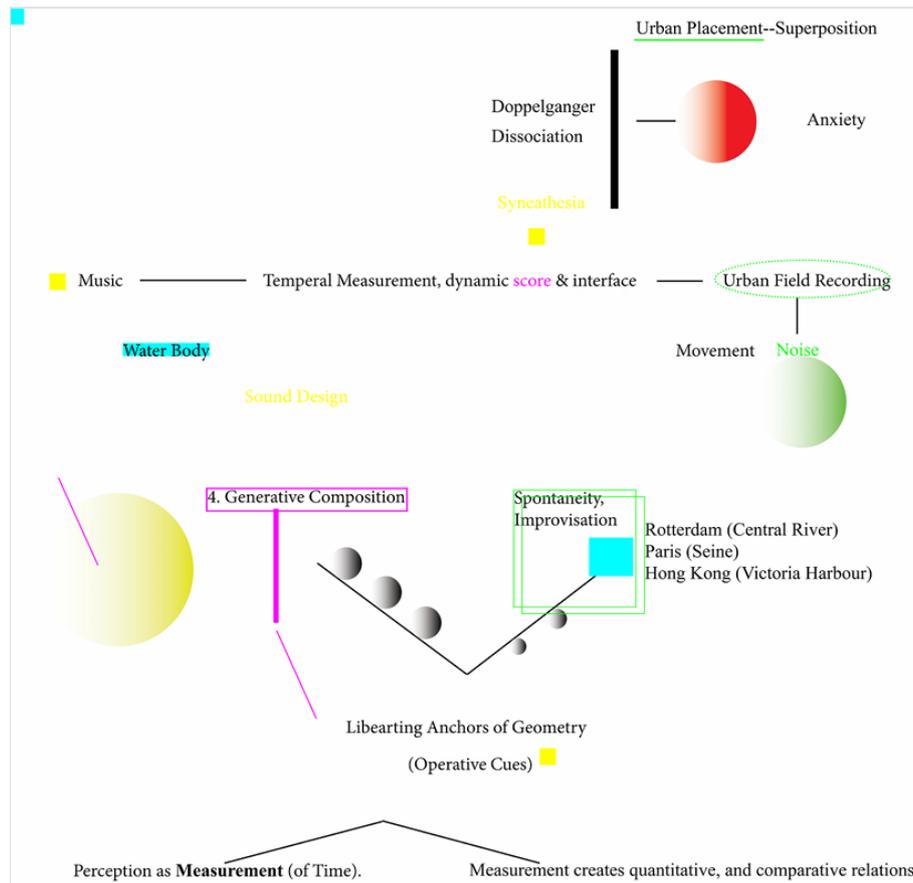
Diagram made by author on a fictional project linking on-site water body, noise, and architecture installation in urban space.

Stochastic Composition: Redundant "Objects" Within Planetary Systems

In *Formalized Music*, Xenakis soon depicted a scene absorbs multiple states "in oscillation between symmetry, asymmetry, order, disorder, rationality" and transcends anxiety which might emerge naturally with the creator's presence. "Traditional behavioural framework" is inherited and negated when "rare random events" occur and "defining chance as an aesthetic law, as a normal philosophy." In this sense, a stochastic composition contains as much fluid instability, noise, and dynamic as transformable "aesthetic stimuli"[25]; and inside the temporal scale, the act of organization, ordering exists rapidly, not necessarily consistently. We then therefore could say a psychological anxiety emerges is not due to disorder itself, but out of a sense of unmeasurablity of temporal scale in the panoramic space.

Combining the architectural and musical notation system, and their relatable compositional aesthetics, we find the unmeasurable redundant objects within a relatively large scale are the engine that keeps the system moving as the node to generate intuition. In spite of the entanglement between notable system and stochasticity, there is always room, or non-space, nothingness for redundancy "endangering being",[26] wherein grows scenarios and narratives, or vice versa. Stephanie Sherman's historical critical piece on Fordism has talked about how ignorance of jungle environment, and therefore concrete contexts, has made Fordist standardized models and platform fail, proving "smart systems" are fragile when they are not adjusting and adapting into transformed scenarios.[27]

Rebellions happen too, and sensorial signals and entities can be used as weapon to intervene into the public space, and a tool to read the complex composition of an environment. Sonic Protest is not just the name of a music festival but occurred politically on-site during 2023 French pension reform strike. Protestors use techno music to build solidarity and occupy street with their bodies and extensions through sound. Gascia Ouzounian in her more-than-concept projects Sonicities, and Scoring the City explored how architectural installation, urban studies, and sonic presence as one gained EU Funds. Replacing traditional top-down perspective of urban planning, this way of intervening into the city requires less rigid view, but more cultural expression and flexible situatedness, expanding the recoding scale into a temporal capability and easy to be understood while music as the carrier. Thanks to the tradition of understanding aesthetics through social critical perspectives by Adorno in the last century, it is rather not surprising when we find in similar initiatives like Theatrum Mundi sonic and theatrical immersive intervention as cultural infrastructure could be critical about issues such as racial barrier attached to territorial division in cities like London, and subcultural backyards in the unique street layout of

Marseille intersecting with its abundant Mediterranean port history which has embraced multiple culture.

Emerging think tank like *Antikythera* led by philosopher Benjamin Bratton and multidisciplinary researchers brings a planetary vision into the ground. Such initiatives and projects are established corresponding to an epistemological shift from the production-based situatedness of fab labs. Based on Bratton's theory, *Antikythera*'s project *Planetary Computation*[28], different yet inspired by what Sun Ra described "planetary sound of guns, anger, frustration" in *Space Is The Place*[29], inherited the positivism of globalism but culturally and technologically critical. Their activism undoubtably melts the barrier between academic and public culture, like AI could do to citizen science. A future of multiple actors' participation could visualize itself as a stochastic composition when actors and objects are able to adjust to and transform the sense of anxiety into nodes of synaesthesia where multiple disciplinary theories coexist in one composition.

Conclusion

The scholar-led initiative *Internet of Species* emphasized the importance of understanding another language when exposing to the anthropocentric world.[30] Computational language was firstly a computer science then used in specific areas of certain fields. Musical and architectural creation both rely on software to articulate their composition either sonic, or geometric. Artificial intelligence or smart intelligence has entered tangible world already in infrastructure with a global fluid layout based on political pursuits. Such smart system could mobilize and empower citizen participation and becoming citizen science considering by grassroot democratic initiatives. Since there is an early tradition between computation and artistic creation, in the current transformation of enlarging AI's implementation, will the definition of aesthetics be remodified along with its intelligent alliance?

Beyond obscurity,[31] architectural practice mirrors the world's changing and situates itself in a core (or physical) part in the yet-to-be phantasm world. Sonic architecture invented and theorized by Iannis Xenakis illuminates the nuanced entanglement. This article unveils the entanglement between separate fields of studies highlighting the potential to reanalyse aesthetics while mirroring us to artificial intelligence as either a mirroring system or a redundant object that reassemble us the most in the completing and existing planetary infrastructure or human colonization of the mother earth alongside territorial violence towards each other based on unethical simplicity and unintelligence.

[1] Serafin, S. (2004) *The Sound Of Friction: Real-Time Models, Playability And Musical Application.* Ph. D. Thesis. Standford University.

[2] Opitz, S, Tellmann, U. (2016) 'Europe's Materialism: Infrastructures and Political Space', *Limn 7: Public Infrastructures/Infrastructural Publics*, pp.89–93.

[3] Folkers, A. (2016) 'Nuclear States, Renewable Democracies?', *Limn 7: Public Infrastructures/Infrastructural Publics*, pp.81–92.

[4] Deleuze, G, Guattari, F. (1987) *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press.

[5] Foucault, M. (1970) 'Theatrum Philosophicum', *Critique* 282, pp.885–908.

[6] Jensen, B.O. (2009) 'Flows of Meaning, Cultures of Movements – Urban Mobility as Meaningful Everyday Life Practice', *Mobilities*, 4(1), pp.139–158. doi:https://doi.org/10.1080/17450100802658002.

[7] Opitz, S, Tellmann, U. (2017/8) 'Simulating The World: The Digital Enactment Of Pandemics As A Mode Of Global Self-Observation', *European Journal Of Social Theory 20:3,* pp.392–416.

[8] Grusin, R. (2010) *Premediation: Affect and Mediality After 9/11*. Palgrave Macmillan UK.

[9] Sherman, S. (2024) The Fordian Slip. *e-flux: Architecture.*

[10] Gabrys, J. (2016) *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*. University of Minnesota Press. https://doi.org/10.5749/j.ctt1b7x5gq.

[11] Gabrys, J, Michelle W, and Yuti A. F. (2024) "Actually Existing Smart Forests: A Proposal for Pluralizing Eco-technical Worlds." *Environment and Planning F*. https://doi.org/10.1177/26349825241264393.

[12] Foucault, M. (1970) 'Theatrum Philosophicum', *Critique* 282, pp.885–908.

[13] Ibid.

[14] Eshun, K. (1998) *More Brilliant Than The Sun*. Quartet Books.

[15] Xenakis, I. (1963) *Formalized Music.* Pendragon Press.

[16] Foucault, M. (1970) 'Theatrum Philosophicum', *Critique* 282, pp.885–908.

[17] Bökesoy, S. (2024) *Introduction to generative audio synthesis: Part 1.* Sounding Future.

[18] Xenakis, I. (2008) *Music and Architecture: Architecture Projects, Texts, and Realizations*. Pendragon Press.

[19] Harman, G. (2018) 'Non-Relationality for Philosophers and Architects', *Bells and Whistles: More Speculative Realism*. Southwest university Press.

[20] Xenakis, I. (2008) *Music and Architecture: Architecture Projects, Texts, and Realizations*. Pendragon Press.

[21] Harman, G. (2018) 'Non-Relationality for Philosophers and Architects', *Bells and Whistles: More Speculative Realism*. Southwest university Press.

[22] Kelly, M. C. (2018) 'The Participatory Development Toolkit', *Limn 9: Little Development Devices/Humanitarian Goods*, pp.110–118.

[23] Bökesoy, S. (2024) *Introduction to generative audio synthesis: Part 1.* Sounding Future.

[24] Serafin, S. (2004) *The Sound Of Friction: Real-Time Models, Playability And Musical Application.* Ph. D. Thesis. Standford University.

[25] Xenakis, I. (1963) *Formalized Music.* Pendragon Press.

[26] Ibid.

[27] Sherman, S. (2024) The Fordian Slip. *e-flux: Architecture.*

[28] Antikythera.org (n.d.) *The Antikythera Mechanism Research Project*. Available at: http://www.antikythera.org

[29] Ra, S. (1974) *Space Is The Place*. USA: Persistence of Vision Films.

[30] Interspecies.io (n.d.) *Interspecies I/O: Exploring Human-Animal Communication*. Available at: https://www.interspecies.io/

[31] Merve Bedir et al., eds. (2023) *Automated Landscapes*, Rotterdam: Nieuwe Instituut.