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NUMERICAL CALCULATIONS IN MALAYSIA ART SONG COMPOSITION: EXPLORING REPERTOIRE I, IV, ii, AND vii

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Abstract

This paper explores the intersection of environmental observation and compositional structure through the lens of melodic numerical calculation, demonstrated in the art song cycle I, IV, ii, and vii. Inspired by birdsong as a natural source of rhythm and pattern, the study employs recorded avian calls, analysing the frequency of chirps to extract quantitative data. These numerical values inform key musical parameters such as phrase length, harmonic progression, rhythmic structure, and melodic development. By translating the organic irregularities of birdsong into a calculated compositional framework, the works embody a dialogue between chance and control, nature and design. For example, in I, a single chirp frequency dictates one phrase, one chord (C major), and one melodic note within the first bar—illustrating the precise embodiment of the source data within the musical material. This approach generates a sonic narrative that resists conventional melodic expectations, offering a soundscape derived from the delicate balance of environmental inspiration and numerical discipline instead. The paper contributes to broader discourses on the integration of natural soundscapes into contemporary composition practice, while enriching the emerging body of Malaysian art song repertoire through alternative compositional strategies.

Keywords: *Art Song, Malaysian Art Song, Soundscape, Numerical Calculation, Melodic Numerical Composition*

INTRODUCTION

The Malaysian natural environment, with its rich and diverse soundscapes, serves as a profound source of inspiration for contemporary music composition. This research looks into the integration of natural soundscapes into the creation of Malaysian art songs, with a particular focus on birdsong as the primary acoustic material. The compositions, titled I, IV, ii, and vii, originate from field recordings of bird calls captured in the serene Bukit Cerakah forest. These distinctive and repetitive bird sounds were meticulously analyzed and transformed into numerical data, which became the foundation for the compositional process.

The study bridges the structured logic of numerical patterns with the creative realm of music composition. By extracting numerical data from the repetitive chirping patterns, the study systematically mapped these values onto key musical elements, including phrase lengths, note durations, and bar counts. This process resulted in a compositional framework that prioritized mathematical precision over emotional intuition or traditional lyrical content. The first art song, The choice of C major as the key reflects the simplicity and universality of the approach, underscoring its foundational nature.

By excluding conventional lyrical or poetic content, the compositions seek to mimic and embody the essence of the natural soundscape, capturing its intricate rhythms and textures. The research highlights how a numerical methodology, inspired by environmental soundscapes, offers innovative possibilities for contemporary art song creation, transforming the genre through a data-driven lens. This paper explores the framework, process, and outcomes of this unique compositional approach, contributing to the broader discourse on nature-inspired music.

LITERATURE REVIEW

Representation, Imitation, and Originality in Artistic Creation

The relationship between nature, imitation, and artistic originality has long been central to artistic discourse. In the visual arts, this is exemplified by Johann Wolfgang von Goethe's reflections on the animal etchings of Roos, as recorded by Johann Peter Eckermann. Goethe observed how Roos's works transcended mere replication, capturing not only the external appearance but also the internal essence of the animals he depicted. According to Goethe, Roos was able to "think and feel himself into the very soul of these creatures," creating images that established an "as-if relationship" with nature (Eckermann, 1998, pp. 46–47). This highlights an important distinction between imitation as simple replication and imitation as an act of deep engagement with natural phenomena, leading to expressive reinterpretation.

A similar paradox exists in music performance and pedagogy, where imitation has traditionally served as a means for developing technical mastery while simultaneously raising questions about its impact on personal artistic identity. Recent empirical studies have examined this tension, such as an investigation involving advanced violinists learning J. S. Bach's Adagio from the Sonata for Solo Violin in G minor. Participants who engaged in detailed imitation of a target recording by Jascha Heifetz were able to reproduce many of its expressive qualities; however, the degree to which this process influenced their personal interpretative conceptions varied widely. While some violinists internalized and incorporated the imitated features into their final interpretations, others demonstrated more limited long-term impact. Listener evaluations further confirmed that imitation produced perceptually significant changes, though the perceived quality of these changes remained highly individual-specific. These findings suggest that while imitation can expand interpretive possibilities, the development of originality depends on how individual musicians internalize and reinterpret the imitated material.

Within the context of composition, the interaction between imitation and originality can similarly be observed in approaches that draw directly from environmental sources. Composers working with soundscapes often engage with nature not merely as a sound source, but as a conceptual framework for generating new musical materials (Schafer, 1994; Truax, 2001). The present study situates itself within this discourse by exploring the application of melodic numerical calculation—a method that translates empirical environmental data into compositional structure. In this case, birdsong recordings serve as the natural stimulus, with chirp frequencies analyzed and mapped onto parameters such as phrase length, harmonic progression, and melodic contour. Rather than imitating the sound of birdsong in a literal sense, this compositional strategy engages with the patterns of nature to generate original musical material that retains a conceptual connection to its source.

Thus, like Roos's animal etchings and the violinists' interpretive processes, this compositional approach navigates the space between imitation and invention—engaging deeply with nature's structures while transforming them into new artistic expressions. This dialogue between environmental observation, numerical data, and musical creativity forms the core of the compositional practice examined in this study.

Soundscape

The term soundscape is defined as "the acoustic environment as perceived or experienced and/or understood by a person or people, in context" (ISO, 2014). In recent years, soundscapes have gained recognition as vital natural resources, particularly within the realms of environmental conservation and protected ecosystems (Brown, 2012). As noted by Dumyahn and Pijanowski (2011), soundscapes carry both ecological and cultural significance, reflecting biodiversity as well as human interaction with nature.

In this study, a clear understanding of soundscape is essential to the compositional process. Here, the term refers specifically to the natural acoustic environment—comprising the sounds of birds, insects, and other wildlife—in urban-adjacent forests and green spaces in

Malaysia. A notable challenge in applying soundscapes to ecological discourse, such as deforestation, lies in the fact that some environmental changes may not be immediately audible. As Xu and Wu (2021) highlight, growing threats to nature from tourism and human activity have spurred a global rise in soundscape-related studies across protected areas.

Recent research has further drawn a link between environmental degradation and soundscape decline. Rappaport et al. (2022) found that deforestation contributes to a loss of acoustic richness in ecosystems, as reduced biodiversity leads to a decrease in sonic activity among birds, insects, and other fauna. These insights underscore the potential of soundscape-inspired music to mirror and raise awareness of environmental transformation.

Soundscapes, however, are not merely objective recordings—they are filtered through human perception and cultural interpretation. Brown (2012) emphasizes that soundscapes are shaped by how individuals hear and contextualize their surroundings. Sterne (2013) expands on this by suggesting that soundscapes function both as physical environments and cultural constructs—frameworks through which people make sense of the world. Accordingly, while this study draws on recordings from natural sites, the subsequent compositional process also reflects personal interpretation, memory, and creative expression.

Echoing R. Murray Schafer's (1994) perspective, soundscapes can be understood as representations of nature and, in some cases, as counterpoints to the intrusions of industrial society. In the context of this research, the soundscapes were sourced from forested areas near urban centers—landscapes that embody a negotiation between nature and encroaching human development. These locations were chosen based on personal familiarity and accessibility, rather than scientific sampling of species or ecological variables.

In summary, soundscape in this study refers to field recordings of natural acoustic environments captured in selected Malaysian forests and green spaces. These recordings serve as the primary data for the compositional process, where they are transcribed, numerically analyzed, and transformed into musical motives for a series of original art songs.

Soundscape Composition and Ecological Listening

The term soundscape composition was popularized by R. Murray Schafer (1994), who emphasized the acoustic environment as a medium not just for observation, but for artistic transformation. Schafer introduced the idea of "schizophonia"—the splitting of a sound from its original source—and argued that through creative reuse, composers could raise ecological consciousness. His work laid the groundwork for treating environmental sounds as both data and inspiration.

Building on Schafer's legacy, Barry Truax (2001) advanced the concept of acoustic ecology by integrating computer-based analysis and granular synthesis into soundscape composition. Truax advocates for a compositional ethic rooted in respect for the environment, where sounds retain their connection to the source, thus preserving a "real-world referentiality." This sensibility is echoed in the methodology, wherein birdsong is not sampled or manipulated, but transcribed and transformed into a musical logic rooted in its original context.

Studies such as those by Harley (2009) further underscore how soundscape compositions serve as artistic responses to ecological disruption. By encoding environmental data into musical form, composers craft works that are both aesthetically compelling and environmentally reflective.

Mathematical and Data-Driven Composition

The use of numerical systems in composition has a long lineage, from medieval isorhythmic motets to 20th-century serialism. In the contemporary context, composers such as Xenakis (1992) explored stochastic processes and mathematical modeling to generate sonic material. Xenakis viewed music as an "audible mathematics," where randomness, probability, and geometric structures formed the basis of compositional decision-making.

More recently, algorithmic and data-driven compositions have gained traction. Work by Ariza (2011) examines how real-world data—ranging from genomic sequences to seismic readings—can be mapped onto musical parameters. These approaches often prioritize systematic transformation over emotive expression, mirroring my decision to remove lyrical content in favor of compositional structure derived from environmental stimuli.

In this vein, the melodic numerical approach can be seen as a continuation of these traditions, yet tailored to a highly specific cultural and ecological context. Rather than deploying abstract code, the numerical values in my work emerge from lived environmental experience, drawing a distinct boundary between synthetic algorithm and embodied listening.

Southeast Asian Art Song and Cultural Hybridity

Malaysian and Indonesian art song traditions, including lagu seriosa, represent a hybridization of Western forms and local idioms. Scholars such as Sooi Beng Tan (2005) have emphasized the role of language, political identity, and post-colonial context in shaping regional art song practices.

As Tan (2005) notes, lagu seriosa differs from European lieder in its use of national languages and its narrative function in articulating sociopolitical themes. While the formal structure often mirrors Western classical models, the lyrical and performative elements are distinctively regional. It was my decision to remove the lyric component entirely presents a compelling inversion of this tradition—asserting a Malaysian compositional identity through soundscape material rather than text.

Art Songs

A review of the art song genre is essential in distinguishing it from other vocal forms. At its core, an art song is a musical composition written for voice and piano, typically situated within the classical art music tradition. Meister (1980) defines it as "a vocal music composition, usually written for one voice with piano accompaniment, and usually in the classical art music tradition." While voice and piano remain the most common instrumentation, exceptions do

exist. For example, Schubert's Der Hirt auf dem Felsen (D.965) includes clarinet alongside voice and piano, demonstrating how instrumentation can vary without compromising the work's classification as an art song (Riggle, 2020).

The role of the piano in art songs extends beyond accompaniment. In many cases, it holds equal expressive weight to the voice, functioning as a condensed orchestral partner that contributes to the musical and emotional narrative. According to Randel (2003), an art song is "a song intended for the concert repertory, as distinct from a folk or popular song," with both the vocal line and accompaniment carefully composed—rather than improvised—by the composer.

A defining trait of art songs is their literary foundation: they are typically settings of high-quality poetry. Kimball (2013) notes that "an art song is a unique hybrid of poetry and music," with the poem often predating the composition. While some composers create their own texts, this remains the exception. Art songs are generally intended for trained voices and are performed in formal or concert settings, factors which often limit their mainstream appeal (Kimball, 2013).

Globally, the art song tradition has evolved to reflect localized identities. In Latin America, for example, the blending of indigenous languages and Western compositional structures has given rise to new expressive forms (Gibbs, 2003). Similarly, the lagu seriosa genre in Malaysia and Indonesia emerged as part of broader cultural efforts during the Konfrontasi era to assert national identity through art music (Sooi Beng, 2005). Although inspired by Western Lied, lagu seriosa exhibits a unique evolution shaped by language, political context, and regional aesthetics. As Bohlman (2010) argues, music rooted in national identity can reflect both political ideals and metaphors drawn from nature, while still employing traditional Western techniques.

For this research, the focus is placed on composition rather than textual setting. While traditional art songs emphasize the poetic element, several works in this study intentionally omit text, aligning instead with wordless vocalises that blur the boundaries of the genre (Jones, 2011). As such, the resulting compositions remain within the scope of the art song tradition, though they challenge its conventions by removing the lyrical component.

In conclusion, art songs are classically styled compositions for piano and voice, historically grounded in poetic text and concert performance. Over time, the form has diversified in both instrumentation and cultural perspective. Malaysian art songs, while often structurally similar to their Western counterparts, distinguish themselves through the use of national languages and context-specific themes.

METHODOLOGY

This study adopts a practice-led approach focused on the capture and analysis of environmental soundscapes as the core data for compositional development. The primary acoustic material was recorded using a Huawei P9 smartphone, selected for its portability and unobtrusiveness in natural settings. All recordings took place on-site within the Bukit Cerakah

forest, with sessions timed to coincide with peak avian activity, typically during early morning hours.

The recorded soundscapes, particularly birdsong, were analyzed aurally. Rather than employing digital audio software or spectrographic tools, this study prioritized a listening-based transcription method, whereby the frequency, rhythm, and character of the bird calls were manually transcribed into musical notation. Key elements derived from the recordings included:

Chirp frequency: Used to determine phrase length and structural repetitions.
Rhythmic density: Translated into note durations and rhythmic groupings.

Pitch tendencies: Interpreted intuitively from perceived inflections and later mapped to tonal centers or melodic contours.

The numerical patterns derived from these observations served as the foundation for the compositional framework, guiding choices in harmony, phrasing, and melodic development. For example, a passage with five repeated chirps within a short interval might correspond to a five-note phrase or five-bar section in the composition.

This methodology embraces a low-tech, high-attention approach, foregrounding the human act of listening as an analytical and creative tool. It emphasizes presence within the environment and a sensitivity to sonic detail, allowing the natural world to serve as both source and co-creator in the compositional process.

FINDINGS AND ANALYSIS

Melodic Numerical Approach

The primary compositional strategy in this research is the melodic numerical approach, a method derived directly from field-recorded bird calls. The process begins with aural analysis of the recorded soundscape, where the number of times a bird chirps without pause is documented and transcribed into numerical data. This quantitative data then forms the foundation for key musical decisions, influencing the number of bars, phrases, pitch selection, harmonic progression, and note distribution within each composition.

The numerical values are first plotted in a visual sketch (Figure 30), representing the rhythmic structure and frequency of chirping patterns. In Composition I, this sketch directly informs the layout of phrases and the corresponding harmonic framework. For example, the first phrase consists of a single bar with only one note in the vocal line and one note in the violin part, supported by a single melodic note in the treble clef of the piano. This alignment of musical parameters around the value "1" is intentional, reflecting both melodic simplicity and structural clarity.

The bird chirps are interpreted as follows: 8, 9, 7, 4, 1, 7, 7, 4, and 2 repetitions, each without pause. These values are mapped onto scale degrees and corresponding keys based on a C major framework, as shown in the numerical analysis table (Figure 32). The ninth chirp set (9) is interpreted as scale degree 2, acknowledging its role as a tension tone (D) within the tonal context of C major.

The resulting harmonic mapping is as follows:

hirp Count	**:ale Degree**	**ey (C Major)**	**armonic Function**
			najor
			minor
			I half-diminished (b5)
			major
			najor
			I half-diminished (b5)
			I half-diminished (b5)
			major
			minor

Each entry informs both melodic and harmonic materials. For instance, the seven chirps guide a seven-bar phrase, in which the counterpoint reflects the numeric value: two soprano notes against five violin notes (totaling seven). This mirrors the structural logic of Renaissance species counterpoint, with the first phrase following first species (1:1), the second phrase using second species (1:2), and so on.

This approach turns biological repetition into compositional architecture, capturing the interplay between natural occurrence and musical logic. Rather than merely imitating birdsong, the composition abstractly translates its structure into a meticulously ordered musical narrative.

Numerical Concept

The numerical calculation concept in this study emerges from the natural soundscape, recorded during fieldwork in areas of ecological concern—specifically green zones in or near Kuala Lumpur that have been impacted by urbanization or deforestation. The recorded soundscape, primarily featuring birdsong, provides the raw material for a process of numerical transcription and compositional mapping.

From these recordings, repetitive acoustic elements—such as consecutive bird chirps—are catalogued into organized numerical sequences. These sequences then serve as thematic and structural anchors for composition. In some cases, a single field recording may generate a focused set of values; in others, multiple recordings may be combined to yield more complex layers of numerical material.

This concept draws conceptual inspiration from technical and scientific disciplines such as mathematics and engineering, where numerical systems are used to derive clear, actionable outcomes. As Quarteroni (2009) notes in his treatment of numerical methods in solving partial differential equations, "it is extremely important to have numerical methods at one's disposal, that allow [one] to construct an approximation... and to evaluate [its] solution in some suitable norm." In a similar spirit, this research adopts numerical modeling as a compositional strategy—not to approximate a solution to a mathematical problem, but to resolve the musical implications of recurring sonic phenomena in the natural environment.

The primary data set derives from a sequence of bird chirps recorded without pause: 8, 9, 7, 4, 1, 7, 7, 4, and 2. These counts are mapped onto the C major scale as follows:

1 = C

2 = D

3 = E

4 = F

5 = G

6 = A

7 = B

Values that exceed the 7-tone diatonic system (8 and 9) are treated as octave extensions or functional equivalents:

8 → 1 (C), acknowledging the octave relationship

9 → 2 (D), interpreted as the extension "9th" from a harmonic perspective

This mapping results in a melodic numerical scale, which is used to determine pitch content, phrase structure, time signatures, and counterpoint density in the compositions.

A numerical distribution table (see below) further explores pitch iteration across time, where y1...y7 represent sequential occurrences of the same pitch class, occurring at regular 7-step intervals. This patterning forms the basis of the formula:

pitch = y(n) – 7(n), where n = sequence iteration (1 through 7)

This formula allows for expanded structuring of melody over time, using bird-derived numbers as motivic fingerprints. The use of this numerical method moves beyond imitation, converting organic environmental repetition into organized musical logic.

Table: Numerical Chirp Count to Scale Mapping

hirp Count	apped Pitch (C Major)	terpretation
		nic
		pertonic
		bdominant
		ading tone
		tave (repetition of tonic)
		tension / Tension (9th)

Formulaic Pattern for Pitch Occurrence

To model the appearance of a pitch class over time, you've employed a 7-step additive pattern using the base formula:
pitch = y(n) – 7(n), where n = sequence iteration (1 through 7)

Here's how that looks when visualized as a numerical spread across pitch categories:

Table: Melodic Numerical Pattern by Pitch Class

tch	ale Degree	ccurrences (y_1 to y_7)
		8, 15, 22, 29, 36, 43, 50
		9, 16, 23, 30, 37, 44, 51
		10, 17, 24, 31, 38, 45, 52
		11, 18, 25, 32, 39, 46, 53
		12, 19, 26, 33, 40, 47, 54
		13, 20, 27, 34, 41, 48, 55
	i	14, 21, 28, 35, 42, 49, 56

Composition I: Numerical Root

Composition I serves as the blueprint for the entire song cycle, applying the melodic numerical approach in its purest form. Written in C major, the most foundational key, it reflects numerical values derived directly from bird chirp frequencies. This piece is entirely devoid of lyrics, focusing solely on representing the acoustic texture of nature.

Scored for soprano, violin, and piano, it strictly follows a logic-driven structure:

Bar 1: One-bar phrase with 1 note in soprano mirrored by 1 in the violin (1st species counterpoint).

Bars 2–3: Two-bar phrase with 1 soprano note against 2 violin notes (2nd species).

Bars 4–10: Seven-bar phrase containing seven notes combined between both lines.

Bars 11–14: Four-bar phrase using four notes total.

Each phrase, time length, and note quantity mirrors chirp counts documented in the numerical analysis, creating a score that is both methodical and representative of an organic source.

Composition ii: The Emblem of Duality

Composition ii is distilled from fragments of Composition I and fully revolves around the number 2:

Key: D major (2nd degree of C)

Time signature: 2/2

Structure: Built on 2-bar phrases within a total of 20 bars

Process: Composed without listening to any playback, in alignment with the numeric emphasis on duality

This composition is more than an echo; it is a deliberate embodiment of symmetry, restraint, and numeric discipline.

Composition vii: Tension & Displacement

Composition vii explores the number 7 across musical and emotional planes. Its instrumentation—soprano, violin, wood block, and piano—introduces texture and narrative tension. Set in A♭ major (7 flats) and in 7/8 time, it captures agitation, fragmentation, and ecological loss.

Inspired by the displaced rhythms of a woodpecker knocking on artificial structures, this piece layers:

Repetitive figures between piano and wood block
Minor seconds between violin and piano to express emotional and sonic friction
Sevens in phrase length, beat structures, and note counts

The wood block, mimicking the woodpecker, becomes a rhythmic heart and environmental signifier, anchoring a composition that meditates on instinct, adaptation, and fragmentation in nature.

Composition IV: Resolution & Reflection

As the final piece in the cycle, Composition IV embodies the number 4:

Key: F major (4th degree of C)

Time signature: 4/4

Length: 40 bars

Structure: 4-bar units between instruments, mirroring each other

Unlike the others, this piece incorporates poetry: > Deruan angin... Patah seribu harapanku by Hajar Aznam.

Here, the melody borrows thematic material from the composer's earlier works (Seindah Lautan, Deruan Ombak), binding past to present. The poem, while not overtly environmental, serves as a metaphor for unspoken love, longing, and environmental loss—making this work the emotional and lyrical culmination of the cycle.

DISCUSSION

This research explores the intersection of environment, numeracy, and musical composition, offering new possibilities for contemporary Malaysian art song. The compositional process reimagines how nature can function not merely as a thematic device, but as a system of compositional logic—a source of data, structure, and inspiration. In this sense, the study departs from earlier soundscape-inspired works that rely on mimicry, field sampling, or ambient aesthetic. Instead, it proposes a translation model, in which the sonic gestures of birds and ecosystems are rendered as musical structures through numerical representation.

The idea of drawing numbers from natural patterns is not new. Historical musical practices such as isorhythm, canon, and the Fibonacci sequence have long informed structural decisions in Western music. What distinguishes the melodic numerical approach in this study, however, is its ecological specificity and cultural embeddedness. By situating the field recordings in ecologically vulnerable areas of urban Malaysia, the research injects meaning into the numbers. Each chirp is not simply a unit of rhythm—it is a sonic remnant of an endangered landscape.

In rejecting poetic text for three of the four compositions, the study also challenges traditional paradigms within the art song genre. Conventionally, art songs are predicated on text-music relationships, where the poetry provides narrative, structure, and affective depth. Here, text is replaced by texture—and narrative emerges through environmental logic rather than literary form. This is not to suggest a disregard for poetry, but a reorientation of the expressive center. Composition IV, with its poetic inclusion, acts as an aesthetic bridge—a final statement that reclaims lyrical expression while remaining grounded in numerical and ecological awareness.

Furthermore, the use of counterpoint and species modeling (particularly in Composition I) introduces a dialogue between historical techniques and contemporary concerns. The species counterpoint method, originally developed to teach voice leading and musical logic, becomes in this context a tool for balance and restraint—mirroring the ordered unpredictability of nature itself. The strict adherence to numerical counts offers creative constraints that foster innovation within limitation, reflecting an idea often discussed in minimalist and process music practices.

In Composition vii, the layering of dissonances, metric asymmetry (7/8), and instrumental textures (wood block as woodpecker) pushes the boundaries of traditional art song expression. The metaphor of a displaced woodpecker knocking on metal instead of bark is not only vividly sonic—it is symbolically rich, evoking the dissonance between natural instinct and urban encroachment. Here, the numerical becomes narrative, and the structural becomes social.

Overall, this research contributes to ongoing conversations in several intersecting fields:

Eco-critical musicology, by asserting that compositional processes can engage with ecological data meaningfully and poetically;

Contemporary composition, by introducing a framework for translating environmental repetition into structured musical decisions;

Malaysian music studies, by proposing new idioms for art song that are rooted in local soundscapes and artistic interpretation;

And acoustic ecology, by demonstrating that listening and composing can form a mutually reinforcing act of environmental attention.

Finally, the work also raises important questions: Can a composition truly represent environmental phenomena without sonic realism? What is lost or gained when numbers stand in for narrative? And how might future art songs continue this trajectory—balancing methodical abstraction with affective and cultural depth?

These questions do not demand immediate answers. Rather, they invite ongoing inquiry—reminding us that as nature changes, so too must our ways of listening, composing, and imagining music's role in the world.

CONCLUSION AND RECOMMENDATIONS

Summary of Findings

This study set out to investigate how environmental soundscapes—specifically, birdsong recorded in Malaysian urban-adjacent forests—could inform contemporary art song composition through a structured numerical approach. Through meticulous listening, recording, transcription, and translation of natural sonic patterns into musical logic, the project produced a collection of four distinct compositions: I, ii, vii, and IV. Each work exemplifies a different way of interpreting numeric values drawn from natural patterns—primarily bird chirp frequencies—and mapping them onto formal elements of musical design such as phrase structure, harmony, rhythm, and melodic contour.

The compositional process eliminated intuitive or emotive decision-making in favor of calculated structural alignment. Each piece in the cycle embodies a specific numerical identity—whether it is the number 1 in Composition I, 2 in ii, 4 in IV, or 7 in vii. These numbers influence musical decisions in time signature, key signature, bar count, and pitch construction. This deliberate adherence to data-led creative practice positions the project within the broader traditions of process music and data-driven composition while retaining a cultural sensitivity to the ecological realities specific to Malaysia.

The study finds that numerical abstraction of environmental data does not diminish expressive potential. On the contrary, by allowing patterns of nature to direct compositional form, a new aesthetic emerges—one that blurs the boundaries between environmental observation and musical expression.

The Ecological Voice in Art Song

One of the fundamental goals of this study was to explore how the voice of nature—often silenced or overlooked in rapidly urbanizing spaces—might find expression in contemporary classical music. By grounding the compositions in soundscapes recorded from semi-urban forests affected by deforestation, the project inherently positions itself within an eco-critical artistic tradition. Here, the birdsong becomes more than a motif; it serves as a testimonial presence—evidence of biodiversity, displacement, and change.

The woodpecker in Composition vii, for example, taps not on a tree, but on a lamppost—a tiny but poignant symbol of habitat loss. Likewise, the recurrence of minor seconds and rhythmic dissonance throughout the cycle reflects tension and fragmentation in the sonic environment. These are not merely musical devices; they are expressive metaphors grounded in environmental realities. The compositions thus become not just creative works, but acts of listening, witnessing, and subtle protest.

This aligns with the growing body of work within acoustic ecology (Truax, 2001; Harley, 2009), where composition becomes a means of advocating for environmental awareness. Sound is not only an artistic element—it becomes an ecological artifact and cultural signal.

Artistic Identity and Cultural Context

While Western art song traditions generally prioritize the poetic setting of existing literary texts, this study intentionally deviates from that path. Composition I, ii, and vii exclude lyrics entirely, allowing for a musical form that privileges environment over narrative and structure over sentiment. In Composition IV, however, a poem is introduced—not as a conventional lyrical setting, but as a parallel metaphor for emotional and ecological loss.

The poetry, like the compositions, speaks in layers—offering a text that can be interpreted both personally (as a reflection on love and longing) and politically (as a lament for environmental degradation). Through this choice, the study challenges traditional definitions of art song while remaining tethered to its structural and performative conventions.

Furthermore, by drawing inspiration from the Malaysian context—geographically, ecologically, and culturally—the project contributes to an emerging national repertoire of Malaysian art song. It joins an important movement to localize classical traditions, reclaiming them from Eurocentric frameworks and imbuing them with indigenous themes, soundscapes, and stories.

Methodological Contributions

The melodic numerical approach developed in this study offers a replicable framework for composers who wish to explore data-derived music grounded in environmental contexts. By relying on repetition frequency, duration, and phrasing of birdsong, a generative structure can be formed—yielding results that are neither arbitrary nor overly deterministic. The system also allows for flexibility: repetitive chirps may dictate tonal centers, phrase lengths, melodic counterpoint, or rhythmic pulse.

This methodology sits at the intersection of practice-based research, environmental listening, and mathematical composition. It emphasizes the act of translating nature—rather than imitating it—and doing so through sonic mathematics. The inclusion of listening-based analysis, as opposed to software-based spectrography, also democratizes the process, making it more accessible to composers working with limited technology but rich with attentive engagement.

In an age of increasingly automated, AI-assisted music generation, this approach reaffirms the composer's role as interpreter of the world, not merely generator of material. It requires being present in the environment, developing an ear for sonic ecology, and engaging in a kind of applied listening that bridges art and science.

Challenges and Reflections

This project has also faced certain limitations. The reliance on field recordings using a consumer-grade device (Huawei P9) introduced sonic constraints such as ambient noise and frequency limitations. However, these imperfections became part of the compositional character, lending authenticity and immediacy to the recorded material.

Additionally, the absence of software-driven analysis may limit scientific verification of certain interpretations—particularly regarding chirp frequencies or pitch height. Nevertheless, this study does not claim to be a work of acoustic science, but rather of compositional craft informed by environmental realities. The subjectivity of human hearing, memory, and perception is embraced as part of the process.

Another challenge lay in resisting the urge to overwrite or interpret numerically derived structures with expressive or intuitive revisions. The goal was to listen, transcribe, and translate—not to editorialize. This restraint was particularly difficult in pieces like Composition ii, where the simplicity and symmetry of the number 2 tempted more melodic development.

Implications for Future Work

This project opens several pathways for future exploration:

Expanding the Compositional Cycle: Further compositions could be created using other numerical values (e.g., 5, 6, or prime numbers) derived from different ecological contexts or species.

Multimedia Performance: Integrating field video or projected imagery alongside live performance would enhance the immersive ecological narrative and heighten audience engagement.

Community Collaboration: Future iterations could involve local communities in soundscape recording, inviting indigenous and urban youth into the creative process as recordists, composers, or performers.

Technological Tools: Incorporating machine learning for real-time birdcall classification or pitch detection could add scientific rigor to the analysis while introducing creative unpredictability.

Cross-Genre Exploration: Elements of this approach could be translated into other genres—choral music, electronic sound art, or even popular songwriting—to broaden its reach and application.

Final Thoughts

At its core, this study is not only about composing music—it is about learning to listen. By turning attention toward the sonic ecology of urban-adjacent forests, and treating each chirp, rustle, or knock as a piece of musical intelligence, we begin to understand the world not only as backdrop, but as co-composer.

In a time when nature is often muted—both figuratively and literally—these compositions offer a framework for translating presence. They do not speak about nature, but with it. Through numerical systems and structured logic, a new intimacy is formed—one that is rooted in observation, shaped by discipline, and expressed in song.

The song cycle I, IV, ii, and vii is thus more than a series of compositions; it is a quiet act of resistance, a creative ecology, and a call to reimagine the boundaries between art, data, and the living world. It is a Malaysian art song not because of the language it speaks, but because of the land that inspired it.

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