PENTAGRAM: FROM COMPLEXITY TO EMOTION THROUGH SOFTWARE SEQUENCERS

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ABSTRACT

Pentagram investigates the integration of technology in modern music composition, focusing on the use of software sequencers to merge human creativity with machine precision. The study highlights how these tools transform live performance by enhancing technical and expressive dimensions. The research aims to explore the roles of sequencers in Pentagram, focusing on complex pattern execution, real-time effect manipulation, expressive outcomes, and the intricate communication between the musician and the sequencer. This study employs a qualitative descriptive approach with a focus on music analysis, examining how sequencers contribute to technical precision, real-time responsiveness, and emotional storytelling in live performances. The research demonstrates that sequencers enable complex pattern execution, real-time effect manipulation, and intricate communication between the musician and the sequencer, offering new possibilities for composition and live performance. Pentagram highlights the transformative potential of sequencers in music, showcasing their ability to expand creative boundaries by combining precision, expressiveness, and innovation in live performance.

Introduction

The idea for *Pentagram* emerged during the composer's prayers at Pura Besakih, a sacred site situated a top Mount Agung. As described, Pura Besakih serves not only as a center of religious activity but also as a hub for cultural and artistic expression, highlighting the deep connection between spirituality and creativity [1, p. 228]. This setting inspired a composition that bridges the spiritual and the technological, embodying the evolving landscape of music.

In this context, the intersection of music and technology becomes a fertile ground for innovation, offering new possibilities for composition and performance. Software sequencers, one of the media frequently used by pop musicians these days, exemplify this innovation by automating intricate musical sequences and enabling real-time manipulation of effects. These technologies provide performers with a platform to explore new dimensions of creativity and expression.

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Pentagram serves as a case study in how such technological tools can enhance both the technical and emotional aspects of live music. Unlike traditional approaches that depend solely on human interpretation, this work integrates sequencers as active participants in the musical process. Through their ability to execute precise patterns, simulate live synthesizer play, and reintroduce fragments of past performances, sequencers contribute to a novel form of music-making that is both innovative and emotionally resonant. This aligns with the idea that experimental music emerges as a form of resistance to conventional musical structures, offering a fresh perspective that counters the monotony of traditional listening and performance practices [2, p. 124].

The unique contribution of this research lies in emphasizing the dual role of sequencers as tools for technical execution and emotional storytelling. By combining the structured precision of software with the organic spontaneity of human performance, *Pentagram* illustrates how technology can enrich the musical experience. Such an approach reflects the potential of sequencers to reshape live music and expand the boundaries of artistic expression, blending innovation with timeless emotional resonance.

Method

This study employs a qualitative descriptive approach, which aligns with the understanding that the qualitative method is a research procedure producing descriptive data in the form of written or spoken words from people and observed behavior [3, p. 21]. Similarly, it resonates with the idea that qualitative research uses descriptive data in the form of written or oral language from individuals, actors, or objects that can be observed [4, p. 143]. In the context of *Pentagram*, this method allows for a deep exploration of both the compositional and performance processes, emphasizing how sequencers contribute to achieving technical precision and emotional depth.

Focusing on three main aspects, complex pattern execution, real-time effect manipulation, integration of expressive elements in live performance, and the communication between musician and the software sequencer, the methodology draws upon music analysis. These elements provide a rich foundation for understanding the interplay between human performers and software sequencers in crafting a cohesive musical experience.

The composition of *Pentagram* exemplifies this dynamic interaction. Sequencers, central to the work, were programmed to execute intricate rhythmic and melodic patterns that challenge human performers due to their complexity. These patterns included rapid note repetitions, unconventional time signatures, and dynamic controls, which highlight the unique capabilities of sequencers. During live performances, the sequencers transmitted MIDI data to synthesizers, effectively simulating live play and enabling seamless interaction between pre-programmed sequences and human

improvisation. This process underscores the technological precision sequencers bring to live music, blending machine-like accuracy with the fluidity of human creativity.

Beyond technical execution, the study also analyzed how pre-recorded sequences were used to evoke emotional continuity. These recordings, derived from earlier improvisations or compositions, were dynamically integrated into live performances to create a meaningful dialogue between the past and present. This interplay reveals the sequencers' ability to preserve and reanimate the emotional essence of prior creative moments, emphasizing their role not just as technical tools but as mediums for emotional storytelling. Through this integration of technology and human artistry, *Pentagram* showcases the transformative potential of sequencers in shaping modern musical expression.

Discussion

The creation of an artistic work does not occur spontaneously but undergoes a systematic process [2, p.125]. This structured progression ensures that the artist can navigate the complexities of creation with clarity and purpose. As noted, if an artist lacks a definite concept, the creative process becomes significantly more challenging, as there is no solid foundation to guide the journey [5, p.133]. Establishing such a foundation is critical, as crafting a compelling piece of art invariably requires a deliberate and thoughtful process [6, p.171].

In developing a work, the creator must first define a clear concept to ensure the final result aligns with their vision and intentions [7, p.163]. With this understanding, the creator of *Pentagram* chose to frame the composition within the context of software sequencers. These tools not only provide the technological framework for the piece but also enable the realization of its four core aspects: complex pattern execution, real-time effect manipulation, expressive outcomes, and the intricate communication between the musician and the sequencer. This conceptual clarity forms the bedrock of the creative process, ensuring the work is both technically robust and emotionally resonant. Through this approach, *Pentagram* exemplifies the importance of merging conceptual focus with innovative tools to bring an artistic vision to life.

One of the most striking features of software sequencers is their ability to execute intricate musical patterns with precision and consistency. In *Pentagram*, this capability was utilized to handle rapid alternations between irregular time signatures, such as seven-eight and five-four, while maintaining an unwavering tempo and dynamic balance. This approach not only showcased the versatility of sequencers but also allowed performers to focus on expressive interpretation rather than the demands of technical accuracy.

The discussion of *Pentagram*'s *complex pattern execution* highlights two critical elements: metric modulation and polyrhythm, both of which are central to the composition's rhythmic complexity. Metric modulation, described as a type of tempo variation where the pulse may either remain constant or change [8, p.16], played a pivotal role in shaping the rhythmic structure of the piece. For example, the application of duration modulation facilitated precise tempo shifts, using a formulaic approach to calculate transitions seamlessly:

The formula for tempo modulation is expressed as follows:

$$\text{New Tempo} = \frac{\text{Old Tempo} \times \text{Old Duration}}{\text{New Duration}} \tag{1}$$

Figure 1. Formula for tempo modulation
Source: I Gede Raditya Yudhistira

This formula calculates the new tempo based on the relationship between the old tempo, the duration of the previous note value (Old Duration), and the desired new note value (New Duration). (1)

For example, applying this formula to a tempo shift:

$$\text{New Tempo} = \frac{80 \times 7}{4} = 140\,\text{BPM} \tag{2}$$

Figure 2. Formula to a tempo shift
Source: I Gede Raditya Yudhistira

Here, the "Old Tempo" is 80 BPM, representing the initial tempo. The "Old Duration" is 7, referring to the previous note value, and the "New Duration" is 4, representing the desired note value. Multiplying the Old Tempo by the Old Duration gives 560, and dividing by the New Duration results in the New Tempo of 140 BPM. (2)

Figure 3. Metric Modulation on Pentagram
Source: I Gede Raditya Yudhistira

This systematic approach to metric modulation enabled the sequencer to execute tempo changes with mathematical precision, ensuring the rhythmic integrity of the composition.

Figure 4. Polyrhythm on Pentagram

In the composition *Pentagram*, multiple rhythmic layers intertwine to form a rich and complex texture, showcasing the expressive potential of polyrhythm. The keyboard, *penting*—a traditional Balinese instrument—and cello establish a steady foundation with a consistent 1/16 rhythmic structure. Over this base, the piano and synth bass introduce a 1/16 quintuplet rhythm, adding a layer of subtle tension and complexity. Meanwhile,

the synth lead performs a 1/16 septuplet rhythm, creating a striking rhythmic contrast that elevates the intricate interplay of these layers.

This nuanced use of polyrhythm underscores its ability to create intricate musical patterns by layering rhythms that are played simultaneously or against each other. As defined, polyrhythm involves "multiple rhythms being played simultaneously or against each other" [9, p.3], and in *Pentagram*, it serves as a cornerstone for the piece's rhythmic complexity. The software sequencer's precise timing makes it possible to program and execute such layered rhythms, enabling consistency and alignment that would be nearly impossible to achieve manually in a live performance setting.

By leveraging the sequencer, *Pentagram* explores rhythmic and melodic ideas that push the boundaries of traditional live music performance. For instance, sequences involving simultaneous cross-rhythms and rapidly shifting harmonic progressions were programmed into the sequencer, creating a dynamic and vibrant tapestry of sound. These intricately designed sequences complemented the live performers' contributions, demonstrating how technology can extend human creative capabilities. Rhythm, as noted, governs the flow of durations—slow or fast, long or short [10, p.222]— and its effective execution often requires musicians with exceptional technical skill [11, p.190]. However, in *Pentagram*, the integration of sequencers allows these complex rhythmic ideas to flourish without compromising precision.

One particularly striking example is the combination of rhythmic structures performed by different instruments. While the foundational layers offer a sense of stability, the quintuplet and septuplet rhythms create tension and contrast, enriching the composition's texture. The sequencer ensures precise timing, allowing all these elements to align seamlessly, even within such a demanding framework. This precision not only enhances the complexity of the piece but also empowers performers to focus on expression and interpretation rather than the mechanical execution of challenging patterns.

The sequencer's role in *Pentagram* highlights its potential as a collaborator in the creative process rather than a mere tool for convenience. Its precision and reliability allow composers and performers to experiment with ideas that challenge traditional notions of live music. By offloading the execution of intricate rhythmic patterns to the sequencer, the piece achieves a depth and complexity that would otherwise be impractical. In this sense, the sequencer becomes an essential instrument for expanding the creative boundaries of contemporary music, bridging the gap between technical innovation and artistic expression.

Ultimately, the use of polyrhythm in *Pentagram* reflects the broader possibilities of integrating technology into music-making. The sequencer does not replace the human element; rather, it enhances and complements it, enabling a collaboration that

elevates the performance to new levels of sophistication. This dynamic interplay between human musicians and the sequencer exemplifies how technology can serve as a vital partner in the ongoing evolution of music.

Another key feature of sequencers is their ability to manipulate effects in real time, a capability that plays a vital role in shaping the sonic landscape of *Pentagram*. In this composition, the sequencer dynamically controlled parameters such as delay, synchronizing these changes with the live performers' phrasing to create a cohesive and immersive sonic experience. A delay works by holding back a sound in time and releasing it at a specified interval. Typically, the original sound remains unaffected while a copy is delayed and mixed with the original, with the copies spaced apart and timed to any desired tempo [12, p.120].

Unlike echo, which is generally defined as a sound reflection heard after the original sound [13, p.180], delay offers precise control over timing and layering. The use of delay in *Pentagram* provided a distinct texture that contributed significantly to the composition's atmosphere. For example, during one section, the sequencer adjusted the resonance and cutoff frequency of a synthesizer filter, creating a dynamic interplay of tension and release. This manipulation mirrored the emotional arc of the performer, effectively blending pre-programmed control with real-time spontaneity.

The sequencer's ability to interact in real time underscores its role as more than just a passive tool; it acts as a collaborative partner in the performance. By allowing for pre-programmed adjustments that could also be modified based on the performer's cues, the sequencer introduced a level of responsiveness that bridged structured control with creative flexibility. This dynamic interaction highlights how the sequencer not only supports but actively shapes the musical narrative, enriching the live performance through its ability to enhance and respond to the human element.

Beyond their technical capabilities, sequencers contribute significantly to the emotional impact of a performance by enabling a unique form of musical storytelling. In *Pentagram*, pre-recorded sequences were not simply replayed but thoughtfully integrated into the live performance to reintroduce fragments of earlier improvisations. This approach created a sense of continuity and nostalgia, preserving the original expressiveness of these recordings while giving them new life in the context of the live performance.

Expressiveness in music performance is often defined as the systematic presence of deviations from the musical notation, serving as a communication bridge between the musician and the listener [14]. These deviations, though seemingly subtle, are deeply rooted in the performer's interpretative choices and have been studied extensively to understand their underlying structures. As such, systematic deviations have led to models that attempt to describe their origins, mechanisms, and purposes—exploring

where, how, and why performers consciously or unconsciously modify the notation of the score [15, p.29]. While these models often rely on the score as a reference point, this dependence presents challenges, particularly in interpreting how listeners perceive and judge expressiveness. The nuances of interpretation often transcend measurable deviations, revealing deeper, less tangible aspects of musical expression that may not directly correlate with the notation itself.

This capacity to preserve and reanimate past performances highlights that sequencers are more than mere technical aids; they function as powerful tools for emotional storytelling. By bridging the temporal gap between past improvisations and present performances, they create a dynamic dialogue among the composer, performer, and audience, enriching the live music experience. As all individuals bring their own statements and perspectives that can be defined and supported by their compositional experiences or specific academic sources [16, p.202], the integration of sequencers allows these personal and collective musical narratives to come to life in new and impactful ways.

Furthermore, the ability to weave past and present performances underscores the importance of musical knowledge across various instrumental traditions. This understanding is vital not only for performers but also for broader communities, as it enhances the appreciation and interpretation of complex musical expressions [17, p.214]. By enabling such layers of interaction, sequencers contribute to a more profound and immersive musical experience, fostering a connection that resonates on both technical and emotional levels.

With the introduction of each new technology, concerns often arise about its longevity, with some fearing it may become a fleeting trend, much like Betamax or dot matrix printers. For scholars aiming to build sustainable research, this concern is valid, as the rapid pace of technological advancement contrasts with the inherently long-term nature of rigorous academic inquiry [18, p.13]. This tension is particularly relevant in creative practices like music, where technology has become both a tool and a transformative collaborator.

Technology, as a product of human choices and decisions, is far from neutral. It is imbued with the biases, values, and cultural frameworks of its creators. As noted, "Technology is not free from human influence... It represents calcified symbolic constructions of these biases," reflecting the cultural and cognitive dimensions of its designers [18, p.15]. These underlying influences shape not only how technology functions but also how it frames interactions, communication, and artistic expression. This human-centered foundation is evident in performances like *Pentagram*, where the sequencer transcends its role as a passive tool to become an active participant in the creative process.

The success of a performance like *Pentagram* depends on effective communication between the musician and the sequencer, a dynamic that extends beyond technical synchronization to include an intuitive understanding of how the sequencer integrates into the musical narrative. This collaborative interaction mirrors traditional gamelan techniques, such as *ubit-ubitan*, which combine *polos* (on-beat) and *sangsih* (off-beat) elements to create interlocking rhythmic patterns [19, p.154]. While scholarly debates persist about the precise definitions of terms like *ubit-ubitan* and *kotekan*, their practical application remains consistent, serving to "fill in empty beats and make interlocking" patterns that produce intricate and cohesive musical textures [20, p.48].
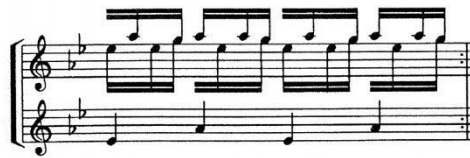
Figure 5. Kotekan Nyogcag
Source: [21]

Figure 6. Kotekan Telu
Source: [21]

Figure 7. Kotekan Empat
Source: [21]

In *Pentagram,* this principle is applied through the rhythmic structures inspired by *kotekan,* as detailed in *Balungan: A Publication of the American Gamelan Institute*. The resource describes three primary types of *kotekan*—Nyog cag, Telu, and Empat— each offering distinct interlocking possibilities [21]. By programming these rhythmic patterns into the sequencer, *Pentagram* bridges traditional Balinese music techniques

and contemporary technological approaches, embodying the cultural value of balance that is central to Balinese artistic and societal life [5, p.132].

This integration of tradition and technology required meticulous preparation and collaboration during rehearsals. Performers worked closely with the sequencer, treating it as a creative partner.

Figure 8. Kotekan in Pentagram
Source: I Gede Raditya Yudhistira

The sequencer was programmed to perform the *polos* part while the musicians played the *sangsih*, requiring careful synchronization to ensure both parts interlocked seamlessly. Through iterative adjustments, such as refining the timing of pre-recorded triggers to align with the performers' phrasing, the collaboration achieved a cohesive interplay between the spontaneity of live performance and the precision of sequenced elements.

The role of the sequencer in *Pentagram* exemplifies its potential to enhance not only the technical aspects of performance but also its expressive depth. By offloading the execution of complex patterns to the sequencer, the performers were free to focus on artistic interpretation, achieving a nuanced blend of human and machine-driven elements. This dynamic relationship underscores the need to view sequencers not merely as tools of convenience but as active contributors to the creative process.

As the sequencer becomes an integral part of the artistic dialogue, its role evolves from supporting the creative process to actively shaping and enriching it. This interplay between human intuition and technological precision demonstrates the transformative potential of human-machine collaboration in expanding the boundaries of contemporary music. Through such partnerships, performances like *Pentagram* illustrate how technology can bridge tradition and innovation, creating new dimensions of cohesion, complexity, and artistic expression.

Conclusion

The composition and performance of *Pentagram* provide a compelling case study in the integration of technology, particularly software sequencers, into live music. By bridging the precision of technological tools with the spontaneity of human expression, the work

exemplifies how innovation can enhance both the technical and emotional aspects of music. The sequencers in *Pentagram* are not merely mechanical devices executing programmed sequences; they serve as active collaborators, enhancing the composer's artistic vision and the performers' interpretative freedom.

Through intricate pattern execution, real-time effect manipulation, and the ability to evoke emotional continuity, the sequencers contribute to the work's technical complexity while preserving its expressive depth. By reintroducing fragments of past performances, they create a sense of continuity, preserving the emotional essence of earlier improvisations and offering a new dimension of musical storytelling. Furthermore, the collaboration between the musician and the sequencer, reminiscent of traditional Balinese musical techniques, highlights the importance of effective communication between human creativity and technological tools.

Pentagram demonstrates that sequencers can transcend their role as mere technical aids, evolving into active participants in the creative process. This partnership between human musicians and technology reshapes the boundaries of musical expression, enabling performers to explore new possibilities while maintaining emotional authenticity. The work not only challenges conventional performance practices but also emphasizes the potential of technology to deepen the emotional and cultural resonance of contemporary music, creating a dynamic and evolving dialogue between tradition and innovation.

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