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SINGKUH: WHERE HUMAN IMAGINATION MEETS TECHNOLOGICAL SOUND EXPERIMENTATION

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ABSTRACT
"Singkuh" is an experimental music composition based on the Balinese concept of "singkuh," meaning "strange." The work challenges traditional musical conventions by introducing unconventional sounds, techniques, and forms, contributing to the field of experimental music. To explore innovative approaches to music-making, breaking traditional norms, and expanding the possibilities of sound exploration through unconventional techniques and instruments. The composition utilizes VCV Rack software to operate modular synthesizers, providing effects for acoustic instruments. The creation process follows the Art Consortium's five stages: preparation, elaboration, synthesis, concept realization, and evaluation. The result is a 30-minute experimental composition for acoustic and electronic instruments. It includes diverse instruments such as piano, synthesizers, ocarina, kalimba, harmonica, bird whistles, and more. The work is divided into five sections emphasizing different experimental aspects. "Singkuh" introduces innovative techniques, instruments, and notations to experimental music. It expands musical boundaries and encourages both musicians and listeners to explore diverse sound possibilities.

KEYWORDS
experimental music, sound exploration, modular synthesizer, VCV rack, acoustic instruments.

Introduction

The experimental music composition Singkuh emerges from the Balinese concept of singkuh, a term that encapsulates strangeness or the unusual, both in form and essence. This work strives to disrupt conventional notions of music by merging acoustic instruments such as piano, vocals, and bamboo flute with modular synthesis using VCV Rack. The blend of traditional and cutting-edge technology in Singkuh not only challenges the norms of music creation but also reimagines the possibilities of auditory experiences in the contemporary context.

Modular synthesis has become a pivotal tool in experimental music, allowing for the deconstruction and reconstruction of sound in ways that traditional acoustic instruments alone cannot achieve. According to Berthaut et al., modular synthesizers enable composers to create immersive soundscapes through detailed signal

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manipulation, offering unparalleled flexibility [1]. This adaptability aligns with the goal of Singkuh, where acoustic timbres are transformed into evocative textures, extending the scope of musical expression.

Furthermore, modular synthesizers like VCV Rack are celebrated for their ability to encourage real-time improvisation and interaction. As Duncan notes, the randomization modules in such systems foster spontaneity, providing a dynamic interplay between structured and stochastic elements [2]. In Singkuh, this feature is exemplified in the processing of bamboo flute and melodica sounds, which are layered with unpredictable variations to create a surreal auditory atmosphere.

The integration of traditional instruments with modular synthesis also aligns with recent trends in contemporary experimental music. Mazzanti highlights how modular synthesis acts as a bridge between traditional craftsmanship and digital innovation, enabling composers to honor cultural roots while exploring futuristic soundscapes [3]. This duality is at the heart of Singkuh, as it celebrates the cultural heritage of Balinese music while venturing into uncharted sonic territories.

Through this hybrid approach, Singkuh not only broadens the boundaries of experimental music but also serves as a case study in the potential of modular synthesis to transform and elevate acoustic instruments. This work underscores the evolving relationship between tradition and technology, offering insights into how future compositions can harness the strengths of both worlds.

Method

This study adopts a qualitative descriptive approach to explore and document how modular synthesis technology, particularly VCV Rack, integrates with acoustic instruments in the experimental composition Singkuh. Emphasizing sound design, real-time processing, and experimental compositional structure, the methodology highlights both technical and artistic aspects of this innovative approach.

The creative process adheres to the Art Consortium Methodology, which comprises five interconnected stages. In the Preparation phase, the conceptual foundation is established by identifying and interpreting the Balinese philosophy of singkuh, focusing on how its essence of "strangeness" translates into auditory expressions. Next, the Elaboration stage involves experimenting with VCV Rack's functionalities, particularly its granular synthesis, spectral effects, and randomization modules, to shape acoustic inputs. This leads to the Synthesis stage, where processed sounds from instruments like piano, vocals, and bamboo flutes merge with electronic outputs to form cohesive soundscapes. The Concept Realization phase structures the composition into distinct movements, each showcasing unique experimental techniques. Finally, the Evaluation

stage iteratively refines the work through detailed listening and adjustments to ensure both technical precision and artistic coherence.

Data collection methods encompass audio recordings of raw and processed sounds, observational notes on the dynamic interaction between modular synthesis and acoustic instruments, and reflective analyses of how these elements collectively embody the concept of singkuh. The analysis process focuses on three main aspects: the transformation of acoustic timbres through VCV Rack modules, the aesthetic unity of the soundscapes, and the broader implications of modular synthesis in pushing the boundaries of experimental music.

This iterative methodology aligns with Berthaut et al.'s observation that modular synthesizers, due to their inherent flexibility and adaptability, are uniquely suited to exploratory sound design [4]. The iterative and adaptive workflow mirrors insights by Ambrose and Harris, who emphasize the role of continuous experimentation and refinement in the evolution of creative concepts [5]. In Singkuh, this iterative process facilitates the integration of acoustic and electronic elements, ensuring a harmonious blend of textures and timbres that aligns with the composition’s conceptual and aesthetic goals.

Discussion

The discussion highlights the significant role of VCV Rack in shaping *Singkuh*, an experimental composition that blends acoustic instruments with modular synthesis. This section provides a detailed examination of VCV Rack's functions, components, and applications within the composition while reflecting on its transformative potential for experimental music. The modular nature of VCV Rack facilitated creative exploration, broadening the auditory horizons through a seamless integration of acoustic and synthetic elements.

As a virtual modular synthesizer, VCV Rack replicates the versatility of analog systems, offering users a customizable environment for interconnecting virtual modules. Its core functionalities are pivotal in experimental music creation, especially in *Singkuh*. Among these, sound synthesis plays a crucial role, enabling the creation and modulation of sounds using various techniques such as subtractive, additive, and granular synthesis. Oscillators, the fundamental building blocks, produce waveforms that can be manipulated into complex textures. Modules like Fundamental VCO-1 generate basic waveforms, while advanced tools like Audible Instruments Braids introduce physical-modeling-based tones. As Duncan et al. (2022) assert, “The ability to combine basic synthesis modules with experimental algorithms enables musicians to craft sounds that challenge traditional auditory expectations” [6]. This aligns with *Singkuh*, where oscillators created ambient drones and harmonic layers to complement acoustic instruments like the piano and flute.

Sound transformation is another defining feature of VCV Rack, enabling dynamic alterations to sound through modules such as filters, reverbs, and granular synthesizers. For instance, filters like Vult Tangents sculpt sound by emphasizing or attenuating specific frequencies, while granular modules such as Grains break down and reconstruct audio into intricate textures. Reverb modules like Plateau were instrumental in creating the ethereal and meditative soundscapes in *Singkuh*. Ambrose (2021) highlights the significance of granular synthesis, stating, "Granular synthesis tools allow artists to stretch and fragment sounds, producing textures that feel simultaneously organic and otherworldly" [7]. This process is vividly demonstrated in *Singkuh*, where the resonance of the singing bowl was stretched and layered to evoke hypnotic auditory effects.

A particularly powerful capability of VCV Rack is real-time modulation and automation. By routing control signals generated by Low-Frequency Oscillators (LFOs), envelopes, or randomizers to various parameters, users can create dynamic changes in sound. For example, the Turing Machine module introduces random melodic patterns, while LFOs provide cyclical control over parameters such as filter cutoff. Karplus and Strong (2021) remark, "The integration of randomness and periodic control in modular systems facilitates the creation of evolving soundscapes that feel alive" [8]. In *Singkuh*, these features brought unpredictability to the bird whistles and *klotokan* rhythms, enhancing the composition's organic yet experimental quality.

VCV Rack's support for polyphony and layering further expands its creative potential, allowing multiple voices to play simultaneously for harmonically rich and textured compositions. Modules like Polyphonic MIDI-CV enable such layering, which was pivotal in *Singkuh*, particularly during sections where the piano and synthesizers interwove melodic and harmonic motifs. Richmond (2020) states, "Polyphony in modular environments transforms single-voice timbres into expansive, orchestrated textures" [9], a principle evident in the dense harmonic clusters of *Singkuh*.

Additionally, VCV Rack enables integration with external hardware and instruments, bridging traditional and electronic music-making. Acoustic inputs from instruments like melodica and bamboo flute were routed into VCV Rack through an audio interface, where they underwent real-time processing. Karplus et al. (2022) emphasize, "Modular synthesis offers an unparalleled platform for integrating acoustic and electronic sound worlds" [10], a concept central to *Singkuh*, where natural timbres were transformed into experimental textures.

Finally, interactive live performance capabilities in VCV Rack make it suitable for dynamic creative workflows. Sequencers and performance utilities allow composers to interact with patches in real-time. For instance, the Impromptu Modular Clocked module provided rhythmic synchronization, while performance utilities facilitated quick transitions during rehearsals. Duff et al. (2020) note, "Interactive elements in

modular systems enable performers to become co-creators with the machine, exploring uncharted sonic territories in real-time" [11]. This was instrumental in *Singkuh*, where live modulation added spontaneity and adaptability to the composition. Overall, VCV Rack's extensive toolkit not only served as a creative medium in *Singkuh* but also redefined the possibilities of experimental composition through its modular, flexible, and interactive nature.

1. Components of VCV Rack

VCV Rack operates as a modular framework that digitally replicates the physical modular synthesizer environment, providing a diverse array of modules designed for sound generation, processing, modulation, and sequencing. Each module performs a distinct role, making the software a vital tool for experimental music compositions such as *Singkuh*. By understanding its components, users can unlock creative possibilities to craft complex and dynamic soundscapes.

Oscillators form the foundation of sound synthesis in VCV Rack, generating basic waveforms such as sine, square, and triangle. Fundamental modules like VCO-1 produce classic waveforms suited for subtractive synthesis, while advanced modules like Audible Instruments Braids introduce intricate textures such as physical modeling and granular tones. According to researchers, "The versatility of oscillators lies in their ability to generate both tonal and noise-based textures, forming the backbone of modular synthesis" [12]. In *Singkuh*, oscillators were layered to create ambient drones, establishing the harmonic foundation of the piece.

Filters play a crucial role in modifying the harmonic content of signals by selectively amplifying or attenuating frequencies. Modules such as Vult Tangents and Fundamental VCF offer precise control over timbre. Tangents, a multimode filter, was instrumental in sculpting the resonances of the singing bowl and flute, emphasizing their ethereal qualities. As noted in the literature, "Filters in modular synthesizers act as sculptors of sound, enabling musicians to refine their auditory canvases" [13]. This functionality added subtle harmonic shifts, enhancing the atmospheric character of *Singkuh*.

Modulators, including Low-Frequency Oscillators (LFOs) and envelope generators, bring dynamic changes to sound parameters, introducing movement and variation. LFO-1 generates cyclic modulations affecting pitch and amplitude, while ADSR envelopes shape the temporal characteristics of sounds. "Incorporating modulators transforms static sounds into dynamic and evolving soundscapes" [14]. In *Singkuh*, these modulators randomized bird whistle pitches, infusing an element of natural unpredictability.

Effects processors further enrich the sonic palette by shaping the spatial and temporal dimensions of sound. Modules like Plateau (reverb) added depth and spaciousness to piano and vocal layers, while Chronoblob2 (delay) created rhythmic echoes that

seamlessly merged acoustic and synthetic timbres. Research highlights that "As effects shape the spatial and temporal aspects of sound, they become crucial for creating immersive experiences in experimental music" [15]. These effects were pivotal in cultivating the meditative and immersive qualities of *Singkuh*.

Sequencers and randomization modules were essential for creating rhythmic and melodic patterns. Impromptu Modular Phrase-Seq-16 generated intricate rhythmic sequences, while the Turing Machine introduced controlled randomness, ideal for experimental compositions. "Sequencers and randomizers provide a balance between structure and spontaneity, embodying the experimental ethos of modular synthesis" [16]. This balance was evident in *Singkuh*, where sequencers guided the rhythmic flow of *klotokan* sounds and randomizers added complexity.

Mixing modules and utility tools ensured seamless integration of various sound elements. The Fundamental Mixer blended acoustic inputs with synthesized layers, while switches enabled dynamic routing for real-time performance adjustments. These utilities, often overlooked, are critical in managing complex signal chains. As described, "Utility modules often act as the unsung heroes, ensuring seamless integration of complex signal chains" [17]. Their use in *Singkuh* ensured the cohesion of its diverse sonic elements.

The integration of external inputs, facilitated by modules like Audio-8, allowed acoustic instruments such as the piano and bamboo flute to interface with the modular environment. These inputs were processed and transformed within VCV Rack, merging traditional and modern soundscapes. Researchers argue that "The ability to integrate acoustic and electronic elements broadens the creative horizon for composers, enabling hybrid soundscapes" [18]. This integration was foundational to *Singkuh*, where Balinese acoustic timbres were seamlessly fused with modular synthesis.

Finally, visualization and analysis tools such as spectrum analyzers and oscilloscopes provided critical visual feedback for sound design. Modules like Fundamental Scope aided in aligning acoustic and electronic elements, offering precise control over modulation and timbre. "Visualization tools in VCV Rack bridge the gap between auditory and technical understanding, empowering creators with greater control" [19]. This alignment was crucial in ensuring the coherence and balance of the composition. By leveraging these components, *Singkuh* demonstrates the creative potential of modular synthesis in crafting an experimental and deeply immersive auditory experience.

2. Steps to Using VCV Rack

VCV Rack is an intuitive yet highly versatile software for modular synthesis, offering tools to explore and create experimental compositions such as Singkuh. The following

steps outline its operation and utilization, providing detailed guidance and practical examples.

The first step is downloading and installing VCV Rack from its official website. Once installed, users can access an extensive library of modules, including third-party add-ons. Configuring the audio output via the Audio-8 module ensures a seamless connection to an external audio interface. As noted, "Setting up the workspace in VCV Rack ensures an optimal workflow, catering to both novice and experienced users" [20].

To begin creating patches, users can add modules to the workspace by right-clicking and selecting from the module library. Oscillators, filters, modulators, and mixers are key starting points. For example, users can use the VCO-1 oscillator to generate basic sounds and connect it to the Fundamental VCA for amplitude control. "The modular structure of VCV Rack allows for infinite combinations of modules, encouraging users to experiment freely" [21].

Modules are interconnected using virtual cables by dragging from one module’s output to another’s input. For instance, users can route the output of an oscillator to a filter and then to a mixer for audio monitoring. "The drag-and-drop interface simplifies patching, making even complex signal paths manageable" [22].

Dynamic modulation can be achieved by adding Low-Frequency Oscillators (LFOs) or envelope generators to alter sound parameters. For instance, users might apply an LFO-1 to modulate an oscillator’s pitch, creating vibrato effects. "Dynamic modulation introduces motion and variability, key elements in crafting engaging soundscapes" [23].

Incorporating effects modules like Plateau (reverb) or Chronoblob2 (delay) can transform raw sounds into immersive auditory experiences. These tools add spatial depth and rhythmic echoes to compositions. "Effects processing transforms raw sounds into polished auditory experiences, essential for experimental music" [24].

Acoustic instruments, such as the piano, singing bowl, or bamboo flute, can be integrated using an audio input module like Audio-8. These signals can be processed with effects such as granular synthesis to enhance texture. "Hybrid setups combining acoustic and electronic elements open new horizons for composers" [25].

Sequencers and randomization modules provide structured and unpredictable elements. Modules like Phrase-Seq-16 generate rhythmic sequences, while tools like the Turing Machine introduce controlled randomness. "Combining structured sequences with random elements allows for balanced yet innovative compositions" [26].

Visualization tools such as oscilloscopes and spectrum analyzers help monitor and refine patches. For example, Fundamental Scope offers real-time feedback on signal flow and

sound properties. "Visual tools offer critical insights, enabling precise adjustments in complex modular systems" [27].

Patches can be saved for future use or live performances, ensuring reproducibility and supporting iterative experimentation. In Singkuh, multiple patches were saved to explore variations in texture and dynamics. "Saving modular patches encourages iterative experimentation, a hallmark of modern composition techniques" [28].

For live performances, parameters can be dynamically manipulated using MIDI controllers or hardware interfaces. "The real-time responsiveness of VCV Rack bridges the gap between studio production and live performance" [29].

By following these steps, users can harness VCV Rack's capabilities to explore creative sound design and performance, exemplified in the dynamic textures and experimental ethos of Singkuh.

3. The Use of VCV Rack in *Singkuh*

The composition Singkuh creatively blends the versatility of VCV Rack with a variety of acoustic instruments, including piano, synthesizers, ocarina, kalimba, harmonica, bird whistles, vocals, and the singing bowl. This innovative integration demonstrates how modular synthesis expands the possibilities of sound by enhancing and reinterpreting acoustic timbres.

VCV Rack plays a central role in processing acoustic instruments, transforming their natural tones into experimental textures. For example, the piano serves as both a harmonic and rhythmic anchor. Its sound is processed using granular synthesis modules like Clouds to create atmospheric layers, while reverb effects from modules like Plateau add ethereal depth. As noted, "Granular synthesis techniques in modular environments allow for the deconstruction and recombination of audio in innovative ways" [30], perfectly aligning with Singkuh's experimental approach. Similarly, vocals are processed through spectral modules such as Spectra for harmonic manipulation and pitch-shifted with tools like Vocoder, producing surreal, otherworldly textures that contrast with the natural piano timbre. This reflects the principle that "the human voice is used not only for melody but as a raw material for electronic transformation" [31]. Meanwhile, the resonant overtones of the singing bowl are amplified and enriched using spectral effects and delays, with modules like Chronoblob2 introducing rhythmic echoes to create a meditative pulse.

The synthesizers in VCV Rack provide an expansive sonic range, from deep bass tones to shimmering highs. Using modules such as VCO-1 and VCF (voltage-controlled filters), the synthesizers achieve precise timbral control and are seamlessly layered with acoustic sounds to create hybrid textures. Randomized melodic sequences generated by tools like the Turing Machine enhance the spontaneity of the composition, as "the

integration of generative modules encourages spontaneity, a hallmark of modular synthesis" [32].

Other acoustic instruments also receive meticulous processing to complement the overall texture. The ocarina and kalimba, for instance, are pitch-shifted with quantizer modules to align with the microtonal aspects of the piece, while delay and reverb effects add spatial depth to their delicate timbres. The harmonica's reed-based tone is filtered and enriched with subharmonic generators, creating a fuller sound. Bird whistles are processed using randomization modules like the Bernoulli Gate, mimicking the unpredictability of natural bird calls and enhancing the organic quality of the composition.

Creative techniques in Singkuh leverage VCV Rack's real-time modulation capabilities. Parameters such as pitch and filter cutoff are dynamically modulated using Low-Frequency Oscillators (LFOs), while sequencers like the Clock Divider organize rhythmic structures, synchronizing acoustic and electronic elements. This demonstrates that "modular synthesis allows for intricate rhythmic interplay between acoustic and electronic components" [33].

Structurally, Singkuh unfolds in four distinct sections, each highlighting a unique sonic exploration. The introduction features ethereal soundscapes dominated by piano and singing bowl, enhanced by granular synthesis. The development brings a dynamic interplay of vocals, bird whistles, and harmonica, processed through randomization modules. The climax builds dense textures with complex layering of synthesizers and acoustic instruments, orchestrated through sequencers and effects. Finally, the resolution presents minimalistic textures featuring the ocarina and kalimba, offering a meditative conclusion. This structural approach showcases the depth of experimentation possible with VCV Rack in creating hybrid soundscapes.

Conclusion

The experimental composition Singkuh is a groundbreaking exploration of sound, merging traditional acoustic instruments with modern modular synthesis technology. Rooted in the Balinese philosophy of "singkuh," which emphasizes the "strange" or "unusual," the work redefines the boundaries of conventional music through a seamless integration of diverse sonic elements.

By leveraging VCV Rack as the core technological platform, Singkuh transcends the limitations of traditional instrumentation. The software's capabilities—such as real-time modulation, granular synthesis, and advanced signal processing—transform the textures of familiar instruments like piano, harmonica, and singing bowls into entirely new auditory experiences. The composition goes beyond technical innovation, fostering a

dialogue between acoustic and electronic soundscapes, where human expression (e.g., vocals) interacts dynamically with digital unpredictability.

Through a methodical process inspired by the Art Consortium's creative stages, Singkuh not only achieves its artistic vision but also sets a framework for future experimental works. Its success demonstrates the potential of modular synthesis tools like VCV Rack to serve as both a compositional aid and an educational platform for exploring sonic possibilities. This fusion of technology and artistry contributes to the broader discourse on contemporary music, offering insights into how traditional and modern elements can coexist to create transformative auditory experiences.

Singkuh serves as an invitation to musicians, educators, and technologists to delve deeper into the intersection of acoustic and electronic sounds. It encourages the continued exploration of modular synthesis as a medium for artistic innovation and emphasizes the enduring relevance of cultural philosophies in shaping modern art. The work inspires not only new compositions but also a deeper understanding of the limitless potential of sound in reshaping our auditory world.

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