



# Human-AI Co-Dancing: Evolving Cultural Heritage through Collaborative Choreography with Generative Virtual Characters

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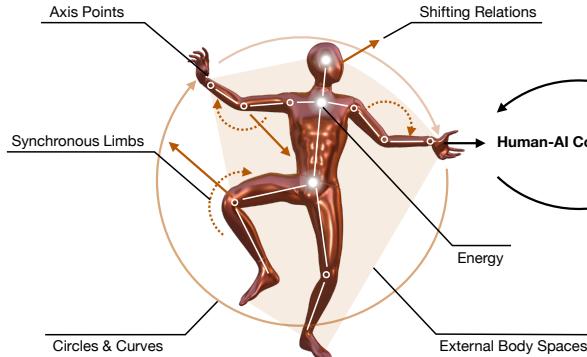
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Thai Traditional Dance Knowledge  
“Mae Bot Yai”



**Virtual Dancer with Choreographic Intelligence**  
Based on Traditional Knowledge



Human Dancer

**Figure 1:** The overall concept of "Human-AI co-dancing" involves human dancers interacting with virtual partners powered by a computational model derived from Pichet Klunchun's No. 60 choreographic principles, which are based on the Thai traditional dance knowledge of Mae Bot Yai.

## ABSTRACT

This research introduces an approach for translating traditional dance knowledge into interactive computational models extending beyond static dance performance recordings. Specifically, this paper presents the concept of "Human-AI co-dancing," which involves integrating human dancers with virtual dance partners powered by models derived from dance principles. To demonstrate this concept, the research focuses on the choreographic principles deconstructed from the knowledge of traditional Thai dance. The principles are

analyzed and translated into computational procedures that dynamically manipulate the movements of a virtual character by altering animation keyframes and the motions of individual joints in real-time. We developed an interactive system that enables dancers to improvise alongside the virtual agent. The system incorporates voice control functionality, allowing the dancer, choreographer, and even the audience to participate in altering the choreography of the virtual agents by adjusting parameters that represent traditional Thai dance elements. Human-AI rehearsals yielded intriguing artistic results, with hybrid movement aesthetics emerging from the synergy and friction between humans and machines. The resulting dance production, "Cyber Subin," demonstrates the potential of combining intangible cultural heritage, intelligent technology, and posthuman choreography to expand artistic expression and preserve traditional wisdom in a contemporary context.



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## CCS CONCEPTS

- Human-centered computing → Human computer interaction (HCI); Systems and tools for interaction design; Collaborative and social computing systems and tools;
- Applied computing → Performing arts; Media arts; Fine arts.

## KEYWORDS

Human-AI Interaction, Computer-generated choreography, Virtual Agent, AI-generated Character, Cultural Computing

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## 1 INTRODUCTION

Dancing exists as a living form of cultural heritage [3, 38], with choreographic knowledge transmitted between bodies across temporal bounds. Tacit encodings of movement vocabularies are continuously expanded through improvised moments that connect traditional forms with new explorations. Recent developments in motion capture technology have enabled the digitization of traditional dance movements, providing a means to preserve this intangible heritage [36, 41, 62, 63, 63, 75]. While the digitization approach can preserve the visual form of dance, the deeper layers, including the tacit knowledge and improvisational techniques, remain frozen in time rather than flourishing as living practices.

This research introduces an approach to computationally formalize traditional dance knowledge as an interactive model [53, 58, 69] that extends beyond a mere static recording of a dance performance. Specifically, this paper presents the idea of "Human-AI co-dancing," which involves combining human dancers with virtual dance partners powered by computational systems derived from dance principles. We refer to this model as a form of "artificial intelligence" system because it aims to encode the "choreographic intelligence" of traditional dances into a computational model capable of responding and choreographing with human dancers in real-time. We acknowledge the importance of non-Western knowledge systems that are often overlooked in the colonial understanding of AI [1, 16, 51, 83]. To demonstrate this concept, a multidisciplinary team of researchers developed a Human-AI system based on the "No. 60" principles established by the Thai choreographer Pichet Klunchun. These principles are derived from the deconstruction of the traditional Thai traditional dance known as "Mae Bot Yai" [74]. The researchers analyze the six choreographic principles of No. 60 and create corresponding computational procedures to manipulate a virtual character's movements, simulating the effects of the principles. These procedures aim to replicate the effects of the choreographic principles on the virtual character. The system allows the dancer to interrogate the principles by calling upon them. This paradigm enables present-day practitioners to creatively and respectfully interact with computational manifestations of ancestral choreographic knowledge.

Rehearsals and live performances highlighted artistic synergies between human and machine as both familiar dance movements and novel aesthetics intersected within an imaginative vision of posthuman choreography [4, 28, 43], expanding out from its traditional roots and advancing the research in computational choreography [14, 48, 53, 65, 67, 69]. This paper discusses both conceptual visions and technical developments behind the system. By bridging the creative possibilities of computation with the accumulated wisdom woven into traditional movement vocabularies, this research cultivates a form of dance that unites the past and future, as well as the human and the machine, as shown in Figure 1.

### 1.1 Cultural Context

Contemporary dance performances in Southeast Asia have been experiencing growing recognition and appreciation, as evidenced by increasing audience engagement. Choreographers across the region have gained greater visibility due to their diverse artistic forms of expression, which are informed by rich cultural backgrounds. A notable aspect of this contemporary dance scene is that many of its pioneers and practitioners began their creative journeys within the context of local traditions or folk dance practices. These artists have skillfully expanded upon long-standing movement traditions unique to Southeast Asia, incorporating new elements and techniques to create distinct contemporary forms [54]. A prominent choreographer from Southeast Asia who has inspired this research is Pichet Klunchun. Renowned as a contemporary Thai dancer and choreographer, Klunchun is celebrated for his reinterpretation of traditional Thai dance into modern performances. Among his notable works are "I Am a Demon" (2005), "Pichet Klunchun and Myself" with Jérôme Bel (2006) [6, 17, 44], "Nijinsky Siam" (2010), "Black and White" (2011), and "Dancing with Death" (2015) [54, 73].

In 2017, Klunchun and his dance company embarked on a project titled No. 60, which sought to encapsulate two decades of Klunchun's research and artistic praxis within Thailand's classical dance tradition. The project was centered around Klunchun's deconstruction of the fundamental set of 59 interconnected poses and movements known as Mae Bot Yai (the "Greater Fundamentals") or "Theppanom," with the latter term denoting the inaugural posture within the sequence. This repertoire of poses and movements constitutes the foundational core curriculum imparted to all students of Thai traditional dance [73].

The mastery of the Theppanom, and the other Mae Bot Yai fundamentals enables dancers to execute the demanding choreography and movements of Khon [42], a Thai classical court masked dance with a history spanning centuries. Khon performances enact the Ramakien, the Thai rendition of the Ramayana epic. The Mae Bot Yai fundamentals, as shown in Figure 2, comprise highly stylized and codified gestures and body positions derived from Indian dance traditions as well as Thai culture, including movements with symbolic hand gestures, graceful walking patterns, and varied arm positions. Additionally, Khon features distinctive footwork and lower body movements such as circular stepping patterns, fluid knee movements, and rhythmic stamping actions. Other characteristics are elaborate hand and finger movements like intricate finger curls and stylized finger poses. There is also coordinated isolation and articulation of various body parts, muscles, and joints to create flowing,

lyrical motions while maintaining firm stances. Dancers employ techniques like shifts in body weight, controlled torso movements, and the integration of arm and leg actions. Fundamental to executing the Mae Bot Yai properly is achieving smooth transitions between poses and an unbroken continuity of movement.

## 1.2 No. 60 & the Deconstruction of Thai Dance

Klunchun deconstructed the embodied knowledge within the Mae Bot Yai, the fundamental poses underlying Thai traditional performance. He created diagrams and annotations analyzing the 59 constituent movements and postures to catalyze a reimagining of classical Thai dance from a novel perspective. This approach offers an introduction to Thai dance that is free from mythological or ideological influences. Through meticulous movement analysis, Klunchun sought to extract choreographic principles from the Mae Bot Yai fundamentals and gain new insight into their possibilities. His work aims to deconstruct and reassemble the elements of traditional vocabulary, creating innovative combinations that could revitalize the form.

Klunchun has uncovered six choreographic principles, as shown in Figure 3, from Mae Bot Yai through his analysis, which are demonstrated in his recent work No. 60. The work aims to reimagine a hypothetical 60th movement, outside of the traditional 59 movements in Mae Bot Yai, through a re-synthesis of the principles. The six principles include Energy, Circles & Curves, Axis Points, Synchronous Limbs, External Body Spaces, and Shifting Relations. Here are explanations for the six elements distilled from the analysis of the Mae Bot Yai fundamentals:

- **Energy** - Exploring the dynamic quality and vitality of the movement and dance phrases. Looking at aspects like force, momentum, acceleration/deceleration.
- **Circles & Curves** - Examining the circular pathways, arcs, and curved lines that the body makes in space. Analyzing rounded versus linear patterns.
- **Axis Points** - Considering points on joints and segments of the body that serve as axes of rotation and balance. Identifying the key pivot points around which motion occurs.
- **Synchronous Limbs** - Analyzing the coordinated movement between different limbs, sides, or parts of the body. Looking at synchronous versus asynchronous body movements.
- **External Body Spaces** - Exploring the spatial patterns, geometry, and relationships between the body and environment. Observing the directions, planes, and dimensions moved through.
- **Shifting Relations** - Investigating how transitions between movements and poses direct audience attention and focus to different body parts and actions. Analyzing how progressions from one form to another create a seamless flow.

The pursuit led Klunchun to view the elements he discovered through his analysis of the Mae Bot Yai as valuable tools for generating improvisational abilities, not only for dancers familiar with the Thai tradition but also for those without any experience or knowledge of Thai dance [73]. This perspective opens up possibilities for exploring these elements through a computational lens using technology, as depicted in Figure 4.

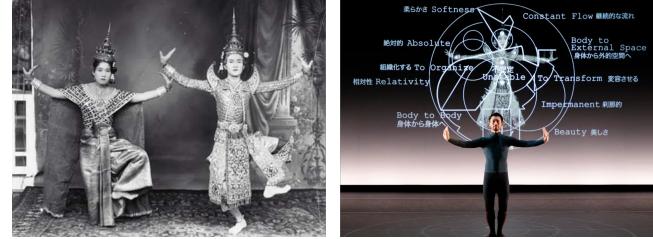


Figure 2: Left: Mae Bot Yai, the fundamental poses underlying Thai traditional dance. Right: No. 60 by Pichet Klunchun, which deconstructed the embodied knowledge within the Mae Bot Yai.

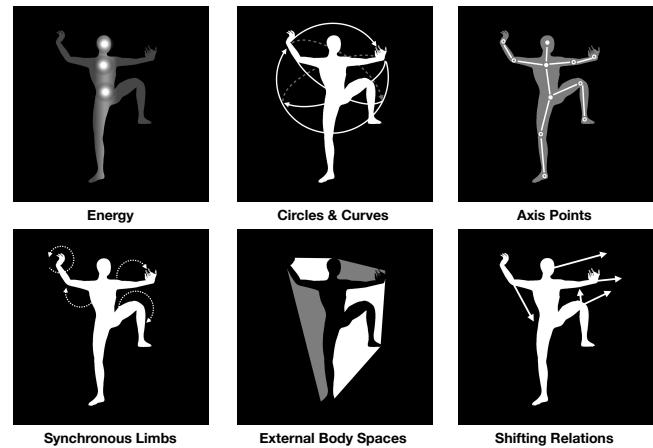
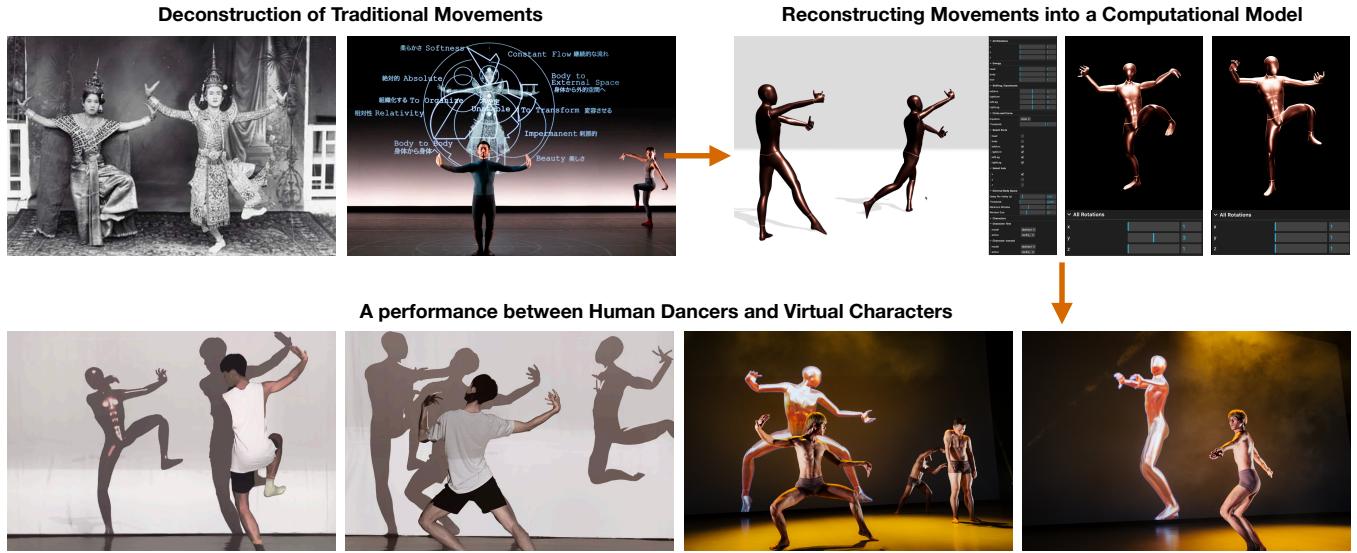


Figure 3: The six principles deconstructed from Thai traditional movements include Energy, Circles & Curves, Axis Points, Synchronous Limbs, External Body Spaces, and Shifting Relations.

## 1.3 Technology and Choreography

The integration of technology in dance has its roots in Merce Cunningham's groundbreaking use of 3D computer graphics to create choreography [70, 71], as well as the Bauhaus Ballet's influence on applying geometric and mathematical concepts to the human body and movement [8, 68, 79, 81]. Over time, computational choreography [18, 19, 46, 47, 53, 67, 69] has progressed alongside developments in virtual theatre environments [26, 29, 30], virtual agents and 3D avatars [2, 5, 7, 10, 20, 22, 23, 31, 52, 77], wearable computing [45, 56, 66, 80], motion capture and annotation technologies [11, 34, 39, 57, 64, 72], human-computer interaction techniques [12, 15, 21, 25, 37, 40, 48, 61, 84, 85], and, more recently, the emergence of generative AI models [13, 32, 49, 50, 59, 78, 82, 86].

This research presents an approach to advancing Thai traditional dance through computational choreography. The model encapsulates the Mae Bot Yai fundamentals, allowing human dancers to co-create performances and develop new choreography with a virtual dancer that embodies the intelligence of traditional choreographic knowledge.



**Figure 4: Conceptual framework of Human-AI co-dancing.** The process involves deconstructing traditional dance movements and reconstructing them into a computational model. This enables a collaborative performance between human dancers and virtual characters, where the AI system generates dance movements that complement and respond to the human dancer's actions in real-time.

## 1.4 Artistic Concept

The fundamentals of Mae Bot Yai are traditionally used to depict the Ramakien [9, 33, 60], a significant work of Thai literature based on the ancient Indian epic, the Ramayana. One passage in the Ramakien that has inspired this work depicts the demon king Thotsakan (known as Ravana in India) struggling with haunting visions in his dreams. Bibhek, Thotsakan's brother and a shaman, interprets these dreams as omens of impending apocalyptic battle that threatens to destroy the demonic realms. Enraged by Bibhek's interpretation, Thotsakan expels Bibhek from the kingdom, pushing him to become an ally with Prince Rama, which eventually results in Thotsakan's demise.

The cautionary tale of heeding a premonition holds significant relevance in the contemporary era. The story of Bibhek, who fore-saw the destruction of the demons, serves as a powerful metaphor for the potential threat AI poses to human artistic creativity and spirit. Instead of casting aside this complex, perilous vision, this project proposes an alternate path where humans could have a symbiotic relationship with machines, cultivating a novel form of contemporary dance. In this project, the artist's dream presents a glimpse of how tradition can thrive in the contemporary world, where machines, humans, legends, and myths intermingle. Just as Bibhek's unheeded warnings proved, valid, prophetic dreams of posthuman choreography begin materializing through peaceful machine kinships rather than destructive rejection.

## 2 METHODOLOGY

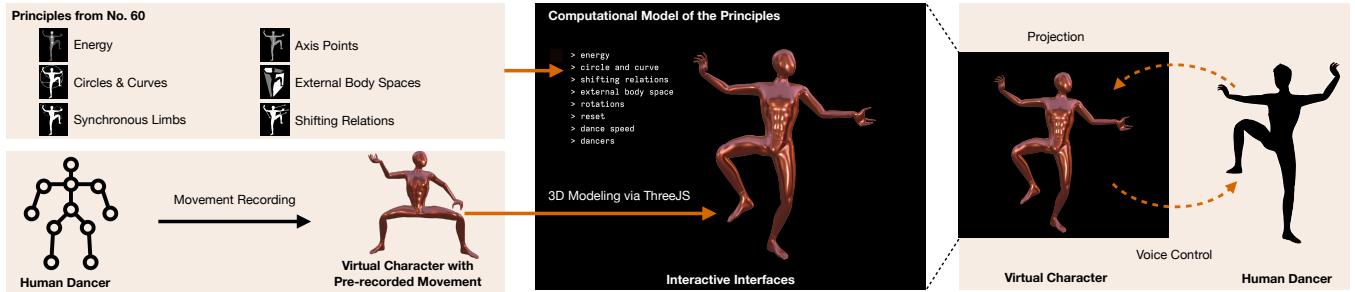
This research formalizes Thai traditional dance knowledge as interactive computational models, enabling human dancers to co-create performances and develop novel choreography with virtual dancers embodying traditional choreographic intelligence, as demonstrated

in Figure 5. The development process, involving interdisciplinary collaboration between technologists, choreographers, and dancers, consists of four major stages:

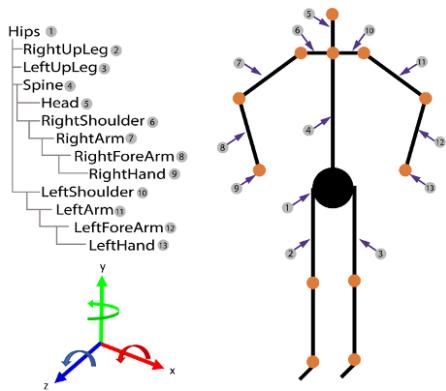
- (1) **Capturing Movement Data:** The creation of a virtual character begins with capturing a human dancer's movements through motion capture technology. This step provides the foundational movements for the virtual character, which the computational model can then modulate and modify to generate novel choreography.
- (2) **Encoding Choreographic Intelligence:** Building an AI model involves translating principles from traditional dance knowledge into a computational process that manipulates and transforms the captured movement data of the virtual character. This model equips the virtual character with the choreographic intelligence derived from traditional dance.
- (3) **Interface Development & System Integration:** Integrating the model and virtual character into an interactive interface that allows the dancer, choreographer, and audience to control various aspects of the system. This interface supports real-time, responsive, and improvisational co-creation through voice control, enabling users to dance alongside the virtual agent.
- (4) **Rehearsing Human-AI Co-dancing:** Collaborative performances and exercises utilizing this technology explore new choreography through human-AI interaction. These endeavors act as an experimental research platform for the future of dance.

### 2.1 Capturing Movement Data

Creating a virtual character involves capturing the movements of a human dancer using motion capture technology, specifically



**Figure 5:** Technical pipeline of the project consists of 4 major processes: 1) Capturing movement data, 2) Encoding choreographic intelligence, 3) Interface development & system integration, and 4) Rehearsing Human-AI co-dancing.



**Figure 6:** Capturing traditional Thai dance movements using motion capture technology. The process involves attaching sensors from the Perception Neuron suit to 17 primary axis points on a dancer's body.

through Axis Studio and the Perception Neuron suit. This process requires attaching sensors to the dancer's body, which track the position of each joint and limb in 3D space, as shown in Figure 6. The capture focuses on 17 primary axis points on the human body as the dancer performs 59 signature poses from the traditional Thai dance repertoire. This generates a robust library of movements that reflect the techniques of a skilled dancer. The sensor data is recorded and processed to construct a .BVH data file. The captured data is then mapped onto a virtual character by aligning the .BVH file to the virtual model's skeleton. The final result is a 3D virtual character that embodies the traditional Thai dance movements captured by the human dancer. These movements provide the basis for the virtual character, which can then be further manipulated by computational models to create new choreography.

## 2.2 Encoding choreographic intelligence

This step integrates traditional dance principles and techniques into a model composed of computational procedures that serve as adjustable parameters to alter movement data in the virtual characters. Building this model requires a thorough analysis of the six choreographic principles of No. 60: Energy, Circles & Curves, Axis Points, Synchronous Limbs, External Body Spaces, and Shifting

Relations. The research team then creates corresponding generative computational procedures to manipulate the virtual character by dynamically adjusting animation keyframes and modifying specific joint movements using TypeScript. These generative procedures aim to replicate the impact of the choreographic principles on the virtual character. This method enables the system to create new movement possibilities while preserving the core essence of traditional dance vocabulary. Here are the algorithmic procedures that represent the six choreographic elements:

- **Energy** - This principle represents the dynamic range of motion in different parts of the body over time, which is important to the aesthetics of Mae Bot Yai, such as the unique knee movements and rhythmic stamping actions. To computationally model energy, the algorithm scales the timing of the different groups of the limb's animation keyframes to increase or decrease the velocity of each individual part's movements, resulting in a variation of movement speed across the bodies.
- **Circles & Curves** - This principle represents the circular and curved movement trajectories with rounded rather than linear pathway transformations, which make the Mae Bot Yai dance fluid, graceful, and pleasing to watch. To computationally model this principle, we apply mathematical equations to the rotational quaternions of the limb's animation keyframes, such as a Gaussian smoothing filter, derivatives, low-pass, and high-pass filters. This results in an increase or reduction of curvature in the movement.
- **Axis Points** - This principle represents key pivot points and body segments, which serve as the reference points for hand movement. The hand points towards this reference point, creating elaborate hand and finger gestures in Mae Bot Yai. To computationally model this principle, the algorithm applies inverse kinematics and smooth linear interpolation to gradually interpolate the position and rotation of arm and leg limbs towards the core axis points. The original movement is altered to gravitate towards the core skeletal axes points.
- **Synchronous Limbs and Shifting Relations** - These two principles represent opposing qualities in Mae Bot Yai, where synchronous limbs create synchronous bodily movement

across the body, and shifting relations create an asynchronous movement that draws the audience's attention to specific body parts. To model these principles, the algorithm applies timing offsets to the individual limb's animation keyframe to de-synchronize the limb movements from the original movement. While the original movement is often mirrored and synchronized due to the nature of the dance, the resulting movement becomes more independent and uncoordinated.

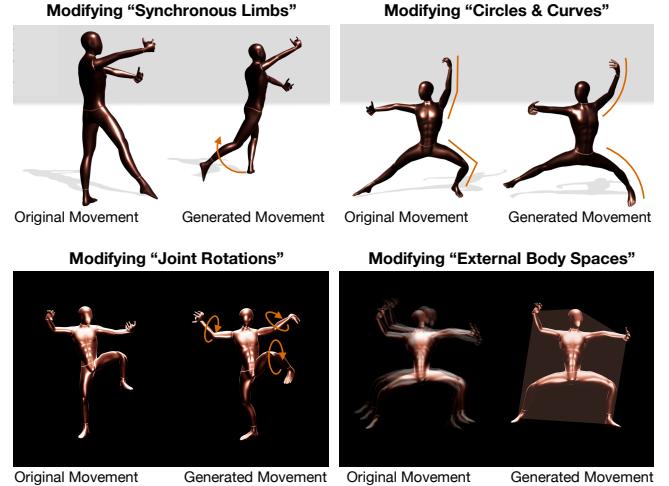
- **External Body Spaces** - This principle represents the negative geometric shapes outside the body that create beauty in Mae Bot Yai. In order to computationally model this principle, the algorithm detects transition signals between sequence positions to slow down the movement and influence the audience to see the negative space in the frozen pose. The algorithm identifies the movement sequences containing minimal rotational changes and then extends the timing of the animation keyframe for those sequences to pause the movement. The resulting movement highlights the external spaces around and within the dancer's body.

Additionally, outside of the six principles derived from Mae Bot Yai, we have introduced additional parameters such as **Joint Rotations**. This parameter allows the algorithm to manipulate the virtual character's joint angles and orientations. In reality, a dancer's joint rotation is restricted by their own physical capability. However, in the realm of the virtual, such restrictions are obviated. By experimenting with the joint rotations, we can create new, novel body configurations for the virtual character, enabling movements that would ordinarily be impossible in reality. This expansion into possibilities that transcend physical constraints deepens the dance vocabulary of the virtual character and further heightens the creative scope of the system.

The developed model features a set of adjustable parameters that embody the principles of No. 60. These parameters can be modified by both performers and spectators, allowing for exploration of how a given principle affects a specific movement. When a parameter is set to 0%, the virtual character performs the original dance move without incorporating the principle. On the other hand, setting the parameter to 100% significantly alters the character's movements, fully integrating the specified principle. The model allows for flexible use of these elements, either individually or in combination, and can be applied to the whole body or specific body parts. This versatility makes it a valuable tool for studying the dynamics of motion and the impact of various algorithmic procedures. Figure 7 depicts the example outcomes of applying the principles to dance movement.

### 2.3 Interface Development & System Integration

The responsive user interface is developed with the Vue.js framework. The virtual character is rendered and integrated into a 3D environment using the Three.js library. The interface supports voice recognition, allowing users to issue spoken commands to control the character's movements. Choreographic elements are accessible via dropdown menus, where users can, for example, select "Energy" and then specify details such as which body parts to modify, as



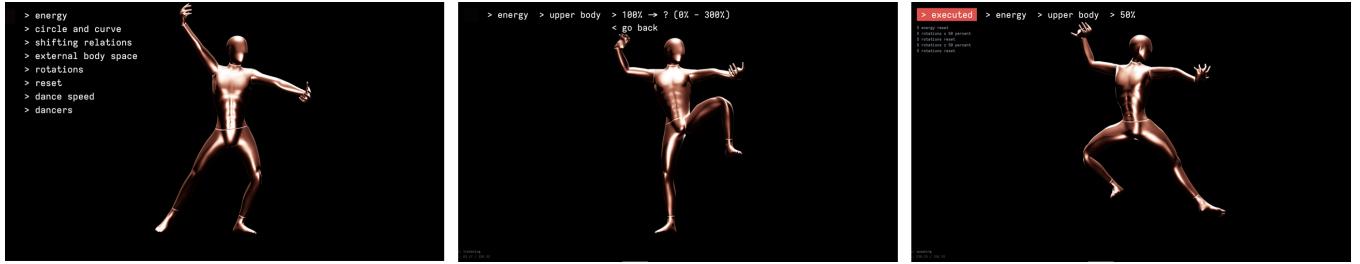
**Figure 7: Modification of pre-recorded motions using the computational model:** Top left: Altering the "Synchronous Limbs" principle misaligns leg and body motions; Top right: Modification of the "Circles & Curves" principle creates more curved movements; Bottom left: Changing joint rotations generates a new body configuration; Bottom right: Alteration of the "External Body Spaces" principle slows movements at peaks to better depict the body's external spaces.

illustrated in Figure 8. Additionally, slider controls provide fine-tuned parameter adjustments, while timeline widgets enable the visualization of movement sequences. Human dancers can observe the character's live animated responses, facilitating an improvisational, call-and-response interaction during the performance. The interactive interface is projected on a screen, allowing the dancer to interact with the virtual character in real-time. This real-time interactivity promotes creative experimentation between the human and virtual dancer, leading to the co-development of innovative choreography that merges tradition and technology.

### 2.4 Rehearsing Human-AI Co-dancing

To investigate the creative potential of Human-AI co-dancing, we organized a two-week workshop involving technologists, choreographers, and dancers. The workshop integrated rehearsals, reflection, and technological development to delve into computational choreography, merging tradition with technology. During these sessions, the human dancers and virtual characters engaged in improvisation, reacting to each other's movements. The performance could be adjusted using voice commands or interface controls. The dancer channeled their traditional vocabulary while the virtual character exhibited new responses generated algorithmically from traditional choreographic knowledge.

Different interaction methods were explored to enable co-dancing with the virtual character in real-time. In the "Direct Control mode," the dancer could activate computational procedures by voicing specific principles and providing immediate feedback during the dance. In the "Mediated Mode," another dancer or choreographer adjusted the parameters in real-time, allowing for more intricate



**Figure 8:** The interface allows users to control character movements through spoken commands and access choreographic elements via dropdown menus. Upon selecting an element, such as "Energy," the interface displays further options to modify specific body parts. The system then generates new choreography accordingly.

commands without hindering the primary dancer's movements. The most intriguing results emerged from the impromptu "Audience Control mode," where viewers changed the movement of the virtual character mid-performance, allowing for emergent collective choreographic interventions.

During co-creation exercises, the human dancers were challenged to intentionally resist, embrace, or conceptualize contrasting responses to the virtual agent's generative dance offerings. Attempts to harmonize with machine-generated interpretations opened spaces of synergy, where hybrid vocabularies organically arose from fusions of traditional principles and synthetic outcomes. Alternately, foregrounding moments of rupture, friction, and opposition highlighted the technology's non-human quality against the dancer's physicality. This fluid spectrum between resonance and dissonance highlights the complex interplay between humans and AI. The emerging choreographic process points to the rich potential for developing future posthuman performances [4].

The virtual character was rendered at multiple scales during experimentation to explore its impact. When visualized at a one-to-one proportionality with the human dancer, it conveyed a deeper sense of direct dialogue and similarity. Conversely, enlarging the avatar to heights beyond the human scale emphasized its digital nature, creating a more towering, transcendent presence. These scale variations influenced the perceived role and semantics of the virtual character during the performances in intriguing ways.

Additionally, we simulated scenarios involving two virtual characters representing different aspects of our experiment. One virtual character maintained an unaltered choreography, serving as a baseline. In contrast, the second virtual character represented the generated choreography, acting as a contrasting variable. This juxtaposition provided valuable insights into how shifts in movement presentation affect viewer perception and interaction. The approach offered a multi-dimensional perspective on the relationship between human dancers and virtual counterparts.

After the workshop, the culmination of this research was the dance production "Cyber Subin," co-created by Pichet Klunchun and Pat Pataranutaporn, which debuted at the National Theatre in Taiwan in March 2024, as shown in Figure 9. By seamlessly coupling human creativity with AI-generated choreography, this work not only expands the boundaries of artistic expression but also fosters a deeper appreciation and understanding of traditional knowledge within a contemporary context.

### 3 DISCUSSION

As the human dancer physically challenges, resists, follows, and improvises with the virtual dance partner's computational interpretations of traditional dance vocabularies, intriguing frictions arise that highlight each intelligence's distinct perspectives and capabilities. This dynamism suggests rich questions around autonomy, influence, control, and co-dependence as humans and virtual agents entangle through points of resonance and dissonance. Such interplay prompts vital discourses on the essence of the human spirit and freedom when choreographically coupled with non-human outputs operating in the same social and cultural space.

The influence of the machine on the dancer and the dancer's influence on the machine, forming a cybernetic loop [27, 35, 76], prompts the inquiry into the future of human creativity. It provokes the question of how human-machine assemblage could be more than the sum of its parts. What role does technology play in re-animating wisdom from the past? How can integrating diverse epistemologies [51, 83] into computational systems counteract humanity's potential homogenization and preserve experiential heterogeneity amidst rapid technological change?

Situating this research within the concept of "experimental preservation" offers an alternative approach to safeguarding cultural knowledge [24, 55, 58]. Unlike traditional preservation methods that often present culture as a static and lifeless object, experimental preservation acknowledges culture as a living, evolving phenomenon that belongs to everyone. By democratizing cultural knowledge, such as traditional dance, through technology, this approach could foster a sense of ownership and connection to ancestral heritage for future generations. Ultimately, this paper presents an imaginative vision for the future of intangible cultural expressions through the fusion of dance, data, code, and culture.

### 4 LIMITATIONS AND FUTURE WORK

The Human-AI co-dancing paradigm introduced in this study highlights the role intelligent systems can play in preserving living cultural knowledge through continuously evolving artistry, extending beyond the bounds of tradition. We address the limitations of static digitization approaches by demonstrating rich interactive capabilities. However, there are limitations to consider and areas for future exploration. The current system focuses on a specific dance tradition and choreographic principles of a single artist. Future work should expand to encompass a wider range of dance



**Figure 9: Photographs from the performance "Cyber Subin," co-created by Pichet Klunchun and Pat Pataranutaporn, which debuted at the National Theatre in Taiwan in March 2024.**

styles, cultural traditions, and choreographic knowledge from diverse artists and regions to create a more comprehensive repository of dance heritage.

Secondly, future research could investigate modern machine learning techniques and generative AI models to enable the system to generate novel movements and sequences based on learned principles, leading to more creative choreographic possibilities. However, this approach may introduce challenges, such as the AI system becoming a "black box," making it difficult to understand how the generated movements relate to the original choreographic principles. This lack of interpretability could be problematic for traditional dance forms, where cultural heritage and meaning are crucial. Ensuring transparency and explainability is important for maintaining the integrity and authenticity of the dance tradition. Furthermore, the limited availability of high-quality datasets for traditional dance forms may hinder the development of robust machine learning models.

Finally, to fully understand the implications of this approach, it is crucial to conduct long-term studies and evaluations that assess the cultural impact and acceptance of Human-AI co-dancing within various dance communities. Engaging with a diverse range

of stakeholders, including dancers, choreographers, cultural heritage experts, and audiences, will be essential to ensure that the technology is developed and applied in a manner that is culturally sensitive, respectful, and beneficial to the communities it serves.

## 5 CONCLUSION

In conclusion, the Human-AI co-dancing paradigm presents a novel approach to preserving and extending traditional dance knowledge through the integration of human dancers and virtual dance partners. By deconstructing the choreographic principles of Thai traditional dance and translating them into computational procedures, the developed interactive system allows for the real-time synthesis of virtual characters' movements. The incorporation of voice control functionality further enhances the participatory nature of the system, enabling dancers, choreographers, and even audiences to contribute to the choreography of the virtual agents. This work highlights the importance of non-Western cultural knowledge systems that are often overlooked in modern perspectives on AI. The developed system facilitates emergent choreographic dialogues between the past, present, and future of this art form.

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