

# Dancing with(in) Your Body Cosmos

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## Introduction

Throughout history, dance is acted as a tangible reflection of the Everywhen concept, linking our past memories, current emotions, and future aspirations. Dance stands as a powerful conduit for emotion and expression, with each movement encapsulating complex internal dynamics[2]. For a dancer, a deep understanding of the interplay between his/her body, movements, emotions, and the external environment is crucial to fully realize the essence of their performance. However, many dancers, in his/her quest for this understanding, remain unaware of the intricacies of their bio-data, including parameters like brainwave. This data, often unseen, constantly evolves, providing a mirror to their cognitive and emotional states.

Recent advancements in technology, combined with interdisciplinary collaborations, have broadened the scope in this area. The interplay between dance and cognitive neuroscience has facilitated a partnership between artists and scientists, aiming to decode the nuanced layers of human experience and expression[6]. Within this synergy, neurofeedback has become increasingly relevant. It offers a lens into the brain's operations and the heart's patterns, granting dancers an intimate connection to their own internal states in real-time[1]. The advent of EEG devices and visualization technologies now makes it possible to render these internal dynamics, giving birth to the "Bio-body", a digital representation that mirrors a dancer's physiological state and body movements.

"Dancing with(in) Your Body Cosmos" emerges at this intersection of dance, technology, and cognitive science, building upon our foundational work "Body Cosmos. [3]" This project introduces the "Bio-Body [3]," a dynamic, digital representation of a dancer's inner state, visualized in real-time through the integration of EEG, motion capture, and Unreal Engine 5. Offering two distinct interactive experiences—"Dancing within your Body Cosmos" and "Dancing with your Body Cosmos"—this artwork propels dancers into uncharted territories of self-exploration and expression. The former immerses dancers in a digital landscape of their physiological state, while the latter creates a bio-digital mirror, enhancing performance and introspection through interactive feedback. Aimed at exploring dancers' aspirations to transcend physical movement and achieve higher awareness and unity, we conducted a workshop with 20 dancers to exam-

ine if interactions with a bio-cosmic environment and engagement with bio-data could enhance their universe connection and deepen body-mind awareness, facilitating an externalization of their inner selves.

## Dancing with(in) Your Body Cosmos

The "Dancing with(in) Your Body Cosmos" features two modes of interaction: "Dancing within your Body Cosmos" and "Dancing with your Body Cosmos". Each mode offers a unique experience, merging the realms of dance and digital representation through cognition and creativity.

### Dancing Within Your Body Cosmos

"Dancing within your Body Cosmos" is an immersive mode that allows dancers to metaphorically enter and explore their own physiological landscapes (Figure 1). This mode utilizes a specialized camera path to navigate through a digitally reconstructed bio-body, providing a unique perspective of the dancer's internal state.

Equipped with an EEG headband and heart rate sensor, the dancer's internal states, encompassing cognitive focus and emotional responses, are continuously monitored. The biometric data thus collected dynamically influences the visualizations displayed on a curved LED screen. This immersive setup encapsulates the dancer within their own physiological universe, creating a feedback loop where internal states directly shape the visual experience. This interaction is a reflection of embodied cognition, where the body's interactions influence cognitive processes [5], and an exploration of the interconnectivity between mind, body, and digital expression.

### Dancing with Your Body Cosmos

In contrast, "Dancing with your Body Cosmos" focuses on external interaction (Figure 2). In this mode, dancers engage with a digital counterpart — a bio-body that mirrors their movements along the Z-axis. However, this mirroring goes beyond simple reflection; it involves complex, responsive interactions where the bio-body dynamically reacts and adapts to the dancer's movements and internal states in real-time.

This interaction blurs the lines between the dancer and the digital entity, creating a dialogue rather than a mere mimicry. It challenges traditional dance boundaries, encouraging dancers to view their bio-body as a collaborative partner or an extension of their physical self. Inspired by the



Figure 1: Dancing within your Body Cosmos

concept of "extended cognition" [4], this interaction suggests that cognitive processes encompass both the body and its environment.

The underlying technology, encompassing real-time motion capture, biometric sensing, and digital rendering, seamlessly melds the dancer's physical movements with the digital response, illustrating an integration of the tangible and virtual realms.

### The Dancing Workshop

Building upon the innovative features of "Dancing with(in) Your Body Cosmos," the workshop designed around this system was crafted to explore the practical applications and experiences of dancers interacting with their bio-digital counterparts.

#### Workshop Overview

The workshop convened a diverse group of 20 dancers, ranging from professionals to enthusiasts, to engage deeply with both modes of interaction offered by "Dancing with(in) Your Body Cosmos": "Dancing within your Body Cosmos" and "Dancing with your Body Cosmos". The primary objectives were to:

**Enhance Connection with the Universe:** By immersing dancers in their own physiological landscapes and allowing them to interact with a digital mirror of their movements, the workshop aimed to deepen the dancers' connection with the broader universe, reflecting on how bio-data can amplify this experience.

**Amplify Body-Mind Awareness:** Through direct engagement with bio-data visualizations, the workshop sought to heighten dancers' awareness of the intricate connections between their physical movements, emotional states, and cognitive processes.

The workshop was structured to allow participants to experience both modes through guided sessions, followed by open exploration periods where dancers could freely interact with the technology. Initial sessions were designed to familiarize dancers with the equipment, including EEG headbands and heart rate sensors, and to introduce them to the concept of bio-digital interaction.

Participants then engaged in "Dancing within your Body Cosmos" sessions, where they explored their internal bio-data landscapes through immersive visualizations. This was followed by "Dancing with your Body Cosmos" sessions, focusing on external interactions with their bio-digital counterparts.

#### Insights and Reflections

Feedback and observations from the workshop highlighted several key insights:

**Enhanced Self-Awareness:** Dancers reported a heightened awareness of their internal states, noting that the visual and interactive feedback helped them tune into subtle emotional and cognitive shifts.

**Creative Exploration:** The technology fostered a new dimension of creativity, with dancers experimenting with how their movements and internal states could alter the digital



Figure 2: Dancing with your Body Cosmos

landscape. This exploration opened up new avenues for performance and choreography.

Collaborative Interaction: Viewing the bio-body as a collaborative partner, rather than a tool, shifted the dancers' perception of their performance. This partnership encouraged a deeper dialogue between the physical and digital selves.

### Conclusion

In conclusion, "Dancing with(in) Your Body Cosmos" represents a step forward in the convergence of dance, technology, and cognitive science. By integrating real-time bio-data capture with the rich, expressive medium of dance, this initiative opens new avenues for artistic expression and self-exploration. The modes of interaction—"Dancing within your Body Cosmos" and "Dancing with your Body Cosmos"—provide dancers with an immersive, introspective experience that redefines the boundaries between the physical and digital realms.

The project lies in its ability to render the invisible visible, allowing dancers to engage with their physiological states in a tangible, dynamic form. This integration of biofeedback and dance enhances the dancers' awareness of their internal states and fosters a deeper understanding of the intricate bond between mind, body, and emotion. The real-time visualization and interaction with bio-data have the potential to transform the way dancers perceive their art form, encouraging a more introspective and responsive approach to performance.

### References

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