



WotaBeats: Avatar-based Rhythm Interaction Applied Wotagei in Virtual Reality Experience

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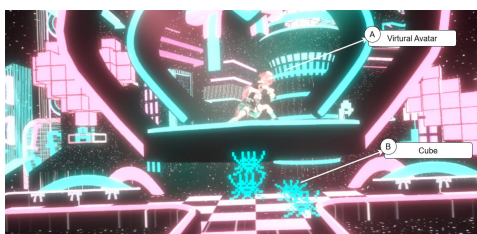


Figure 1: The system incorporates interactive block-hitting mechanics, decomposing dance movements into key actionable points. Users interact with these points by hitting virtual blocks, with accuracy evaluated to generate performance-based scores.

Abstract

This paper presents a novel interactive system that combines Wotagei culture and virtual reality (VR), with the aim of providing an immersive training platform for beginners and experienced dancers. Despite the growing popularity of Wotagei, current training resources are limited. To address this gap, the system integrates intuitive gaming elements from popular rhythm games, motion capture technology, and interactive virtual environments, facilitating effective learning. By leveraging VR's immersive capabilities, the system significantly enhances user engagement, providing a culturally authentic and accessible platform for mastering Wotagei.

CCS Concepts

• **Human-centered computing** → **Interaction paradigms; Virtual Reality;**

1. Introduction

In Japanese otaku and idol culture, audience engagement is vividly expressed through "Otagei," where fans use glow sticks to energetically support their idols during performances. This practice has evolved into "Wotagei," a choreographed performance art utilizing glow sticks, demanding precise timing, rhythmic coordination, and physical agility, presenting challenges for both novices and seasoned performers.

Despite its cultural significance and growing global interest, structured training resources for Wotagei are scarce, highlighting a critical gap in accessible training systems. The existing literature underscores the transformative potential of virtual reality (VR) to enhance cultural interactions and fandom experiences. Studies such as [YG20], [Lin08] and [Zho20] explore how fans interact with vir-

tual idols. These foundational works emphasize the importance of interactive engagement and immersive cultural exploration through VR technology.

Recognizing the absence of a specialized training system for Wotagei, our system aims to bridge this gap by developing a comprehensive interactive platform that combines advanced VR techniques with gamified learning approaches. This platform will cater to both beginners and experienced dancers, contributing to the preservation and popularization of this unique cultural.

2. Design and Implementation

This work aims to develop a comprehensive interactive platform that integrates advanced VR techniques with gamified learning ap-



Figure 2: Professional dancer preparing for motion capture to accurately translate Wotagei movements into virtual animations.

proaches. Our design synthesizes key interactive elements from three well-known rhythm games to enhance user engagement and facilitate learning.

2.1. System Overview

Immersive interaction inspired by *Kizuna AI - Touch the Beat!* [Gem20] creates a captivating environment for virtual idol interactions. This VR setting allows users to experience Wotagei dance movements from a first-person perspective. We captured professional Wotagei dance movements using motion capture technology, converting them into animations as shown in Figure 2. In addition, intuitive game mechanics derived from [DG23] enable users to quickly grasp and participate effectively in rhythmic interactions. Users are guided by virtual idol avatars demonstrating precise dance sequences. The system incorporates interactive block-hitting mechanics [ABQH22], breaking down dance movements into key actionable points (Cube) recorded in Unity’s world coordinates, as illustrated in Figure 1(B). Users interact with these points by hitting virtual blocks, with accuracy evaluated to generate performance-based scores.

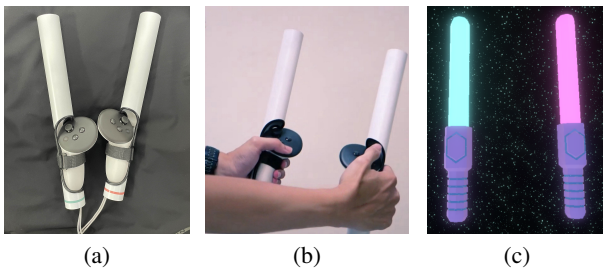


Figure 3: Customized controllers resembling glow sticks were constructed from PVC pipes with tactile coatings to enhance realism and provide haptic feedback. (a) Physical controller design, (b) demonstration of how the controller is naturally gripped by the player, and (c) the corresponding visual representation within the VR environment.

2.2. Software and Hardware

The system is developed using Unity version 2022.3.601f1 and the Meta XR All-in-One SDK, utilizing the Meta Quest 3 headset along with specially modified Meta Quest Plus controllers. These controllers are customized to mimic glow sticks, made from PVC pipes

coated with specialized finishes to enhance realism and tactile feedback, further enriching the user experience (see Figure 3).

3. Application: Wotagei Rhythm Game

Participants wear the Meta Quest 3 headset and use glow stick-shaped controllers, immersing themselves in a VR environment tailored for Wotagei performance training. Initially, they experience an immersive idol performance, followed by narrative-driven prompts that guide them to acquire virtual glow sticks and engage in interactive training sessions. Participants practice fundamental Wotagei movements through tapping, holding, and sliding interactions, similar to rhythm games. To advance, they must achieve at least 60 percent accuracy. The final phase includes a 30-second dance session for immediate application of learned skills, as shown in the demo video, complemented by clear step-by-step dance guidance to enhance the learning process.(see Figure 1).

4. Discussion and Future Works

This research contributes significantly to the intersection of cultural practice and immersive technology by addressing the absence of dedicated Wotagei training systems, although the game system is still early in development. The novel integration of VR and interactive gameplay elements fosters accessible professional-level training opportunities. Future developments will include structured user testing to evaluate system usability and learning outcomes, offering learners a comprehensive and progressive learning path. To enhance the system’s transparency and cultural relevance, we will document the mapping process of iconic Wotagei movements, such as Romance, to the system’s interaction logic and evaluation metrics. Moreover, to support Japanese idol culture and promote social interaction and collaborative learning within fan communities, This work also plan to incorporate a multiplayer online mode that integrates Virtual YouTubers (VTubers) and virtual idols into the game. Ultimately, our goal is importing more idol characters and promote them to further expand the community and enhance user engagement. This will contribute to creating a robust, immersive, and culturally enriched interactive training system.

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