



Celestial Blossom: A Collaborative, Meditative VR Journey of Fractal Art and Music

Pincun Liu
New York University
New York, USA
NYU Courant Institute of
Mathematical Sciences
New York, USA
pl2253@nyu.edu

Xiaoan Liu
New York University
New York, USA
xl5040@nyu.edu

Keru Wang
New York University
New York, USA
NYU Courant Institute of
Mathematical Sciences
New York, USA
kw2727@nyu.edu

Yushen Hu
New York University
New York, USA
yh3856@nyu.edu

Yi Wu
New York University
New York, USA
yw5759@nyu.edu

Zhu Wang
New York University
New York, USA
zhu.wang@nyu.edu

Agnieszka Roginska
New York University
New York, USA
roginska@nyu.edu

Ken Perlin
New York University
New York, USA
NYU Courant Institute of
Mathematical Sciences
New York, USA
kp1@nyu.edu

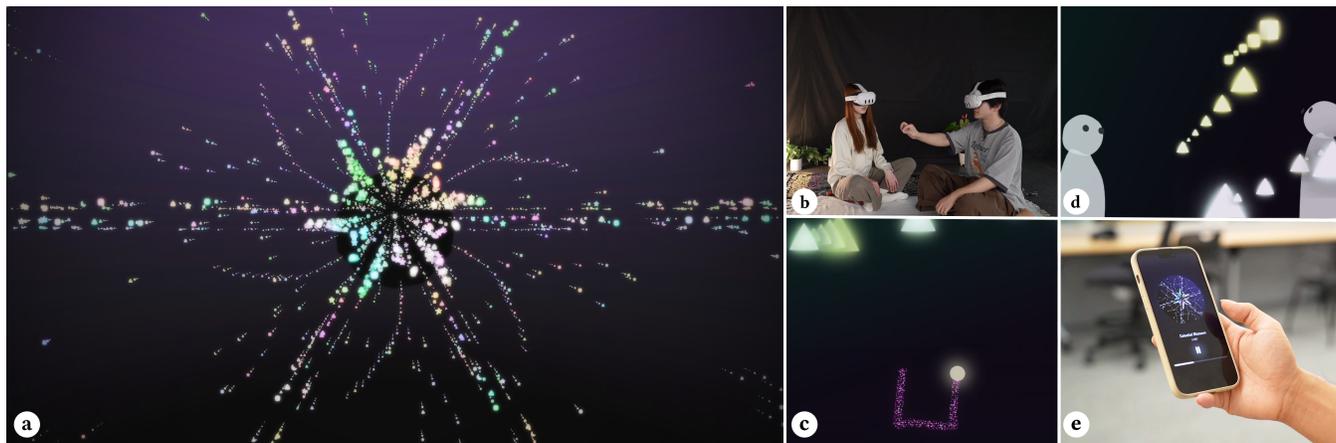


Figure 1: Celestial Blossom: A Collaborative, Meditative VR Journey of Fractal Art and Music: (a) Example of a top-down view of the artwork created in the experience. (b) Multiple participants can create together; (c) Participants can do mid-air sketching that will then transform into shining particles; (d) Participants can see each other as spirit avatars in VR. (e) Participants can keep and revisit the visual pattern and the music they created after the experience.

Abstract

Celestial Blossom is a collaborative, meditative VR experience where participants co-create generative fractal art through hand-drawn sketches, transforming movements into evolving audiovisual symphonies. Set in a celestial void, strokes morph into glowing fractal particles, from microscopic grains to cosmic stars, each shaping sonic textures and evolving into an immersive soundscape. Multiplayer interaction allows users to weave their creations into a shared immersive composition. At the end, participants receive a

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

SA XR '25, Hong Kong, Hong Kong

© 2025 Copyright held by the owner/author(s).

ACM ISBN 979-8-4007-2168-7/25/12

<https://doi.org/10.1145/3761667.3761947>

printed rendering of their artwork, which can be scanned to revisit the fractals and melodies they created in VR.

Keywords

VR, Art, Music, Fractal, Meditation, Collaboration

ACM Reference Format:

Pincun Liu, Keru Wang, Yi Wu, Xiaoan Liu, Yushen Hu, Zhu Wang, Agnieszka Roginska, and Ken Perlin. 2025. Celestial Blossom: A Collaborative, Meditative VR Journey of Fractal Art and Music. In *SIGGRAPH Asia 2025 XR (SA XR '25)*, December 15–18, 2025, Hong Kong, Hong Kong. ACM, New York, NY, USA, 3 pages. <https://doi.org/10.1145/3761667.3761947>

1 Introduction

Virtual Reality (VR) has been explored as a tool for mindfulness, with studies showing that VR-based meditation can reduce stress and enhance emotional well-being [Hacmun et al. 2021]. However, most VR meditation experiences are passive, relying on guided breathing or static environments [Döllinger et al. 2021]. While effective, meditation is fundamentally about self-awareness and presence, which can be deepened through active engagement rather than passive observation.

One way to cultivate active presence is through creative expression. Activities like coloring books promote relaxation and introspection, making artistic creation a powerful meditative tool [Greenhalgh 2020]. VR expands this concept, enabling immersive artistic experiences beyond traditional media [J. 2017]. Applications like Tilt Brush and Quill make digital art intuitive and accessible [Facebook Technologies, LLC 2016; Google Inc. 2016], allowing users to create freely in three-dimensional space while enhancing meditative focus.

Building on these ideas, we introduce Celestial Blossom, a VR experience that blends artistic creation with meditation. Through body gestures, participants generate evolving fractal patterns and harmonious sounds, transforming movement into an immersive, meditative journey. By creatively shaping their environment, users cultivate self-awareness, presence, and tranquility, offering a personal and interactive path to mindfulness.

The fractal design is inspired by the idea that small actions can lead to infinite complexity. As William Blake wrote, "To see a world in a grain of sand, and a heaven in a wild flower," a single sketch in Celestial Blossom expands into a self-replicating pattern, illustrating how simple gestures can generate vast, intricate forms.

Celestial Blossom is a shared experience. The system supports multiplayer interaction, allowing participants to create together in the same virtual space. This shared creative process helps the participants stay connected with the environment, encouraging a sense of community and harmony [Liu et al. 2020].

The experience extends beyond VR. At the conclusion of the session, each participant receives a printed fractal representation of their creation, which can be scanned to retrieve the music piece they created. This tangible artifact bridges the digital and physical worlds, allowing users to revisit the tranquility they experienced long after leaving the installation.

By presenting Celestial Blossom, we introduce an active, collaborative, and immersive approach to VR meditation. Through generative fractal art, interactive music, and embodied interaction,

the system transforms mindfulness into an expressive, deeply personal, and reflective journey.

2 System Design

Celestial Blossom runs on a customized WebXR platform with a built-in renderer and multiplayer capabilities. The system uses Meta Quest 3 headsets with hand-tracking for interaction.

Gesture-Based Sketching. Participants can draw freely in VR using hand pinching gestures (Figure 1c). The system recognizes these sketches by calculating the mean squared error between the drawn paths and predefined shape templates such as moons and stars. Once a match is determined within a defined threshold, the system morphs the sketches into particles in the recognized shape.

Fractal Particles. The particles will be replicated at various scales to form a fractal pattern extending from the center of the world. Their movement and color are predefined by the drawing's time and position. This dynamic particle system ensures that each drawing evolves organically, creating a visually intricate and responsive environment.

Interactive Music. Each drawn stroke evokes a corresponding musical gesture, shaping an evolving and immersive soundscape. This is achieved by sending metadata from the user's interaction to a server, where it is processed by a customized Max/MSP patch for real-time music generation. The patch maps these inputs to a range of synthesis parameters: drawing attributes such as stroke length, curvature, and density are translated into musical elements—including pitch, duration, grain size, envelope shape, and spatialization. The resulting audio is then streamed back to each client in real time.

Multiplayer Interaction. Celestial Blossom is designed as a shared experience, allowing multiple participants to create and interact in the same virtual space. Users appear to each other as ethereal, glowing forms (Figure 1d). Drawings and sounds are synchronized in real time, enabling participants to collaborate on evolving artworks.

Revisiting The Experience. At the end of the experience, each participant receives a printed card featuring a top-down rendering of what they created in VR. The image on the card serves as a scannable pattern that, when scanned by our designated app, directs users to an online portal where they can listen to the unique music piece created during their session (Figure 1e).

3 User Experience

Our booth at SIGGRAPH Asia 2025 is designed as a serene, Zen-like space (Figure 2). Participants enter a dimly lit area with cushions, soft lighting, ambient lamps, and natural elements, creating a peaceful atmosphere. A projector displays a real-time top-down view of the evolving fractal patterns for spectators.

We guide 2 to 4 participants into the booth at the same time, where they sit on cushions. They will start with a built-in tutorial introducing the interaction before experiencing Celestial Blossom for about 3 minutes. After the session, each participant receives a printed card featuring their fractal artwork that they can scan to retrieve the music they created.



Figure 2: The booth setup

References

- Nils Döllinger, Carolin Wienrich, and Marc Erich Latoschik. 2021. Challenges and Opportunities of Immersive Technologies for Mindfulness Meditation: A Systematic Review. *Frontiers in Virtual Reality* 2 (2021), 644683. doi:10.3389/frvir.2021.644683
- Facebook Technologies, LLC. 2016. Quill. <https://quill.fb.com/> Virtual Reality illustration and animation tool.
- Google Inc. 2016. Tilt Brush. <https://www.tiltbrush.com/> Virtual Reality painting software.
- Wendy Ann Greenhalgh. 2020. *Mindfulness & the art of drawing: A creative path to awareness*. Leaping Hare Press.
- Irit Hacmun, Dafna Regev, and Roy Salomon. 2021. Artistic Creation in Virtual Reality for Art Therapy: A Qualitative Study with Expert Art Therapists. *The Arts in Psychotherapy* 72, Article 101745 (2021), 10 pages. doi:10.1016/j.aip.2020.101745
- Gerry L. J. 2017. Paint with Me: Stimulating Creativity and Empathy While Painting with a Painter in Virtual Reality. *IEEE Transactions on Visualization and Computer Graphics* 23, 4 (2017), 1418–1426. doi:10.1109/TVCG.2017.2657239
- Chao Liu, Hao Chen, Chia-Yi Liu, Rung-Tai Lin, and Wen-Ko Chiou. 2020. Cooperative and individual mandala drawing have different effects on mindfulness, spirituality, and subjective well-being. *Frontiers in Psychology* 11 (2020), 564430.