Illuminated Neverland: sculpting an interactive journey through shadows

CHENG-HSIN HAN, National Taiwan University, Taiwan
XING-YING LI, National Taiwan University, Taiwan
GUAN-XIU JIN, National Taiwan University of Science and Technology, Taiwan
AN-CHE LIANG, National Taiwan University, Taiwan
YIN-TING LU, National Taiwan University of Science and Technology, Taiwan
NIL PONSA I CAMPANYÀ, National Taiwan University, Taiwan
MIKE Y. CHEN, National Taiwan University, Taiwan
NENG-HAO YU, National Taiwan University of Science and Technology, Taiwan

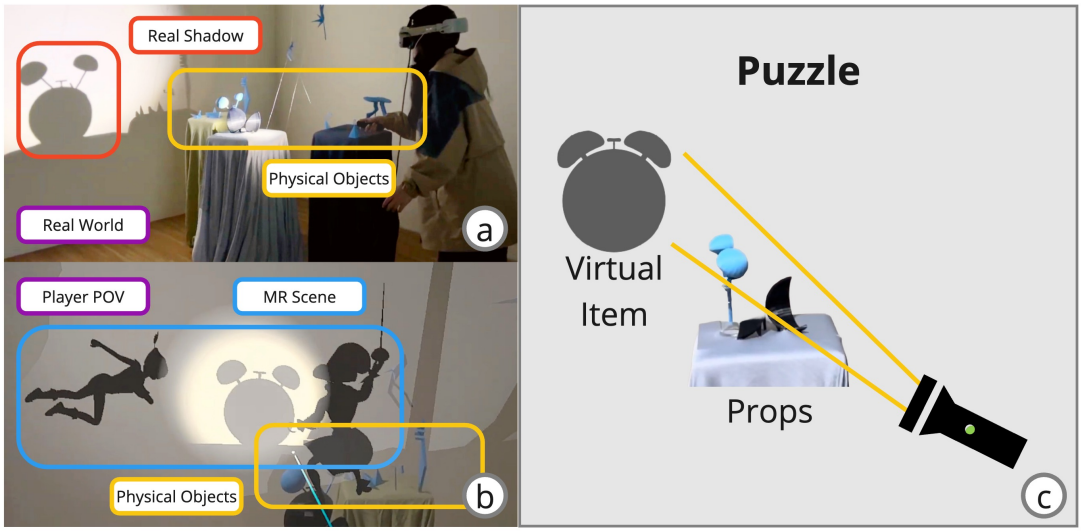

Fig. 1. This figure provides an overview of our game. Subfigure (a) illustrates real-world interactions, subfigure (b) showcases gameplay in mixed reality, and subfigure (c) highlights the core game mechanism.

Authors' Contact Information: Cheng-Hsin Han, sinhan0918@gmail.com, National Taiwan University, Taipei, Taiwan; Xing-Ying Li, leesinging888@gmail.com, National Taiwan University, Taipei, Taiwan; Guan-Xiu Jin, jin.austin@gmail.com, National Taiwan University of Science and Technology, Taipei, Taiwan; An-Che Liang, namwoam@gmail.com, National Taiwan University, Taipei, Taiwan; Yin-Ting Lu, evan.lu.mun@gmail.com, National Taiwan University of Science and Technology, Taipei, Taiwan; Nil Ponsa i Campanyà, r12944063@csie.ntu.edu.tw, National Taiwan University, Taipei, Taiwan; Mike Y. Chen, mikechen@csie.ntu.edu.tw, National Taiwan University, Taipei, Taiwan; Neng-Hao Yu, jonesyu@ntust.edu.tw, National Taiwan University of Science and Technology, Taipei, Taiwan.

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This work presents 'Illuminated Neverland', a mixed reality experience that transforms a physical space into an interactive shadow world. Users begin in a real room featuring abstract sculptures. As the lights dim, these sculptures become dynamic shadow projectors within the MR environment. By manipulating a virtual flashlight, users physically move and alter shadows, solving puzzles woven into a Peter Pan narrative. This work showcases a novel approach to spatial storytelling, blending tangible objects with virtual light to create an engaging, shadow-based interaction. We highlight the real-time manipulation of virtual shadows in a physical space, demonstrating the potential of MR to create immersive and interactive narratives through light and shadow.

CCS Concepts: • **Human-centered computing → Mixed / augmented reality**.

Additional Key Words and Phrases: Art, Experience, Games, Interaction, Mixed Reality, Narrative

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1 Background

The interplay between light, shadow, and interactive experiences has been a recurring theme in both artistic and digital domains. Previous works have explored various applications of virtual lighting and shadow in different contexts, including their role in storytelling [Moon 2022], the adjustment of light position [Games 2021b] or object orientation [Games 2015a] to cast meaningful images, and the combination of multiple objects' shadows to create complex visual compositions [Coatsink 2019]. Building upon these works, we aim to integrate the interactivity of virtual light and shadow with mixed reality (MR) technology, enhancing user engagement and introducing an innovative spatial storytelling technique that deepens the relationship between space, narrative, and gameplay.

2 Game Design and Implementation

2.1 Experience and Interaction Development

Inspired by the story of Peter Pan, our narrative unfolds as Tinker Bell is captured by Captain Hook. Players take on the role of Peter Pan's shadow, assisting him in solving puzzles to rescue her. Through the narrative of the story, players can find hints from the narrator to guide them through. They must position the flashlight at the correct angle and location to interact with their surroundings in a Neverland-inspired wallscape. By puzzling the shadows of multiple fragmented props, players can form coherent and meaningful shadows. After overcoming numerous obstacles, they will succeed in rescuing Tinkerbell.

The experience is enhanced by immersive environmental sounds and the development of the story, deepening the engagement of the player. The game encourages creativity and problem solving by allowing players to experiment with how virtual light transforms real spaces and object shadows. This MR-based puzzle-solving experience deepens the engagement of the player by blending the physical and digital worlds.

2.2 Technical Details and Interaction Mechanics

Our game is designed for the Quest 3 headset and developed using Unity 2022.3.26, integrating the Meta XR All-in-One SDK to create an immersive mixed reality (MR) experience. The 3D models of real-world objects are crafted in Maya 2022.3 and then imported into Unity. Additionally, some in-game animations are created using Blender 4.1.0.

The core interaction mechanics involve connecting the real and virtual worlds through light and shadow manipulation. Players use a flashlight as a guiding tool, with the distance indicator changing color and emitting a sound based on proximity to the correct shadow projection trigger zone (red for far, yellow for near, and green for correct). By illuminating real-world objects with virtual light sources, players create interactive shadows that shape the digital environment. Adjusting the light angles allows for dynamic light manipulation, enabling players to explore how shadows influence the game world (as shown in figure 1 subfigure (c)). Through exploratory interaction, players experiment with different light angles to determine the best configurations for solving puzzles and progressing through the narrative.

3 Conclusion

Our project introduces a novel MR-based interactive puzzle game where realistic shadows projected from physical objects interact with the digital story, blurring the boundary between the real and virtual worlds. By integrating tangible objects into the gameplay through shadow manipulation, we create a deeply immersive and creative experience that encourages players to explore light, shadow, and storytelling in new ways.

References

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Joon Moon. 2022. Chasing Stars in Shadow. Interactive installation. Augmented reality mixing physical objects and shadows, computer, projector, customized electronic device equipped with position sensor and LED, custom software.