

Unified Virtual Workspace

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Abstract: This project introduces a three-map Metaverse workspace themed around offices, where users navigate avatars through interconnected realms featuring conference rooms, desks, and social areas. Proximity-based interactions limit engagement to specified ranges, simulating real-world dynamics. Communication includes text chat, voice calls, video conferencing, and additional tools like screen sharing and app integrations. Developed using 3D engines (e.g., Unity) and real-time networking (e.g., Photon), it enhances remote collaboration, productivity, and networking. Future expansions may incorporate AI avatars and VR/AR support, making it a versatile solution for virtual teams and events in the Metaverse.

Keywords: Metaverse Virtual Office, Proximity Interactions, 3D Navigation Real-Time Communication, Remote Collaboration

INTRODUCTION

In an era where remote work and virtual interactions are reshaping professional landscapes, the Virtual Office Metaverse Platform emerges as an innovative solution to bridge the gap between physical and digital workspaces. This immersive, three-map environment allows users to navigate customizable avatars through office-themed realms, including conference rooms, collaborative desks, and social zones, fostering a sense of presence and productivity. By implementing proximity-based interactions where communication tools like text chat, voice calls, and video conferencing activate only within specified ranges the platform simulates natural social dynamics, reducing overwhelm and enhancing focus. Built on robust technologies such as 3D engines and real-time networking, it aims to revolutionize remote collaboration, networking, and team engagement, offering a versatile tool for businesses, events, and the evolving Metaverse ecosystem. This project not only addresses the limitations of traditional virtual meetings but also paves the way for more inclusive, interactive, and efficient digital experiences.

RECENT WORKS

TAVR-based virtual office tool by Meta (formerly Facebook) that allows users to create avatars, join meetings in shared virtual rooms, and interact via voice and gestures. It emphasizes spatial audio and proximity for realistic collaboration, with integrations for productivity apps like Microsoft Office [1]

A 2D/3D web-based platform for virtual offices where users navigate avatars in customizable maps. It features proximity-based chat and video calls, themed rooms for meetings or casual interactions, and tools for remote team building, widely adopted during the pandemic for hybrid work.[2]

Part of Microsoft's mixed-reality ecosystem, Mesh enables cross-device virtual meetings with 3D avatars in shared spaces. It supports proximity interactions, holographic content sharing, and integrations with Teams, focusing on immersive collaboration for distributed teams.[3]

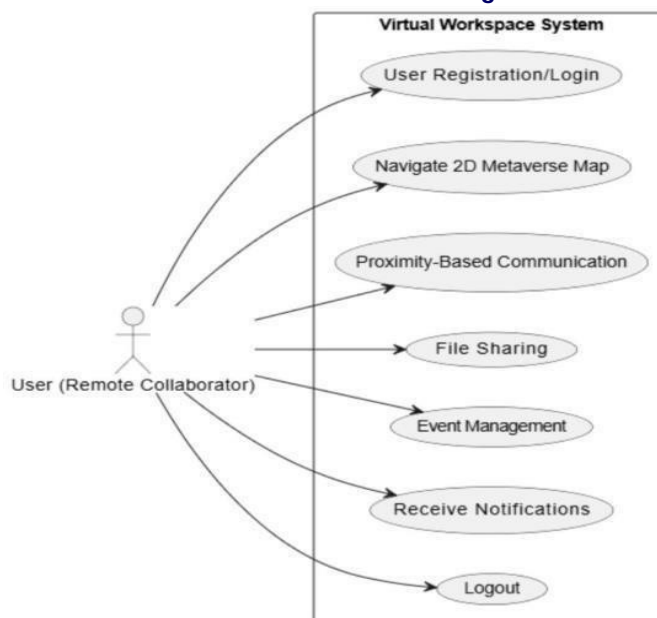
A VR platform for virtual offices and events, allowing users to create 3D spaces, interact via avatars, and use proximity-based voice/video. It includes features like white boarding and file sharing, aimed at enhancing remote creativity and networking.[4]

"Metaverse for Remote Work: A Systematic Review" (2023, IEEE): A study published in IEEE Transactions on Human-Machine Systems reviewing Metaverse technologies for virtual offices, including proximity mechanics, 3D navigation, and communication tools. It analyzes tools like those above and proposes frameworks for improving user engagement in digital workspaces.[5] In this platform, users navigate 3D virtual spaces using avatars and can interact through voice and text chat within defined areas, simulating real-world proximity-based communication. The Coty Campus represents a practical implementation of a virtual office world with interactive rooms, communication tools, and immersive collaboration, making it a strong example of a recent metaverse-based work environment.[6]

PROPOSED WORK SOLUTION

- **System Overview:** A metaverse - based virtual office platform where users interact and collaborate in a 3Doffice environment.
- **User Representation:** Each user is represented by a customizable 3D avatar that can move freely across the office map.
- **Environment Design:** Office-themed 3D map with rooms such as meeting halls, work stations, lounges, and discussion areas.
- Interactive elements like doors, white boards, and screens.
- **Communication Features:**
- **Text chat:** Users can send messages through a chat box.
- **Voice and video calls:** Available within specific zones or rooms.
- **Proximity-based interaction:** Communication only allowed when users are within a defined range or area.
- **Spatial audio:** Sound intensity varies based on user distance.
- **Access Control:**
- Users can enter only authorized rooms or private meeting spaces.
- Role-based permissions for administrators, employees, and guests.
- **System Architecture:**
- **Backend:** Real-time server using Node.js with Web Socket or Photon Server for synchronization and interaction management.
- **Front end:** Developed using Unity or Unreal Engine for immersive 3D visualization.
- **Database:** Stores user data, chat history, and activity logs (e.g.,MySQL or MongoDB).
- **Additional Features:**
- User authentication and profile management.
- Screen and file sharing with in rooms.

Architecture Diagram



CONCLUSIONS

The proposed Metaverse Office System provides an innovative solution for enhancing virtual collaboration and remote working experiences. By combining immersive 3D environments, spatial interaction, and real-time communication tools, this system replicates the dynamics of a real-world office within a digital space. Users can navigate virtual rooms, communicate through voice, video, and chat, and collaborate in an engaging and interactive manner. The integration of technologies like Unity/Unreal Engine, Node.js, Web RTC, and spatial audio ensures realistic user experiences and efficient communication. Overall, the system demonstrates how metaverse technology can revolutionize modern workplaces, increasing engagement, productivity, and a sense of presence among distributed teams.

Moreover, the system's architecture built upon Unity/Unreal Engine for visualization, Node.js with WebSocket for real-time synchronization, and WebRTC for communication ensures smooth performance and scalability. This combination of technologies allows multiple users to interact simultaneously without compromising efficiency or immersion. The proposed system demonstrates how the metaverse can transform modern workplaces by offering flexibility, inclusivity, and sustainability. It eliminates geographical barriers, supports remote collaboration, and creates engaging alternative to traditional office setups. In the future, this system can be enhanced further by incorporating AI-driven virtual assistants, blockchain-based identity management, and VR/AR compatibility, enabling a more secure and intelligent metaverse workspace.

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