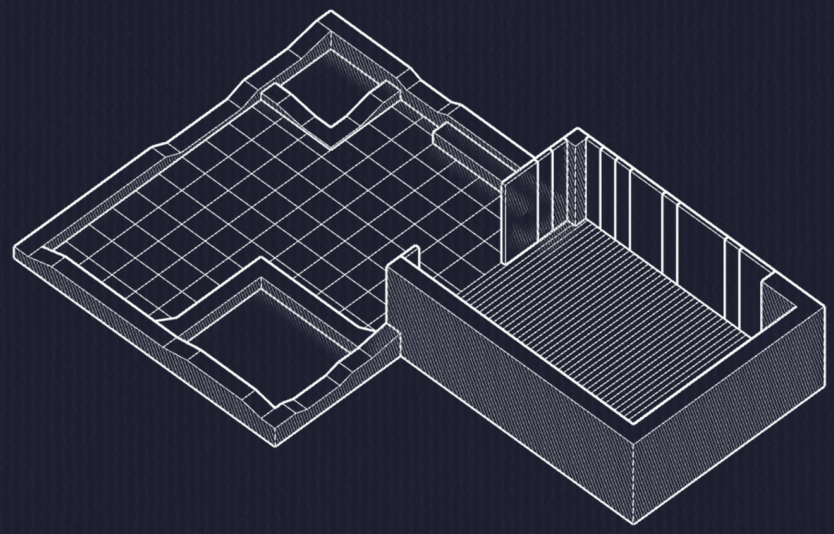
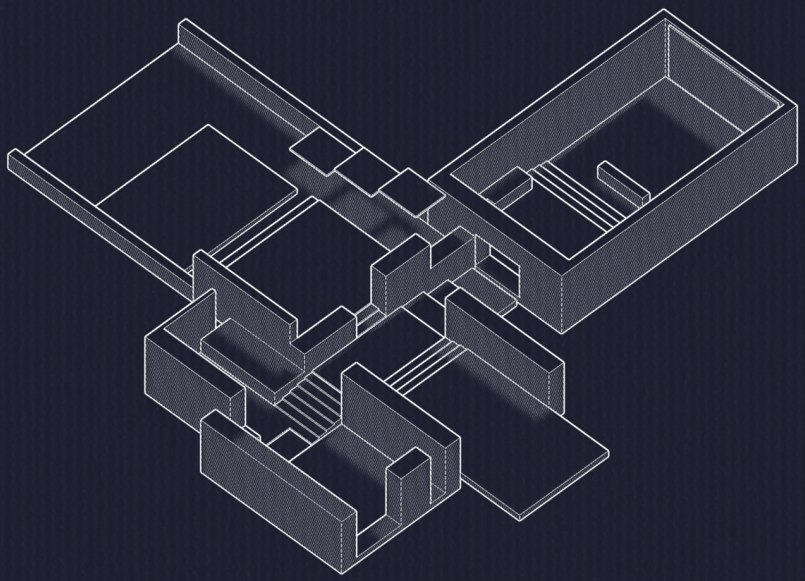




POST.SPACES

APPENDIX I: INSPIRATION AND PRECEDENT

CONTENTS

WINDOWS MIXED REALITY "CLIFF HOUSE"

The Windows Mixed Reality 'Cliff House' is the first environment a user experiences when they first use a WMR headset. It is clearly designed to be an introductory environment, appearing familiar to users as a semi-realistic 'house', yet taking advantage of the virtual environment to ease the user into more unconventional aspects of navigation and interaction.

There is a clear attempt at realism with the use of material textures such as concrete and wood for building surfaces, as well as the breathtaking rendering of the natural landscape beyond.

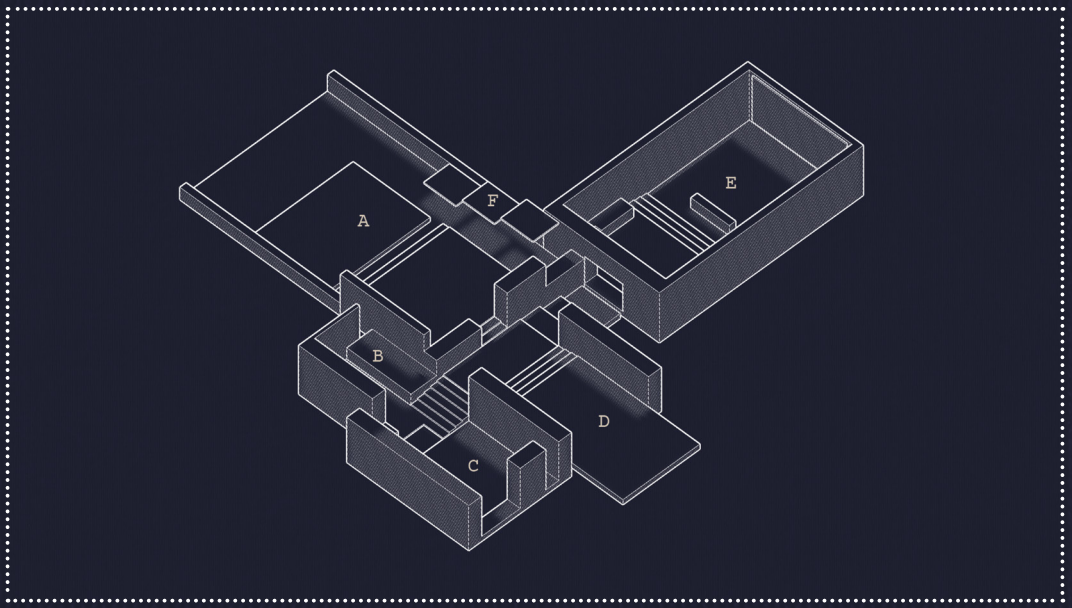
While the inclusion of structural elements such as floors, steps, walls, and ceilings might add realism at first glance, their scale and configuration are somewhat fantastical and do not necessarily comply with real-world physics. Unsupported roof planes and floating platforms give the space an ethereal quality, while exaggerated wall thickness is used more for aesthetic effect than any sense of structural realism.

Constant level changes and steps throughout the space highlight the ability to move up and down and even get onto the roof, familiarising the user with the potential of virtual space.

Users are also able to manipulate static and interactive objects within the space, such as decorative furniture items and 3D icons that serve as shortcuts to various applications. This can be achieved at a distance via a direct pointer beam from either hand controller.

#VRENVIRONMENTS #NAVIGATION

Entrance view of the 'Cliff House'.



Axonometric drawing of the 'Cliff House'.

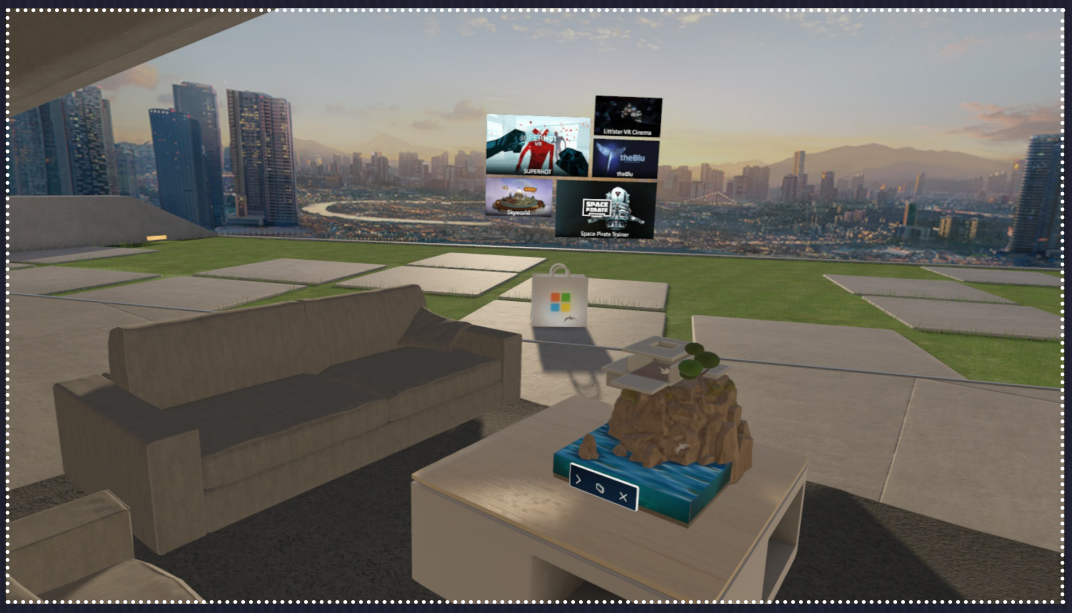
WINDOWS MIXED REALITY “SKYLOFT”

The Windows Mixed Reality ‘Skyloft’ is an alternate home environment to the ‘Cliff House’, requiring the user to actively select it after being introduced to the Cliff House. Similarly, it takes on a semi-realistic design with imitation of real-life structure and material, with a composited city skyline in the distance.

Compared to the Cliff House, the Skyloft appears to strive for a greater sense of architectural realism, with the inclusion of architectural details such as structural framing, glazing detail and other structural features. There are also no floating platforms or obviously unrealistic features, although the location and design of the space as a towering, futuristic penthouse could be seen as somewhat fantastical in itself.

There is a similar use of levels to create variety in the spatial environment, with the main foyer opening up into a large, sunken room lined with application windows. Users are able to manipulate screens and objects in the same manner as the Cliff House, however, the Skyloft presents a default configuration that organises multiple windows into a ‘media room’ of sorts, highlighting the potential of VR for the spatial organisation of information.

#VRENVIRONMENTS #NAVIGATION #MEDIA



View of 'Skyloft' looking out over skyline

Interior of 'Skyloft' with media room

STEAMVR “SUMMIT PAVILION”

The “Summit Pavilion” is the default home environment for the SteamVR platform. It is designed as an introductory environment with a simple-to-understand layout, favouring immersion and graphical fidelity over showcasing unconventional virtual spaces to the user.

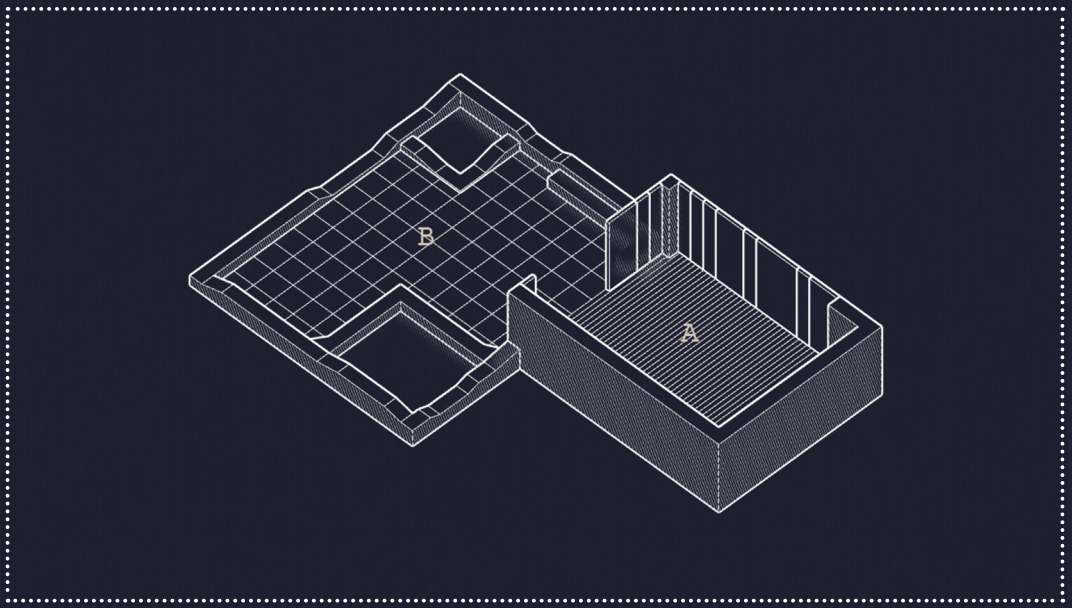
It makes use of high-resolution, realistic textures for the structure and environment, such as in the concrete walls, timber flooring, and photorealistic vegetation. Structural elements such as window framing, supports, and joinery are also detailed in the model, emphasizing the realistic nature of the space.

The spatial organisation is simple, with a continuous indoor/outdoor space separated by a large aperture that facilitates aiming of teleportation. There are no level changes in the traversable surface throughout the entire space. While the user is aiming the teleport, the traversable surface is highlighted, along with several preset nodes which, when teleported to, allow the user to see particular views or access specific options such as changing the furniture layout in the room.

Users are able to manipulate furniture as well as other interactive items such as 3D game shortcuts and media panels through their hand controllers.

#VRENVIRONMENTS #NAVIGATION

View from inside the 'Summit Pavilion'



Axonometric drawing of the 'Summit Pavilion'

ALTSPACEVR HOME

The AltSpaceVR home is the default environment for users of the AltSpaceVR social application, which allows users to meet up in virtual spaces either casually or for scheduled events. It takes on a cartoonish aesthetic that is nonetheless clearly imitative of real space. While the structures and objects are skewed and disproportionate, the design is meant to evoke a regular house with its associated structural elements and clutter.

The space is roughly divided into 3 parts with minimal level changes. Users start out in an interior space, decorated with residential clutter, while they are introduced to the various menus and functions through a tutorial. The large door to the left leads to an exterior balcony, containing several interactable items such as throwable basketballs and animated fireworks for the user to play with. A second door from the balcony leads to a third, smaller interior space, similar in character to the first.

Most functions such as viewing information or choosing other rooms is accessed via pop-up menus, with the space serving largely as a backdrop that situates users in space. The imitative design helps the user feel more comfortable in the space, while the few interactable objects placed around the area introduce the user to their capabilities in the virtual environment.

#VRENVIRONMENTS #NAVIGATION

Starting perspective view of the interior room

External balcony space with interactive props

ALTSPACEVR “CAMPFIRE”

The “Campfire” environment is one of the primary social spaces in AltSpaceVR, allowing users to gather freely once they leave the home space. It takes the form of a wide grass field with undulating terrain and several points of attraction such as the campfire and a log cabin. This serves as a general-purpose meeting space and secondary introductory space for new users, in contrast to the exclusive rooms where scheduled activities are organised.

In the same vein as the AltSpaceVR home, the scale, proportion and design of objects are cartoonish in nature but clearly representative of real-world equivalents.

Focal points such as the campfire itself are not only visual points of interest, but are also host to interactive objects such as virtual marshmallow sticks that users can roast in the campfire. These objects serve as novelty focal points that attract users and create natural points of congregation.

The wide open nature of the space and the scattering of such attraction points around the map allows for users to congregate in various clusters of different sizes as they wish. In addition, communication takes place largely through voice chat, which is modulated by proximity. This creates an added incentive for users to naturally cluster around each other when talking and distance themselves from others who are not part of the conversation, much like in real life.

#VRENVIRONMENTS #NAVIGATION #SOCIAL

View of campfire space

Close-up of other users interacting around the campfire

VRCHAT HOME

The VRChat home is the default environment that the user is introduced to when they enter VRChat, a social application with a focus on user-generated content. Users can create and upload their own spaces for others to experience or interact in, as well as utilise any suitable 3D model as their in-game avatar.

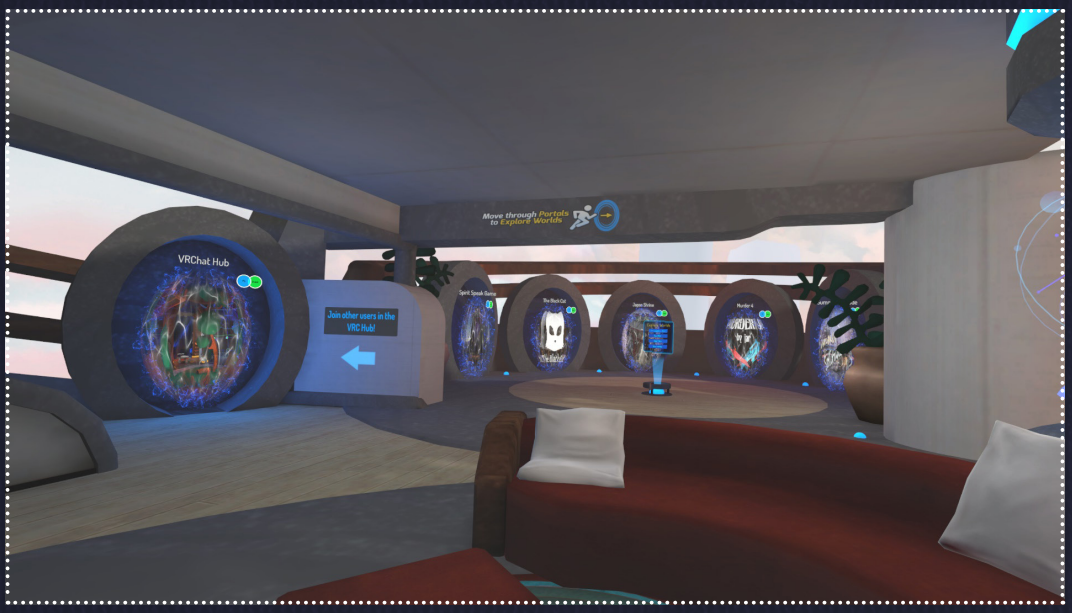
The design of the VRChat home is largely cartoonish and takes on a science-fiction aesthetic. While it is not entirely abstract and remains somewhat recognisable as a house with furniture and doorways, there is little attempt at realism in the design. There are no narrow doorways or level changes, allowing the user to navigate freely with the teleportation controls.

This room serves mainly as an introductory space for new users to VRChat, allowing them to play with the various settings that govern their character and their interaction with the world. Along with static decorative furniture, there are several interactable toys lying around such as 3D markers that allow the user to draw in 3D space.

Although the vast gallery of user-created and user-inhabited rooms can be accessed from a pop-up menu, the home space also features portal doorways that lead to some of these recommended rooms, serving as a strong spatial suggestion to the user that there are other spaces beyond this one to explore.

#VRENVIRONMENTS #NAVIGATION

Starting view of VRChat home environment



Close-up view of portals leading to other rooms

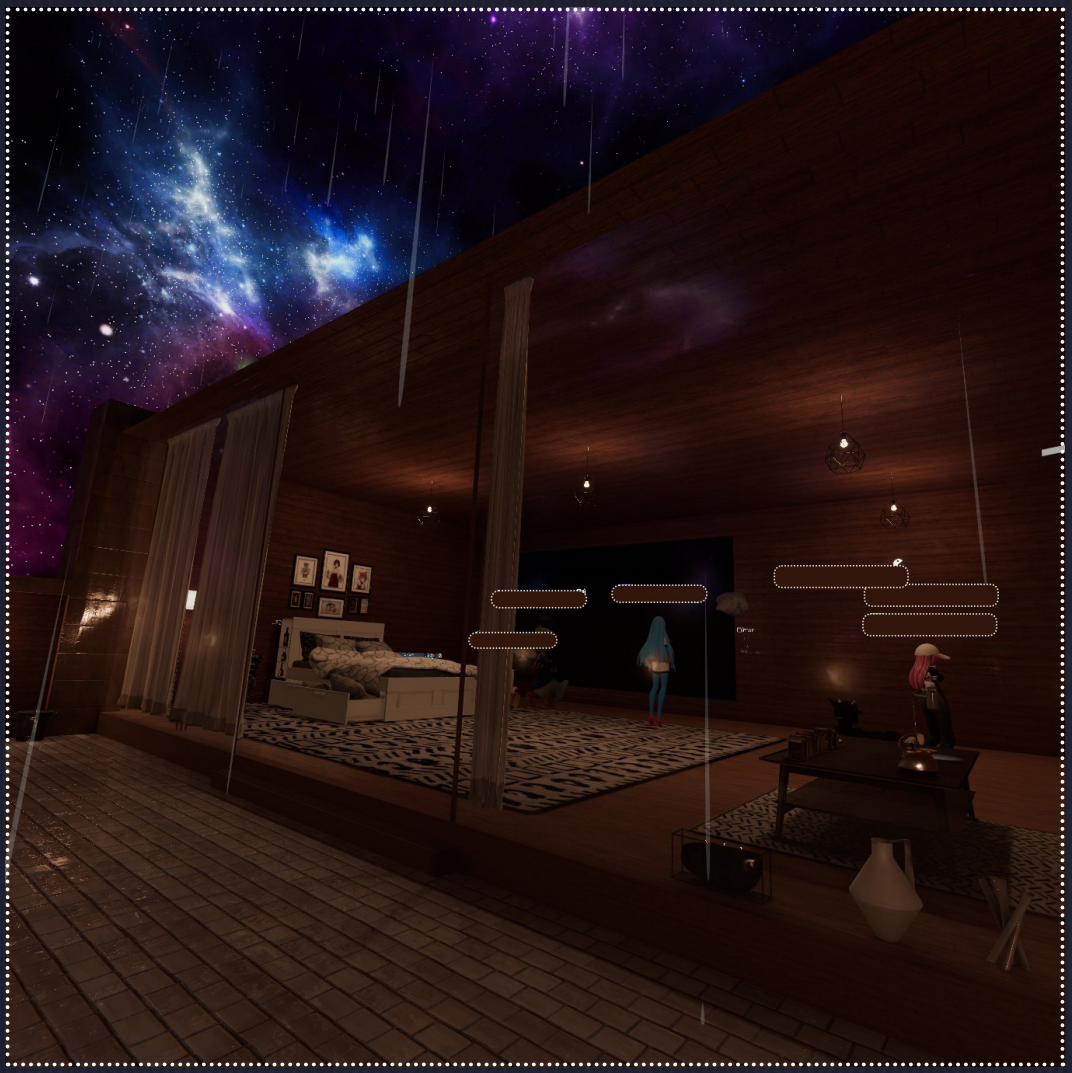
VRCHAT “ROOM OF THE RAIN”

The “Room of the Rain” was one of the more popular user-created rooms on VRChat at the time of research. It is a rather compact environment, featuring a small external balcony which players spawn in, and a similarly small interior separated by full-length glass panes and a large open doorway.

The environment is designed to be realistic in nature, with photorealistic textures on the timber structure and tiled flooring including reflective effects from the rain, as well as decorative furniture such as a bed, seats, and light fixtures. At the same time, the sky and environmental effects are fantastical in nature, with the default skybox being a highly detailed image of a star-filled galaxy. Users can further customise the sky, surroundings, and weather by choosing from a set of pre-determined options, juxtaposing the comfort of a realistic-looking house with the wonder of a virtual environment.

Along with interactive elements such as useable seats, a media player, and other features, a large VR mirror at the back of the room serves as a focal point for social interaction. The mirror allows users to view themselves and others in third person, enhancing the nature of the interaction between participants as they watch it play out on the reflective surface.

#VRENVIRONMENTS #NAVIGATION #SOCIAL



‘Room of the Rain’ balcony view looking in, featuring the interactive mirror on the back wall

VRCHAT “THE BLACK CAT”

“The Black Cat” was one of the more popular user-created rooms on VRChat at the time of research. It is designed in the form of a large virtual bar or restaurant, featuring spaces such as a reception, restrooms, private lounges and a main dining area. Like many other rooms in VRChat, it is designed to be physically-imitative, with realistic textures simulating most materials.

The room is divided into many areas as with a real bar, with doorways and level changes separating some spaces. Narrow doorways are present in some areas as per real-world proportions, making it more difficult to navigate areas such as the restroom.

While there is lots of furniture scattered around the space, almost all of them are static and cannot be interacted with, making them merely backdrop elements that add to the immersion of the theme. In practice, users congregate around the two large VR mirrors placed on either side of the main dining hall, which allow users to view themselves and others in third person. These virtual nodes with an actual function serve as much stronger attraction points than the imitative furniture which cannot be interacted with.

As with the rest of VRChat and most other social platforms, speaking audio is modulated by distance, creating a natural incentive for users to cluster or spread apart depending on who they are conversing with.

#VRENVIRONMENTS #NAVIGATION #SOCIAL

'Black Cat interior with users gathering around the interactive mirror

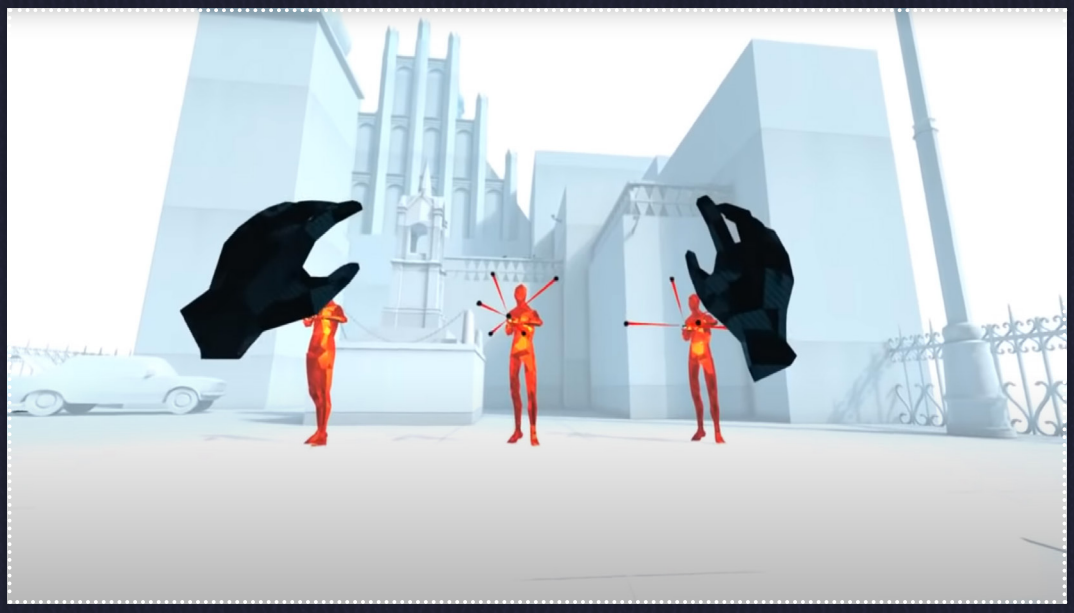
SUPERHOT VR

SUPERHOT VR is one of the most acclaimed games for VR, due largely to its unique combat system and premise. It is an action-shooter game with the unique premise that time only passes when the player is moving, allowing the player to achieve slow-motion feats like bullet dodging and trick kills if they are careful with their actions. The game takes place as a series of action vignettes that the player has to complete, with the player being automatically teleported to the next location upon defeating all the enemies at the previous one.

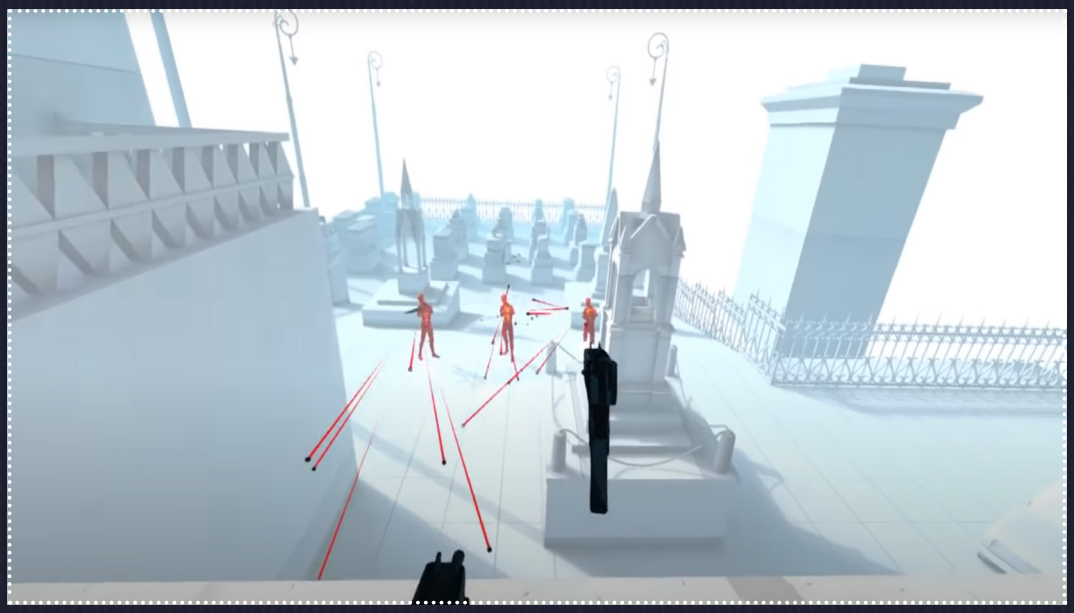
Such a design takes locomotion out of the players hands entirely, allowing players to move on the spot within the confines of their playspace but removing the fiddly, often immersion-breaking movement between locations. Deliberate positioning of these successive points of view allows the player to understand that the scenes are taking place in the same overall environment by recognising common environmental features or figures.

In addition, while the 3D modeled spaces appear to simulate real-life environments, they are presented in monochrome white, with enemy figures colored in bright red and interactable objects in black. Despite the lack of realistic texturing, the player is clearly able to understand the nature of the architectural space via depth perception, while their attention is drawn to the key objects of importance.

#VRENVIRONMENTS #NAVIGATION #VIRTUALMEDIA



First vantage point where the player has to dodge bullets aimed at them



Second vantage point that the player is teleported to within the same area, after successfully dodging the bullets earlier

NOTRE DAME VR

Produced by Ubisoft, the Notre Dame VR experience was published after the fire at the Notre Dame cathedral in 2019. Using assets previously created for “Assassin’s Creed: Unity”, the short ‘game’ takes users through a 3D model of the Notre Dame and its surroundings in the 18th century, with the player teleporting between preset locations and being able to look around in VR.

This project showcases two important aspects of VR technology. Firstly, it demonstrates how spatial experiences as unique as a cathedral can be conveyed in VR, where users can look up and around to experience the full magnitude of the space with the aid of depth perception. Such an experience is difficult if not impossible to convey within the limitations of 2D screen space. Additional elements such as lighting and stereo sound when using the headset further contribute to the sense of immersion.

Secondly, the project also demonstrates the immense potential of virtual media, especially VR, in conserving or reconstructing historical architecture and bringing those experiences to people wherever they are. Not only are our experiences now unbounded by space, they are also unbounded by time.

#VRENVIRONMENTS #NAVIGATION #VIRTUALMEDIA

Notre Dame Cathedral as seen in Assassin's Creed: Unity

Screenshot of Notre Dame as seen in VR

RICHIE'S PLANK EXPERIENCE

Richie's Plank Experience is a mini-game where the player is placed atop a tall skyscraper and is challenged to step off a plank. While there is little real 'gameplay' involved, it is a game that clearly illustrates the feeling of 'presence' that is often discussed by VR developers and academics.

The notion of 'presence' refers to the fact that although our rational brains know that we are only in a simulation, the combination of depth perception and visual trickery afforded by VR, along with any additional sensory aids such as audio and physical props, tricks our primal brain into believing that we are really in the world presented by the simulation. Successful evocation of 'presence' allows for wide-ranging applications of VR such as meditation, training, or emotional attachment that often rely on our brains believing that a situation is real.

In this case, the plank simulation is a highly popular experience for first-time VR users or at social gatherings as it is a particularly effective illustration of the concept in action. While the player knows that they are standing on solid ground, the realism of the visual and audio feedback are usually enough to provoke hesitation, if not outright fear, at the thought of stepping off the plank.

#VRENVIRONMENTS #VIRTUALMEDIA

Screenshot from Richie's Plank Experience

ASSASSIN'S CREED: ORIGINS

The Assassin's Creed series of games is famous for its detailed open-world renditions of historic locales, with games in the franchise visiting locations such as Jerusalem, Renaissance Italy, London and Constantinople. Published in 2017, Assassin's Creed Origins is set in ancient Egypt, allowing the player to explore a vast open-world map with many urban and rural locations.

Much can and has been said about the possibilities of architectural representation in video games - Assassin's Creed Origins was in fact notable for developing a 'discovery tour' mode that allows players to explore and learn facts about the historical locations represented in the game without gameplay interruptions.

However, one of the most interesting innovations from a navigational interface perspective is the addition of an 'eagle vision' mode, which allows the player to switch to the perspective of their pet eagle to gain a literal bird's eye view of the map. This transition can be toggled seamlessly at will, not only granting another perspective but also as a means to highlight important game objectives and characters.

The ability to switch perspectives in and out of first person to gain a greater understanding of the overall space is an interesting mechanism that could prove useful in VR, where the user is ordinarily confined to a first-person body.

#VIRTUALMEDIA #NAVIGATION

Bird’s eye view mode in Assassin’s Creed Odyssey

GHOST OF TSUHIMA

“Ghost of Tsuhima” is an open world action-adventure game set in a fictional Japanese-themed world. In addition to other gameplay design features, it has been praised for its innovative navigational systems and reduced reliance on user interface elements. This is important for the development of VR environments as not only is there limited space for a persistent heads-up-display in the user’s field of view, such elements can be intrusive and detract from the feeling of immersion.

In “Ghost of Tsuhima”, instead of using a compass or mini-map to guide the player, an environmental feature called the ‘Guiding Wind’ uses visual cues from the environment to point the player in the right direction. As long as the player has selected a target destination, the wind blows subtly in the direction of the target, causing leaves, grass, and other elements to nudge the player towards their destination.

In addition, other in-world elements such as the presence of yellow songbirds or color-coded smokestacks mark points of interest in a clear, yet immersive manner without the use of a heads-up-display.

#VIRTUALMEDIA #NAVIGATION

Screenshot showing the 'guiding wind' in action

NON-EUCLIDEAN WORLDS ENGINE

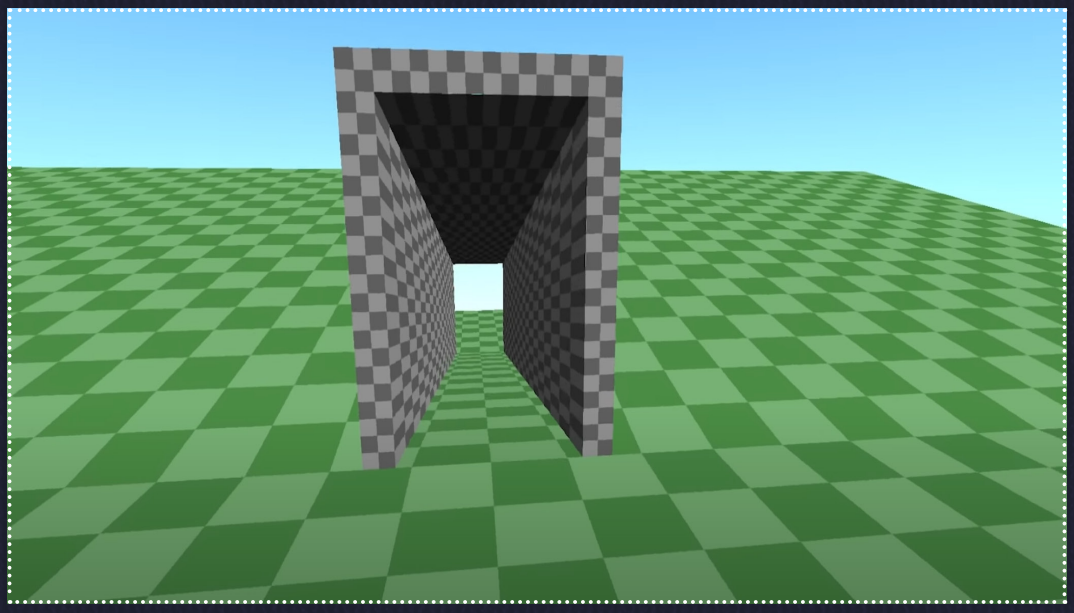
Created by user 'CodeParade', this proof-of-concept video on a non-euclidean worlds engine showcases the ability of virtual environments to entirely subvert our expectations of space and physics.

In the video, he demonstrates several different examples such as doorways that are longer on the inside than they are on the outside, or, as depicted in the first image, a tunnel which leads uphill when viewed from the outside but is traversed as though you are walking downhill on the inside.

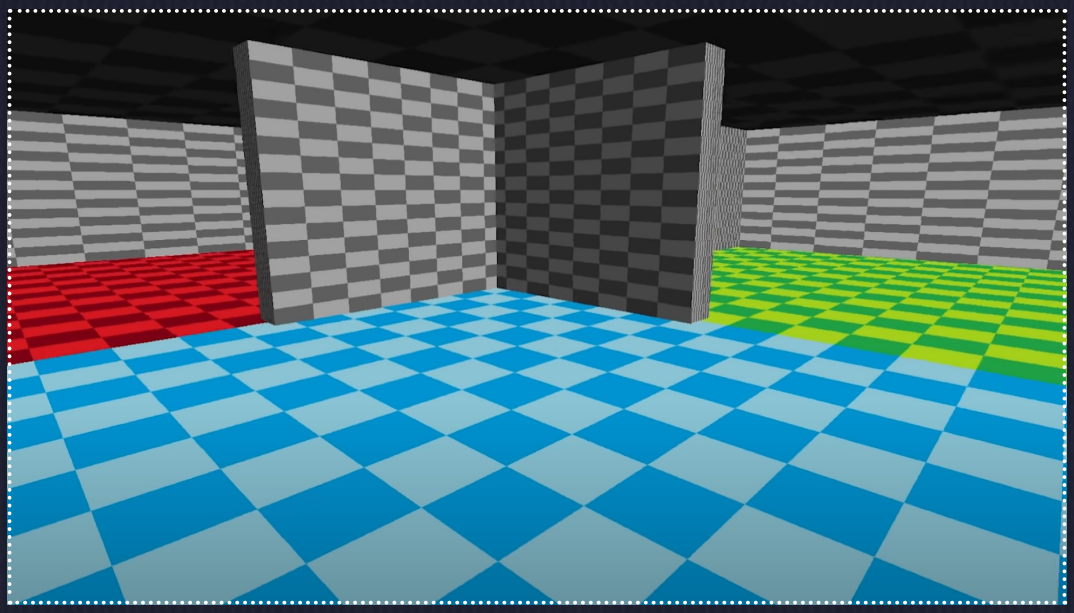
In another example, he showcases a square room which would appear to have 4 rooms as suggested by the square geometry, yet when he walks through all the rooms, it can be seen that there are only 3 distinct rooms that somehow fit into the 4-room arrangement of space.

This demo, and others like it, showcase the possibilities afforded by virtual spaces that go beyond imitating the real, creating new configurations of space not possible in the real world.

#VIRTUALMEDIA #NAVIGATION #SPATIALDESIGN



Non-euclidean tunnel



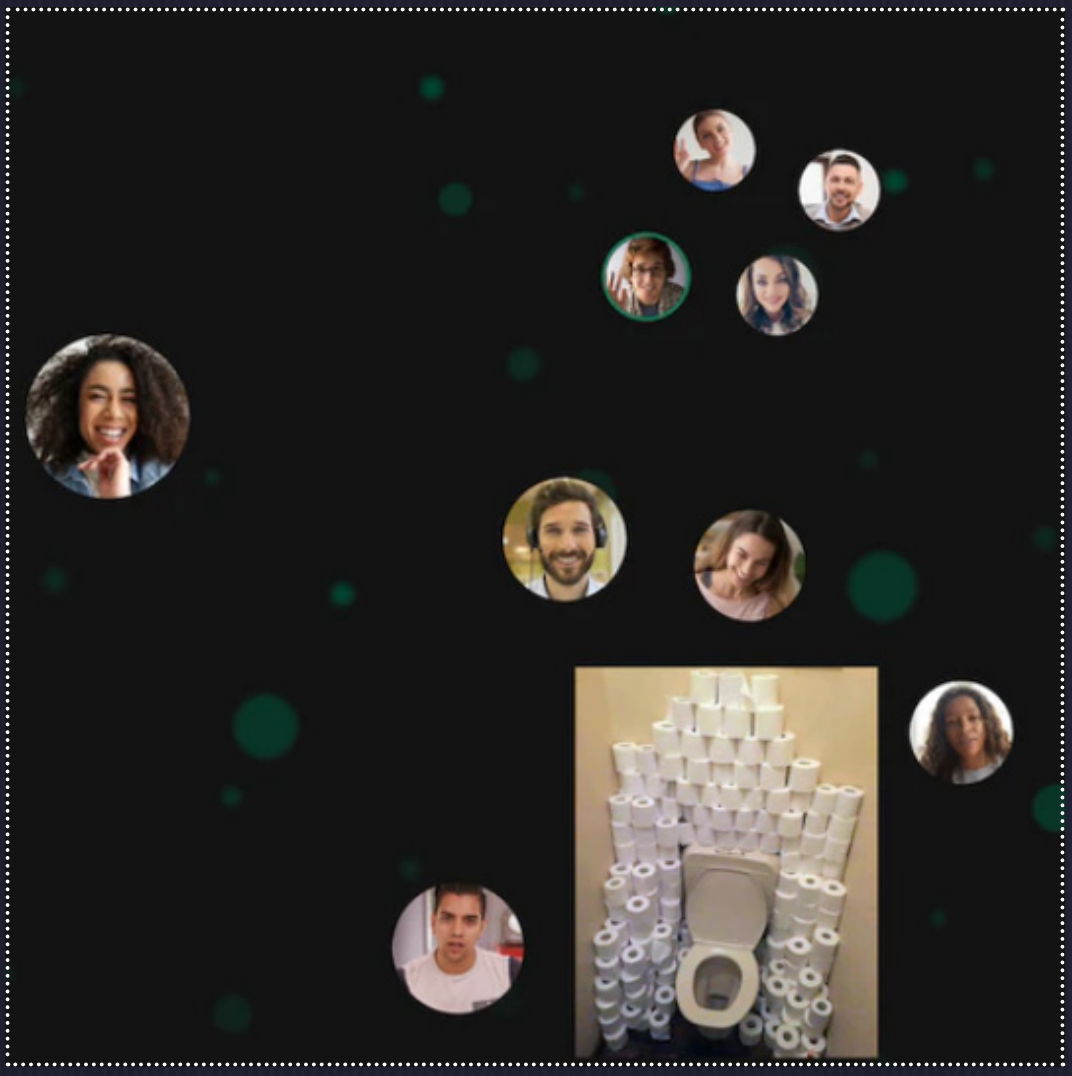
Space with 3 rooms in the shape of 4

SPATIAL CHAT

Spatial chat is a simple multi-user social conferencing tool, with the innovative premise of representing users as bubbles in a 2D space instead of as a regular list or panel of faces. Audio is then modulated by proximity to other users. This allows users to 'move' their avatar to associate with different groups and listen in on different conversations.

By providing a spatial dimension in an otherwise dimensionless virtual world, this simple 2D map allows for far more users to be in the same room and creates incentives for users to cluster together or spread apart depending on the nature of their interactions. This concept is highly applicable to VR spaces as most of the existing VR social apps have adopted a similar mechanism of modulating audio by distance, in imitation of the real world.

#VIRTUALMEDIA #SOCIAL #MEDIA



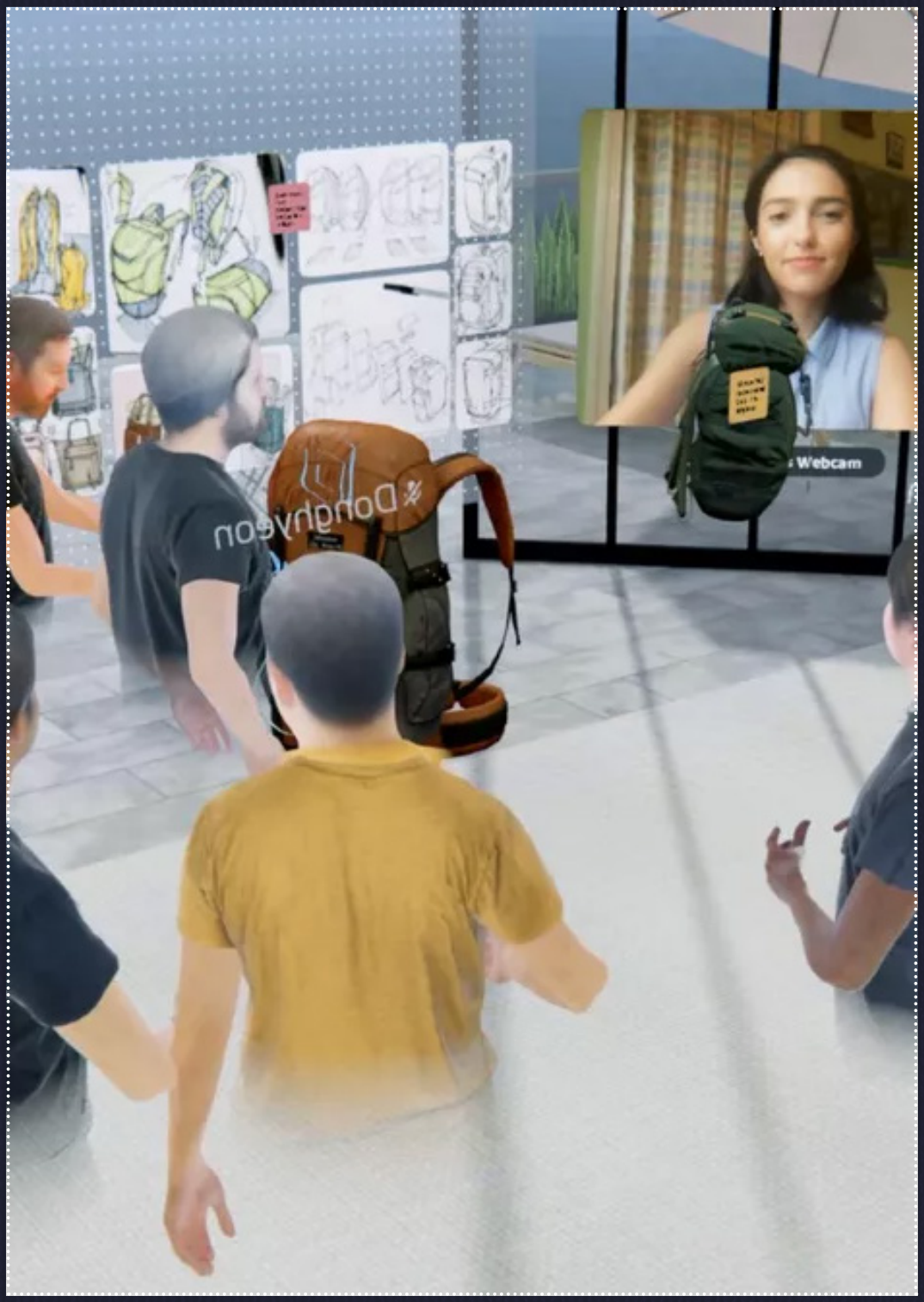
Screenshot of users arranged in 2D space with natural clustering into groups for discussion

SPATIAL

Not to be confused with “Spatial Chat”, Spatial is another company which is pioneering the use of cross-platform interactions, allowing users to connect to each other through different platforms such as VR, AR, or traditional webcams and voice chat.

Interesting to note is the “plug and play” approach, allowing users to select predetermined rooms and starting a discussion with ease despite the multiple platforms. The app also brings together an array of different media presentation formats such as video, images, and drawing, showcasing the potential of VR to facilitate discussions where different media are laid out in space rather than having to constantly switch between multiple tabs or windows on one screen.

#VRENVIRONMENTS #SOCIAL #MEDIA



Publicity image from Spatial, showing cross-platform interaction between users.