To Cuddle, Mingle, Venture, or Guide: How Architectural Affordances Influence the Experience of Social VR Places

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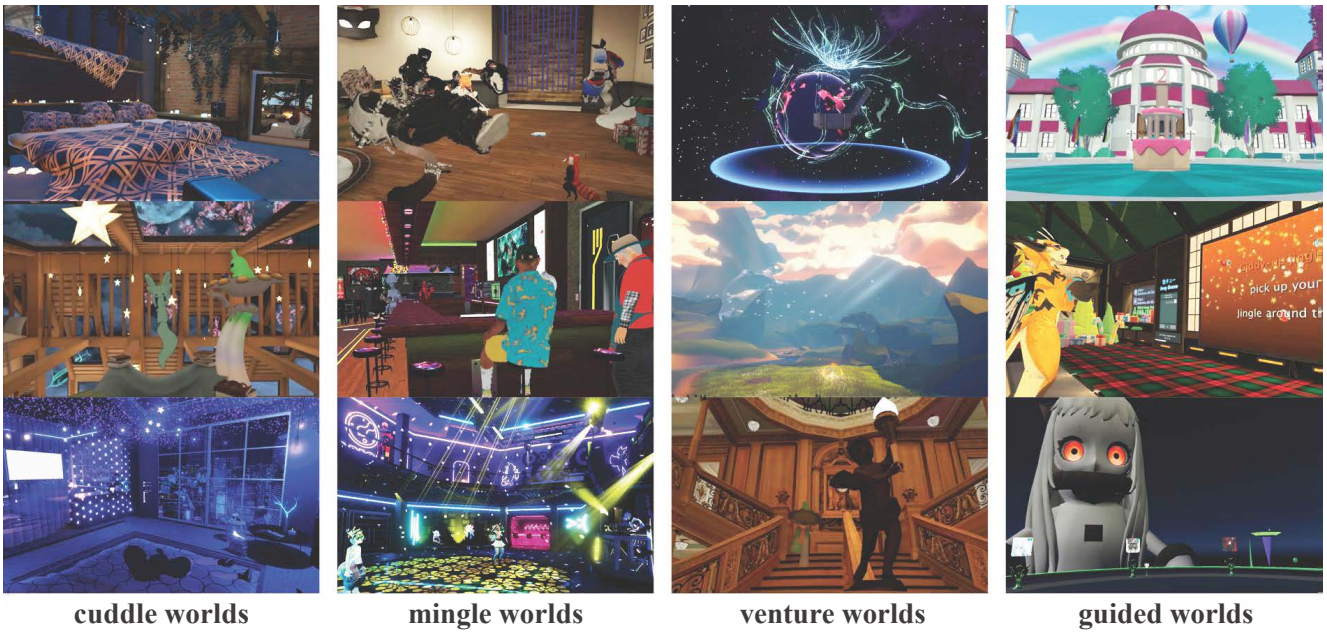

Figure 1: Screenshots of VRChat worlds where users cuddle with friends, mingle with strangers, venture into new worlds, or guide events for user communities.

ABSTRACT

Social virtual reality (VR) encompasses a growing network of three-dimensional virtual worlds where users interact in a shared, embodied way. While research has focused on the social interactions between the users themselves, less is known about how the design of virtual spaces influences these interactions. Our study combines interviews with 15 social VR users logging over 1,000 hours and a 20-hour spatial protocol of a purposeful sampling of VR worlds. We analysed how spatial characteristics (including proportion, sightlines, materiality, atmosphere, and navigation) influence meaningful user interaction to turn space into place. We synthesised four place types for a new social VR typology: Cuddle worlds that encourage cosy conversations; Mingle worlds that facilitate new encounters; Venture worlds that promote exploration; and Guided worlds that elicit a sense of belonging with the online community. By relating architectural affordances to social patterns, we contribute insights towards the purposeful design of social VR places.

*All authors contributed equally to this research.

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CCS CONCEPTS

• **Human-centered computing** → **Virtual reality**; **Empirical studies in HCI**; **Interactive systems and tools**.

KEYWORDS

Virtual Reality, Social VR, Architectural Design, Virtual Worlds, Virtual Environments, Annotation, Spatial Analysis

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1 INTRODUCTION

Virtual Reality (VR) has emerged as a compelling medium for immersive experiences, offering new possibilities for user engagement and social interaction [71]. VR transports us into digital environments that feel real, even though they often disrupt physical constraints like gravity or scale, expanding how we perceive virtual spaces and connect with each other [16]. Among its many applications, one of the fastest-growing trends is social VR, where users gather in real-time to interact, converse, experience, and collaborate in shared virtual worlds [11, 25, 59]. VR Chat is one of the most prominent platforms that demonstrates the breadth of social VR possibilities. VRChat hosts over 25,000 user-created worlds that support activities ranging from casual conversations [10, 60] to unique practices like group sleeping [78] or mirror-dwelling [28].

Despite the variety of social activities documented in prior research [19, 46, 47, 50, 73], the specific ways in which virtual spaces shape social interaction remain insufficiently understood. While architecture and evidence-based design show that physical spaces can profoundly influence human behaviour [43, 68], how these insights translate to virtual worlds require further investigation. In this paper, we leverage architectural design as a theoretical lens to investigate how virtual environments foster or inhibit social interaction, transforming ephemeral 'spaces' into meaningful 'places' [12, 61, 76]. In physical reality, this transformation occurs when individuals form emotional connections to a space by engaging in shared activities or establishing social bonds [67, 76, 77]. In social VR, this transformation adopts new dimensions due to the flexibility of virtual environments, which allow for dynamic adjustments to their appearance and interaction possibilities.

We conducted a three-part study to (**I**) identify a purposeful sampling of social VR worlds; (**II**) perform an on-site VR analyses of this sample; and (**III**) annotate their place characteristics. First, we conducted interviews with 15 intense social VR users – each logging over 1,000 hours – to gather in-depth perspectives on their social VR activities. Second, we entered social VR to perform first-person spatial analysis of how architectural affordances influenced user activity. Third, leaving VR, we annotated a collection of 1,158 screenshots to examine the place characteristics (space, activity, and atmosphere [53]) of these virtual worlds. We framed our research questions (RQs) accordingly:

- **RQ1:** How do architectural affordances shape user engagement in social VR?
- **RQ2:** How do VR spaces become places in social VR?
- **RQ3:** How do types of social VR places support patterns of social interaction?

Based on an architectural analysis of the collected verbal and graphical data, we present the framework for a new **social VR typology**, which studies the interplay of form (the architectural characteristics of virtual environments), activity (the social characteristics they support), and atmosphere (the emotional significance attached) to examine the transformation of social VR spaces into meaningful 'places'. Within this typology, we report on four **place types** that are functionally classified according to whether they are used to (1) *Cuddle*, (2) *Mingle*, (3) *Venture*, or (4) *Guide* in social VR [1]. Accordingly, we discuss how these place types may inform designers and VR content-creators alike, helping compare different virtual places and make informed design decisions. Nevertheless, acknowledging the evolving scene of social VR, we anticipate that additional place types may yet emerge with new functionalities.

2 BACKGROUND

2.1 What Do People Do in Social VR?

VR enables users to transcend physical boundaries, entering simulated or novel environments that replicate or exceed real-world experiences [71]. Beyond entertainment, VR now supports a wide range of activities, including socialising [51], dating [79], exercising [41], meditating [22], performing [27, 62], gaming [33], film-watching [37], and attending events [55, 63]. This evolution has transformed virtual worlds into spaces where everyday routines are reimagined. Social VR platforms like VRChat and Rec Room highlight this shift, offering immersive, multiuser environments where users interact in real-time through three-dimensional spaces [11, 25, 59]. Through leveraging immersion [70], embodiment [39, 72], and social presence [21], these platforms enable lifelike communication and engagement. As VR hardware becomes more affordable, users are increasingly forming communities and daily routines that blur the lines between virtual and physical worlds [51].

Recent work in HCI reflects the view of social VR as a developing "living space". Advances such as full-body tracking [60], customisable avatars [24], and user-generated worlds [31] enhance embodiment and interaction, allowing users to express themselves authentically or transformatively [25, 52]. These features help users build meaningful social ties, connect with like-minded communities [10], and maintain close bonds over distance [79], contributing to improved well-being [19] and stronger feelings of connection [18]. The reduced influence of physical-world norms in social VR often encourages bolder behaviours [3, 48]. Beyond replicating real-world activities, social VR enables unique practices such as social sleeping and mirror dwelling. Social sleeping involves users resting together in virtual spaces, transforming a typically private activity into a shared experience [46]. Mirror dwelling, where users interact through their avatars in front of virtual mirrors, fosters self-reflection and bold social behaviours [17, 28].

While these activities demonstrate VR's growing role in daily life, they raise questions about the long-term psychological and social effects of incorporating such practices. As social VR grows, it faces challenges similar to real-world spaces, including harassment,

[1] As a parallel to our social VR typology: a 'commercial typology' in architectural design includes building 'types' such as offices, stores, and restaurants, where people accordingly go to 'work', 'shop', or 'eat'.

toxic behaviour, and abuse fueled by anonymity and lack of consequences [5, 26, 66, 69]. Moreover, issues such as compulsive use, disrupted sleep, and weakened offline connections mirror those of social media and gaming [57]. Even though social VR offers new opportunities for interaction and self-expression, it also highlights the need for effective moderation, robust community guidelines, and further research into its broader impact on users' lives.

2.2 Where Do People Spend Time in Social VR?

Social VR platforms offer highly customisable virtual environments that support diverse user activities and interactions. Unlike physical spaces designed by trained architects, virtual environments are created by 'digital architects' [23]: a growing community of creators using platform-provided tools to design, script, and populate worlds [50]. Platforms like VRChat and RecRoom offer accessible world-building kits for game engines like Unity, enabling creators with varying expertise to build environments ranging from realistic urban settings to fantastical worlds [40, 73].

Yet while much research has focused on user behaviour in VR [46], the design, use, and experience of the virtual worlds themselves have received less attention. To this extent, many virtual spaces replicate physical environments, incorporating familiar elements such as rooms, corridors, and furniture [74]. This mimicry helps users orient themselves and feel comfortable by drawing on real-world spatial metaphors [50]. For example, virtual homes and lounges evoke feelings of safety and familiarity, helping users associate a space with a sense of place [36, 51]. Similarly, bars and clubs recreate physical designs, providing recognisable settings for socialising, dancing, or people-watching [10, 46]. Physical realism also supports functionality – users prefer navigating virtual spaces in ways that mimic real-world movement, such as using elevators or hallways instead of instant teleportation [9, 58].

However, unlike physical spaces, virtual environments are not limited by physics or materials. Instead, they allow for imaginative settings like floating islands, gravity-defying worlds [25, 33], or dynamic topographies [30, 32]. Moreover, supporting behaviours emerging specifically in social VR involves different design considerations from physical reality. For example, mirror-dwelling requires large virtual mirrors to operate, where multiple users can be reflected together [28]. Another example is social sleeping, where perpetual rain and soft lighting serve to elicit intimacy and comfort [78]. Importantly, social VR worlds adapt to varied social needs through 'public' and 'private' settings – a virtual feature that allows users to moderate who may access the world. Public worlds support unstructured activities like role-playing or people-watching [51], while private instances offer invite-only spaces for personal conversations or small gatherings, often customised to user preferences.

2.3 How does Virtual Space Become Place?

The transformation of space into place has been widely studied in architecture, social science, and HCI [14, 15, 20]. A space refers to a physical or abstract area that exists independently [13, 44], while a place emerges when personal, social, and cultural meanings are layered onto that space through individual actions and adaptation [20, 44]. Scholars identify three qualities that define place: spatial, situational, and subjective [29]. *Spatial* qualities involve physical attributes like layout, materials, and lighting. *Situational* qualities relate to context and activities, such as gatherings or performances. *Subjective* qualities stem from personal and cultural associations, shaping the emotional resonance of the space [29, 53]. In social VR, spaces become meaningful places when they transcend their role as mere backdrops and gain significance through user experiences and emotional connections [64]. This transformation follows similar principles to physical spaces but takes on new dimensions due to VR's flexibility and interactivity [50]. However, users in social VR, unlike inhabitants in physical reality, can freely customise their environment, bringing a new angle for taking ownership and becoming attached to a space through the cumulative customising of virtual objects, materials, and features over time.

3 METHODOLOGY

Our methodology follows three phases: **(I)** the purposeful sampling of social VR worlds; **(II)** the first-person VR site visits of this sampling; and **(III)** the graphical analysis of collected screenshots to identify architectural patterns in regards of their place characteristics (purpose, form, and atmospheric qualities). We chose VRChat as our focal platform due to its prominence in the social VR landscape [19, 78] and its capacity for user-generated content.

3.1 Phase I: Sampling of Social VR Worlds

We conducted in-depth semi-structured interviews with 15 participants, we refer to as 'intense' users, i.e. individuals who engage with social VR platforms frequently (daily or weekly) and for extended periods (at least 1,000 hours). This threshold reflects a significant commitment recognised within social VR communities as a marker of veteran users[2]. It also aligns with VRChat's ranking system, where achieving the 'Trusted User' rank requires 500–1,500 hours and a substantial social network[3].

3.1.1 Participants. Participants were recruited online through posts on Reddit and Discord servers and direct outreach in VRChat. Ages ranged from 18 to 60+ years (M=29). The sample included 10 male, 3 female, and 2 non-binary participants[4]. VRChat experience varied: 36% had used it for over 5 years, 36% for 2–5 years, 14% for 1–2 years, and 14% for 1–12 months. Regarding VRChat usage hours, 50% logged over 2,000 hours, 22% 1,000–2,000 hours, 21% 500–1,000 hours, and 7% 100–500 hours[5]. Participants used diverse setups to access VRChat: Valve Index with full-body tracking (50%), tethered Meta Quest (43%), and HTC Vive Pro (7%).

3.1.2 Interview Procedure. Twelve interviews were conducted in VRChat (one with two participants simultaneously), one via Zoom with screen-sharing in VRChat, and one on Discord through audio call[6]. Interviews lasted 2–3 hours depending on participant preference, and were conducted by two researchers. Sessions began in a private instance of the virtual world *Cuddle Me!*, chosen for its cosy

[2] https://www.reddit.com/r/VRchat/comments/q4v37t/sooo_the_dreaded_flex_how_many_hours_do_you_have

[3] steamcommunity.com/sharedfiles/filedetails/?id=3145786562#

[4] The majority of VRChat users are male. Therefore, our sample is representative of the community [65], aligning with gender ratios from similar studies such as work by [19] and [56].

[5] Some participants with under 1,000 hours in VRChat switched from other platforms, such as Altspace VR, after its closure.

[6] Technical issues prevented two participants from using VRChat on the interview day.

atmosphere, diverse spaces (e.g., living room, bedroom, balcony), and features (e.g., mirrors, drawing tools, and customisation options). Participants were introduced to the study's purpose before settling into their preferred seating. Many described this world as a personal favourite due to its comforting environment.

In this phase, we explored the lived experiences of intense social VR users through semi-structured interviews. Discussions revolved around participants' history and experiences with VRChat, motivations for active engagement, and types of activities. We asked about usage patterns, social interactions, avatars and identity, and the impact of intensive usage on their everyday. Many interviews included guided tours of their favourite virtual worlds. This flexible protocol allowed us to adapt conversations based on what each participant was sharing.

3.1.3 Data Analysis and Hypothesis generation. All interviews were video and audio recorded, transcribed using an AI tool, and manually reviewed for accuracy. Observational data, including field notes and post-interview reflections, were also collected. We used reflexive thematic analysis [7, 8] to guide the analytic process, focusing on how participants described the activities they engaged in, the virtual worlds they frequented, and the emotional and social significance they attached to these spaces. In early stages, coding centred on recurrent patterns in how users experienced and made sense of different environments, particularly the connection between space, activity, and atmosphere. Through collaborative discussion, we organised this material into three analytic layers: **(1)** *distinct virtual worlds* in VRChat, **(2)** their *spatial* and *atmospheric* characteristics, and **(3)** their hosted *activities*. We then enriched this analysis with metadata about each world, including creators' descriptions, frequency of mention, and whether the world was visited jointly during interviews. This process resulted in a dataset of 49 virtual worlds, summarised in Table 1.

Afterwards, we held two two-hour workshops to cluster the worlds into early place types. Drawing on the themes developed through our reflexive analysis, we grouped the worlds based on shared architectural patterns across participant narratives and spatial descriptions, resulting in four provisional categories:

- **Cuddle worlds**: Small, cosy, and intimate spaces fostering close social interactions.
- **Mingle worlds**: Larger, open spaces designed for socialising, people-watching, and social chaos.
- **Venture worlds**: Expansive spaces encouraging exploration, discovery, and immersive storytelling.
- **Guided worlds**: Structured environments supporting specific community activities.

The categories emerged directly from the interview data, with spatial and atmospheric characteristics serving to support and refine our understanding. For example, *Cuddle worlds* were consistently described as having small, enclosed layouts with features like oversized sofas and warm lighting, while *Venture worlds* were characterised by open terrain, hidden elements, and a sense of wonder. Based on the analysis, we purposefully selected 18 virtual worlds for observation for Phase II, as detailed in Table 2. The sampling aimed to investigate how spatial design shaped user behaviour across diverse place types.

We adopted a *qualitative* approach, focusing on a smaller number of worlds to allow in-depth investigation, and a *purposeful* sampling strategy, choosing worlds with diverse spatial characteristics rather than simply the most popular ones. For example, as both *Cuddle Me!* and *Moonlit Wanderings* featured cosy atmospheres, drawing tools, and nighttime settings, we included only one to avoid redundancy.

3.2 Phase II: Spatial Protocol of Social VR Worlds

We conducted a first-person **spatial protocol** of our sampling in a series of four, half-day workshops of approximately four hours duration, engaging with the virtual context through embodied participation and immersive exploration. Rather than a self-reflective or narrative-driven approach, our spatial protocol focused on conducting in-situ, design-informed analyses of virtual spaces, sharing methodological traits with the architectural 'site visit'[1], i.e. an inspection of a site's topography, context, demographic, etc.

In each workshop, the first two authors used Quest 3 headsets to enter VRChat, exploring 4-5 virtual worlds. Each world was visited twice. First, the **private** instance of the world was visited to observe its spatial characteristics. By 'private', we refer to creating a unique session of the virtual world accessible only by the researchers themselves and no other users, ensuring a *controlled* setting for discussion. During these visits, these discussions focused on the following five research objectives (ROs):

RO1 Proportions. Describe the dimensions and scale of the spaces. Are the proportions intimate (hosting a few people), spacious (allowing many people to join), or open (no end in sight)? How does this influence the atmosphere (cosy, social, or grand)? How do proportions support user activities?

RO2 Sightlines. Describe patterns in looking based on the spatial layout. When are the sightlines oriented towards other users, and how does the spatial layout support looking (proximity, directionality, vantage points)? When are the sightlines oriented towards the environment, and how does this support exploration (framed view towards path) or provide an overview of the whole space (view towards many spaces)? When are sightlines obstructed, and how does this support a sense of privacy?

RO3 Inside and outside. Describe the relationship between the 'inside' of a space and its wider 'outside' context. From the inside, where are the openings that lead towards the outside (skylights, open roofs, lack of doors)? From the outside, how do users approach the inside (distance, paths)? How does the representation of the outside support the environmental narrative (realistic like a city, fictional like a fantasy)? What story does this tell (a cyberpunk skyline narrating a science fiction future)?

RO4 Physical metaphors. Describe how affordances from physical reality are appropriated in VR space. How do the physical metaphors elicit specific material qualities (fabrics and softness, snow and coldness)? How do they communicate the purpose of the space (sofas for sitting space, bars for drinking space)? Are they used differently from physical reality and how so?

World Name	*No.*	*Vst.*	*Interview Description*	*Official Description*
The Black Cat	6	Y	chaotic, hang out, fun, mirrors	The Black Cat is a simple mirror world.
Cuddle me!	3	Y	cosy, comfy, drawing	A relaxing intimate space to destress
Murder 4	3	N	game, socialise with friends	A murderer is on the loose again!
Moonlit Wanderings	2	Y	cosy, drawing, moon & stars	Lay down and get comfy with friends
Popcorn Palace	2	Y	homey, watch movies	Intimate gatherings or quiet conversations
Trans Academy	2	N	speech therapy, make up, learn	Social space and peer resource center
Aero House	1	Y	pretty, homey, special	A luxurious, cozy hideaway
Cozy Apartment	1	Y	cosy, home	A small apartment overlooking Tokyo
Spirits of the Sea	1	Y	drawing, mirrors, comfortable	Updated 7-10-2024
Starboard Summer	1	Y	endless, floating, cool, explore	Cruise on a lake with your friends!
Sunset Bar - DVC	1	Y	hang out, drink, bartend	Sunset is a downstairs bar
Ice Skating at Night	1	Y	skating, chill, hang out	Ice skating at night in a forest
Kronii's Bedroom!	1	Y	experimental, replica, hololive	Almost 1 to 1 Kronii Bedroom
Nikbackgroundart	1	Y	exhibit, arty	Explore Art
Bounded H2	1	Y	experimental, crazy, cool	Hyperbolic plane, near-isometric
Particles	1	Y	music, hang out, vibe, relax	Particles go brrrrrrrr!
Hoppou Foundation	1	Y	raiding, ritual, interesting	Homeworld of the Hoppou Foundation
5 Pyaterochka Russian	1	Y	exciting, learning Russian	Russian-speaking community
Beyond a Bit	1	Y	pretty, explore, watch world	Stars and lives blossom beyond our reach
The Light of Digital Hope	1	Y	cool, beautiful, interesting	A beacon that shines a path
Peaceful and Chill	1	Y	jumping, explore, pretty	A place built with love and acceptance
New York RP	1	Y	role playing, simulation	RP with your friends in a city block
Antiheat's Apartment	1	Y	cool, explore, sci-fi	Santuary in a world where cozy is a luxury
Ramu's Gun Range	1	Y	fun, game	Take on challenges to beat your friends
Solar System	1	Y	explore, learn, understand	Solar System with accurate size ratios
Emerald Valley	1	Y	super cool, explore, jumping	Plenty of secrets to discover!
Steampunk Zeppelin	1	Y	beautiful, explore, jumping	A Steampunk Zeppelin in space
Titanic Survival	1	Y	explore, learn, interesting	Welcome aboard the luxurious R.M.S. T.!
Bingo 2000	1	Y	cute, game, role-play	Welcome to the Deirdre Memorial Bingo
Shiba Paradise	1	Y	experimental, memes, fun	Paradise for the Shibas!
Self Checkout Machine of Horror	1	Y	experimental, challenging	WELCOME TO VR-Mart!!
[Initial D] Myogi (Circuit)	1	Y	game	Myogi Circuit from Initial D Arcade Stage
NPC AI Proof of Concept	1	Y	experimental	testing AI NPCs
Temple of Heresy!!	1	Y	role-play, intimidate	-
Club Orion	1	Y	club, raving, social	full support for VR Stage Lighting
Sly Fest Beach	1	Y	festival, rave, interesting	Promotional world for Sly Fest 2021
Udon Bird Santuary	1	Y	fun, hang out, ducks	Come feed some ducks!
No Time Two Talk	1	N	game, random, socialise	Talk to random people for 2 minutes
Terra Cotta Valley	1	N	explore, share with friends	Perhaps your arrival brings it life anew?
Goodnight Sleep	1	N	relax, listen to music, draw	Added 98% darker mode for sleeping
Soft Sea of Stars	1	N	relax, cosy, drawing	A small relaxing home at sea with mirrors
Helping Hands HQ	1	N	learn, sign language	World used to teach ASL, KSL, BSL & LSF
Cozy Studio Home	1	N	small, compact, chill, home	A warm and cozy home
Furry Karaoke	1	N	sing, hobby, fun	Karaoke with a song queue system!
Among Us	1	N	game	A weird 3D recreation of the Skeld map
Terrors of Nowhere	1	N	game	A chaotic udon survival 'horror' game
Magnetize	1	N	explore, share with friends	Why not have some photoelectric fun?
Sanctum	1	N	club, dancing	-

Table 1: Sample of 49 social VR worlds elicited from our interviews.'No.' is a shorthand for the number of users who mentioned the listed virtual world. 'Vst.' is a shorthand for whether the virtual world was visited together with the researcher. Note that the 'Official Description' only includes an excerpt, if available, from the VRChat platform.

Place Types	*ID*	*Space*	*Description*	*World Name*
Cuddle	C1	penthouse	A relaxing intimate space to cuddle, hang out, and draw.	*Cuddle Me!*
	C2	multistorey	A cosy space to draw, mirror-dwell and hang out.	*Spirits of the Sea*
Mingle	M1	penthouse	A mirror world to hang out and meet new friends.	*The Black Cat*
	M2	bar	A downstairs bar to drink, get drunk, or serve patrons.	*Sunset Bar*
	M3	club	A club world to dance, perform, get crazy, or get intimate.	*Club Orion*
	M4	room	A game to "Talk to random people for 2 minutes!"	*No Time Two Talk*
Venture	V1	mansion	A social murder mystery game.	*Murder 4*
	V2	valley	A peaceful valley to explore and share with friends.	*Emerald Valley*
	V3	landscape	A dreamy landscape with a visual-musical performance.	*Beyond a Bit*
	V4	cruise	A simulation of the sinking of the R.M.S. Titanic.	*Titanic Survival*
	V5	neighbourhood	A recreation of a Russian neighbourhood.	*Pyaterochka*
Guided	G1	pavilion	A beautiful and relaxing space to meditate.	*Mushroom Cave*
	G2	pavilions	The official quest home world for a raiding community.	*Hoppou Foundation*
	G3	deconstructed	A world made for role-playing an evil despot.	*Temple of Heresy!!*
Hybrid	CG1	cinema	Cosy and comfortable rooms for home cinema.	*Popcorn Palace*
	CG2	karaoke	A comfortable space to have fun and sing as furries.	*Furry Karaoke*
	MV1	pavilions	Cruise between pavilions to explore and hang out.	*Starboard Summer*
	GV2	academy	A social space and peer resource centre for trans people.	*Trans Academy*

Table 2: Qualitative sampling of 18 virtual worlds from VRChat

RO5 Navigation. Describe how the orchestration of spaces influence the navigation. Where do users spawn in the VR world and what is it used for (lobby)? What are the affordances for guiding the user into the next space (form, light, signs)? To what extent do users have a choice where to go (are the paths linear, branched, labyrinthian, obstructed)? Are there secret spaces and why (exploration, exclusivity)?

Second, a **public** instance of the world was visited to observe how other users, if present, engaged with the space. By 'public', we refer to joining an existing session of a virtual world accessible by any member of the VRChat community, facilitating an *in-the-wild* setting. Here, we attempted to avoid discussing our research to engage more naturally with the activity taking place, partaking in the world narrative by singing karaoke or talking to the other users. Throughout the process, the researchers took at least five screenshots of each virtual space and video-recorded the session. As the virtual worlds differed in size and complexity, more time and screenshots were taken for the larger worlds. This resulted in a total of **1,158 screenshots** collected. Combining situated immersion with structured observation allowed us to study the interplay between virtual architecture and social interaction, while maintaining analytic distance from our own user identities.

3.3 Phase III: Annotation Protocol of Social VR Worlds

Phase III focused on analysing our collected screenshots to identify patterns in spatial, atmospheric, and behavioural characteristics. The same authors for the spatial protocol followed the annotation protocol, facilitating a holistic reflection on the place characteristics of the VR worlds. Rather than treating this phase as autoethnographic, we approached the task as an analytic visual method grounded in first-person observation. We combined screenshots with systematic annotation to externalise our interpretations, making spatial features visible in a structured format.

The protocol involved two steps. First, screenshots were clustered together based on similarities in the information conveyed, such as perspective, materials, forms, or the timing of the screenshot, as seen in Figure 2. Second, key screenshots were graphically annotated to highlight explicit spatial and atmospheric qualities, as well as exactly where interactions took place. Instead of providing abstract generalisations such as 'mirrors facilitate mirror-dwelling', the annotations described 'a small, enclosed room with a mirror fosters intimacy in mirror-dwellers in [world x]'.

Additionally, the VR site visits provided supplementary data on user interactions within public instances, such as how users engaged with the virtual space and the impact of interactive features – highlighting how virtual environments differed from physical spaces in terms of design and functionality. For the annotation, the following colour-coding scheme was used to summarise findings clearly:

- ★ **Avatars and activities.** In *blue*, articulate the presence of users, represented as avatars, and their activities. Annotate how the users use, engage, and inhabit the virtual space.
- ★ **Interactive features.** In *red*, articulate observations regarding the interactive[7] features of virtual objects or spaces. Outline or circle the feature and annotate what it is doing or how it is changing the virtual environment. Note whether these interactive features attempt to replicate (a collider to move a chair) or disrupt (a superpower to jump far) how people interact with physical environments.

[7]We refer to interactive capabilities such as a button used to toggle a mirror on and off.

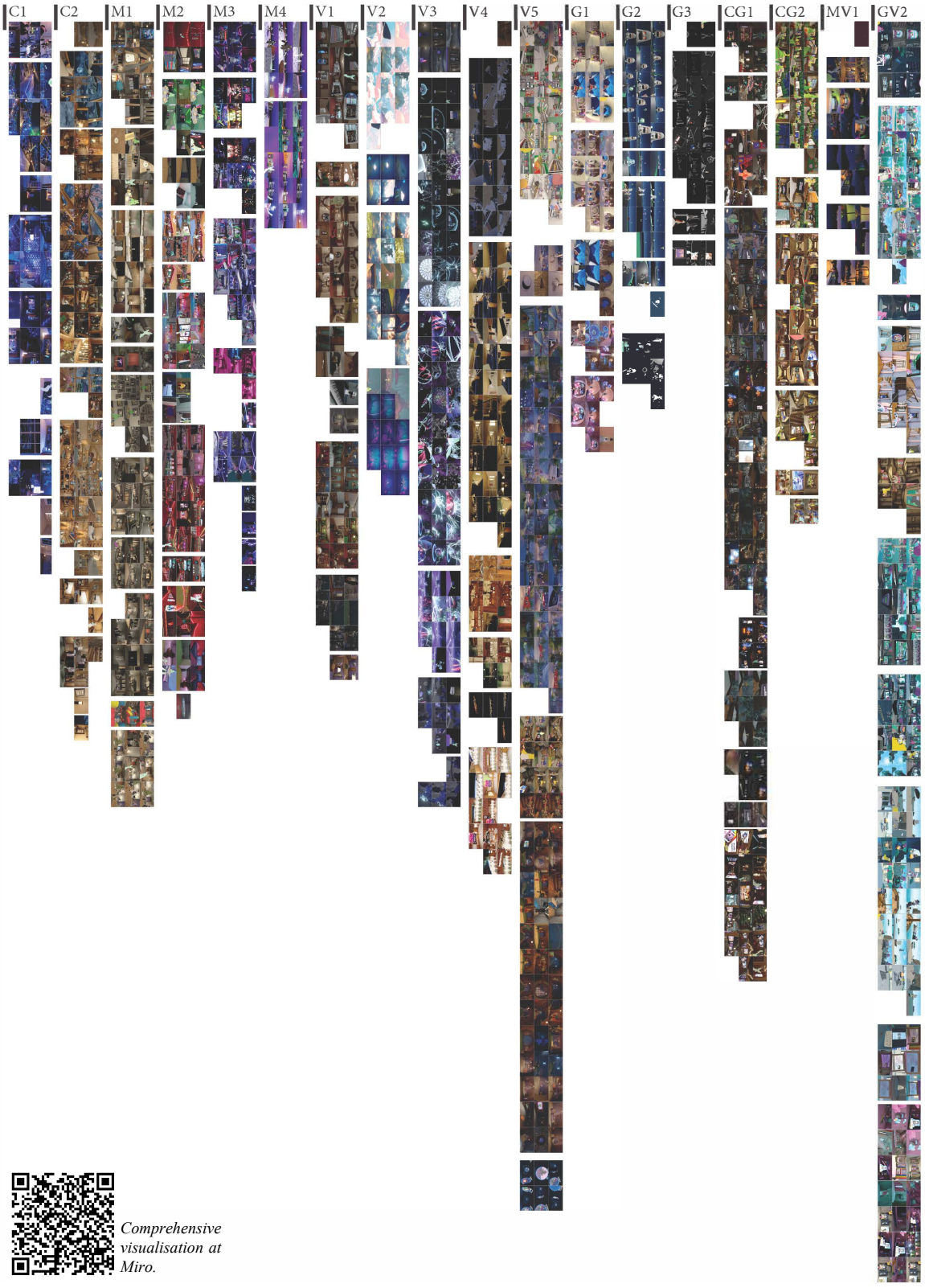

Figure 2: Clustering 1,158 VRChat screenshots according to similarities in perspective, materials, form & time.

★ **Sightlines and connections.** In *yellow*, articulate the sightlines between users and spaces or the connections between the inside and outside. Draw arrows showing the direction towards where users can see. Describe what users see – other users, interiors, or exteriors – and how this supports the world narrative. Note how connections are facilitated by framing views or providing vantage points.

★ **Environmental representation.** In *grey*, articulate general observations regarding the proportions, navigation, and physical metaphors – noting how these characteristics contribute to the perceived atmosphere. For proportions, outline where edges come together. For navigation, outline directionality, annotating how clear or challenging it is to travel between locations. For physical metaphors, circle or outline the virtual object and its use. For materiality, annotate the insinuated 'tactile' feel of the textures.

On a shared Miro board, we purposefully selected screenshots from their initial clustering based on the diversity of conveyed graphical information. The selection and annotation was performed twice: once by the first researcher and again by the second researcher, with the order of the researchers alternating based on the virtual world. This resulted in a refined selection of **200 annotated screenshots**, as seen in Figure 3 - Figure 6.

3.3.1 Synthesising Place Types. We synthesised the data to validate the preliminary place types. This phase integrated findings from all previous phases, evaluating how annotated observations confirmed or extended the insights gathered during interviews:

- **Interview data.** Participant insights were revisited to validate initial hypotheses about the activities, emotions, and preferences associated with each place type.
- **Spatial observations.** First-person spatial analyses provided detailed accounts of environmental features, which were cross-referenced with participant descriptions.
- **Annotated Visuals.** Graphical annotations identified recurring spatial design elements and spatial configurations, offering visual evidence to inform the categorisation.

This led to iterative discussions among co-authors to identify consistent patterns across activity, atmosphere, and space, informing place-making strategies in social VR. Additionally, new patterns emerged during the spatial analysis which were not part of our initial hypothesis, such as the significance of interactive features in shaping each of the place types. We subsequently validated these through going back to participant feedback and graphical evidence.

The synthesis also confirmed that the value of certain place characteristics were consistent across multiple data sources. A five-hour workshop was then held to review and finalise the place types, resolving ambiguities by focusing on each world's core purpose. When reporting the place characteristics, we organised our findings by atmosphere. This allowed us to articulate the relationship between multiple spatial characteristics, such as how intimate proportions and soft materials work together to elicit cosiness.

3.3.2 Positionality Statements. This study was conducted by researchers with complementary expertise: two researchers with a background in architecture, one of which also has a background in game design, two researchers specialising in XR, and one in designerly HCI. The architectural and game design background informed the analysis of spatial characteristics, emphasising proportions, sightlines, and materiality in relation to user engagement. The XR expertise shaped the focus on technological affordances, immersive features, and platform-specific dynamics. The HCI perspective centred the study on user experiences, ensuring a strong connection between spatial design and social practices. Together, our perspectives influenced every stage, from the framing of research questions to the synthesis of findings, allowing for a comprehensive and balanced interpretation of social VR worlds.

4 PLACE TYPES IN SOCIAL VR

We report on four **place types** of social VR: **1)** *Cuddle*, **2)** *Mingle*, **3)** *Venture*, and **4)** *Guided*. For each type, we present the relationship between user activities and space, graphically illustrated through annotated figures (Figure 3 - Figure 6) and textually supported with participant quotes. Importantly, while each place type is defined by a set of *distinctive* interactive, spatial, and atmospheric characteristics, some virtual worlds blend key features from multiple types, resulting in a **hybrid** classification. Here, we use (w=...) as a shorthand to refer to the number of virtual worlds correlated with a specific place type, and each virtual world is referred to by a unique ID, as denoted in Table 2. In terms of participant interviews, we refer to a specific participant using the notation (P1-P15).

4.1 To Cuddle

The *Cuddle* place type (w=4) is characterised by activities such as cuddling, drawing and sleeping, and are purposed for close relationships. They are *proportionally* small to encourage lingering, *spatially oriented* to encourage sightlines between users, and *atmospherically* cosy. Mirrors are often located within its cosier corners to support intimate conversation through mirror-dwelling. In terms of *lighting*, they typically feature dim, warm light in the interior, with colder blues in the exterior. Notably, they disrupt *physical metaphors* to feature proportionally large sofas and beds to afford cuddling or lying. Other distinctive objects, such as an abundance of fabrics, fairy lights, water features, and framed views to a beautiful, tranquil outside often characterise these worlds.

4.1.1 Cosy. A 'cosy' quality evokes softness, warmth, and enclosure, eliciting a willingness to linger and fall asleep. Small proportions elicit cosiness: *'It's just a nice little condensed sort of house. I just enjoy it because it's small and compact.'* (P14). C1 is penthouse with multiple small rooms, just large enough to fit a single bed, sofa, or carpet. C2 is a multistorey house subdivided by numerous interior partitions. Despite these partitions, none of these rooms are fully enclosed, and no doors exist to block off access between users, allowing for users to see and be seen by others in the environment.

Cosiness is thus associated to a sense of security, facilitated by nooks where users can hide but also look towards others. These 'nooks' refer to small, recessed, partially enclosed spaces. For example, C1 has a darkly illuminated, partially hidden nook behind a wall partition, where users pick up interactive pens to draw three-dimensional sketches. P2 describes, *'I'll just like put myself in a corner and just be drawing'*. As these nooks are only partially enclosed, they provide sightlines towards other users (C1, C2), supporting

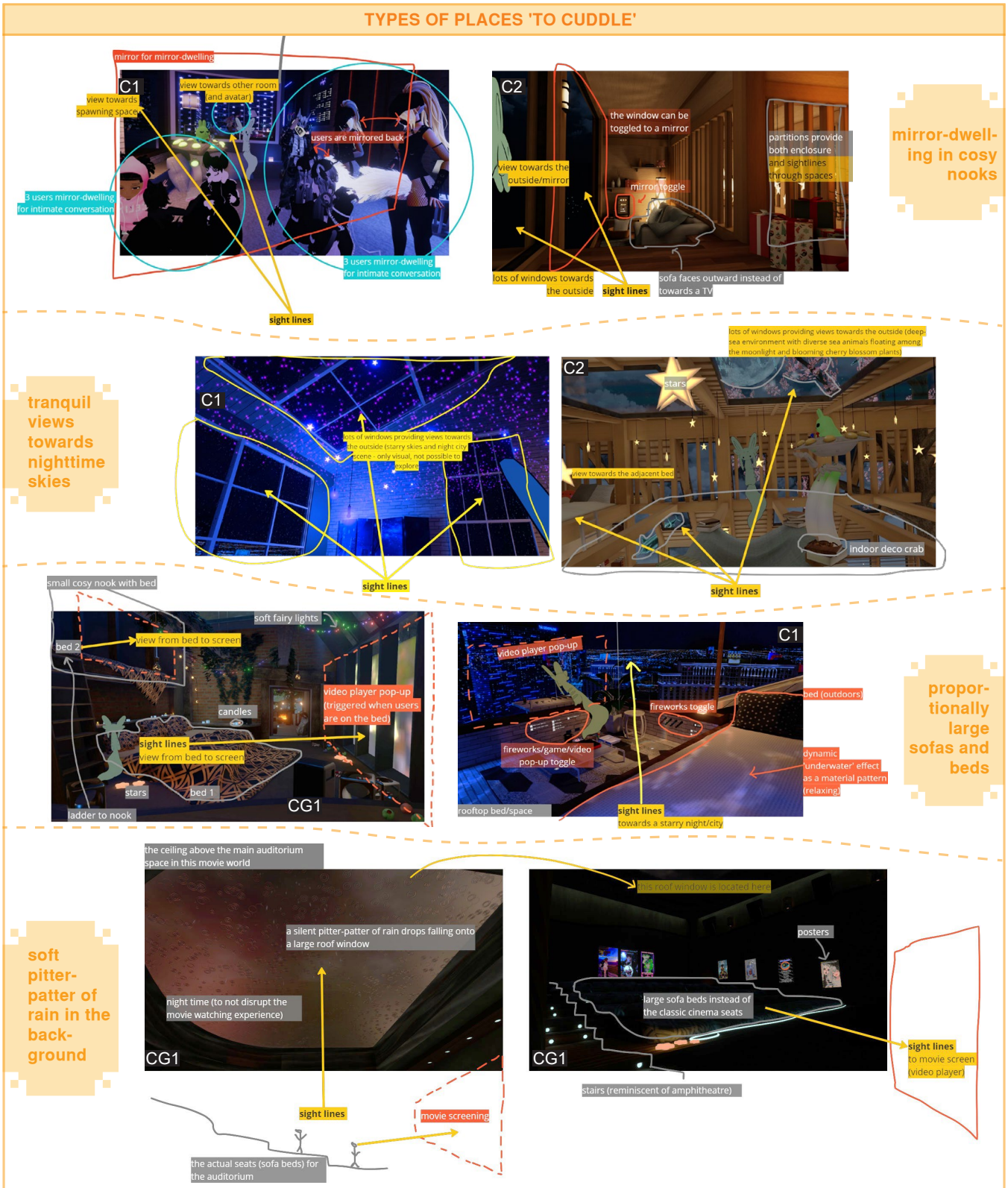

Figure 3: Cuddle Place Type: annotated screenshots from social VR worlds C1, C2, and CG1.

'drawing, just 'cause there's a lot of people here' yet feeling safe because cosy worlds are typically populated by *'friends'* (P2). With bidirectional sightlines, spectators could also *'see people drawing things in 3D and [think] it was absolutely fascinating'*. Drawing thus fulfils a social function, where *'drawing was one of the best mediums to communicate with people, even though you're not talking'* (P12).

Cosiness is also characterised by perceived warmth. While the outside of cosy worlds feature cold, nighttime environments (C1, C2, CG1, and CG2), they are softly illuminated from candle light, fairy lights, and fireplaces. This contrast between cold outside and warm inside accentuates the feeling of cosiness when inside the virtual building. Warmth is further evoked through physical metaphors such as fabric textures and natural materials, which do not virtually exude temperature but draw upon their real-life associations for softness and warmth. C1 has large carpets and stuffed animals, C2 has wooden floors and blankets, and all cuddle worlds have beds and sofas that are both proportionally larger and unusually located compared to their real-world counterparts. For example in CG1, a world architecturally similar to a cinema, the spaces were populated with beds instead of seats. P9 describes: *'you're in a place where you're at home, where you could can do it yourself, and it feels very natural (...) watch it laying down (...) put your feet up on stuff, and sit exactly how you want'*.

Importantly, cosiness is associated with the concept of a 'home' (P5, P9), a place to come back to repeatedly and anchor a user's experiences within the myriad of worlds. P14 states, *'This here is my first and only home world that I ever set. In VRChat, you probably still have the VRChat standard home, but you can set one world as your home world, where you're spawning every time you start the game. This has been my home world since four years (...) this is also probably the world I spend most of my time on.'* Similarly, P5 and P6 selected C1 as their home world, explaining that *'I just really like comfy worlds'* (P5) and *'It's a very cosy world'* (P6). P9 and P10 frequently revisit a different world, CG1, for its homeyness – *'the same principles still apply with it being homey and everything, we still love it'*. We observed that cuddle worlds shared many characteristics with domestic architecture, such as the multistorey home (C2) or penthouse (C1), which includes living rooms, bedrooms, and smaller nooks. However, these worlds rarely featured bathrooms, kitchens, or storage rooms – parts of the real-life home but not the VR home.

4.1.2 Tranquil. A 'tranquil' quality evokes relaxation, eliciting calmness, serenity, and an appreciation for the ebb and flow of time. Many cuddle worlds employed gently floating particle and texture effects to this effect. P2 describes, *'There's also a lot more particle based worlds (...) that feel cosy and relaxing to be on. Stuff with colours, dark lighting...'*. Similarly, C1 includes a bedroom with customisable particle lights drifting along the ceiling, where the user can select between different particles or movement. Cuddle worlds often also feature customisable textures, where C1 allows users to place rippling water effects as though the space is submerged underwater. These effects are only visible to the customiser, preventing the customiser from disrupting others in the scene through sudden change.

Moreover, tranquillity is supported by the narrative of the outside environment – *'a big freaking moon and stars and everything that's just very calming to visit'* (P2). C2 features a surreal nighttime sky with a full moon and sea creatures slowly swimming through the clouds, and CG1 portrays a winter nighttime forest with snow gently falling atop its leaves. Numerous and intermittent sightlines – through windows, skylights, and balconies – allow users to look towards the tranquil outside. Notably, cuddle worlds often employ features associated with water. This includes aquariums nearby the lobby space (C1, CG1), a water wall (C1), or rain (C1, CG1). CG1 has a cinema room where the entire ceiling is a window, displaying the gentle pitter-patter of rain against the glass – visible when users choose to lie down, cuddle up, and stare upwards in relaxation. Yet tranquillity is not only supported with visual cues but also auditory cues. P2 describes, *'Good Night's Sleep is another one that I really like, just 'cause the music is very relaxing to draw to.'*

Mirror-dwelling supports relaxation in cuddle worlds, and *'you'll find [that] anywhere in this game where it's meant to be a relaxing place will have a mirror by it.'* (P3). In C2, a cosy couch faces a large window, which can be triggered into a mirror and allow mirror-dwelling. In C1, a small room with a cosy rug also features a mirror, where three small groups of avatars cluster together for conversation. Like particle effects, mirrors can only be triggered by the customiser and cannot be seen by others, mitigating disruption to the tranquil atmosphere. Interestingly, this asymmetric visualisation creates a visual cue where observing multiple avatars staring at a wall – instead of each other – indicates that the process of mirror-dwelling is ongoing. P3 mentions, *'I just assume there's a mirror here, there probably is, um I haven't turned it on though.'*.

4.2 To Mingle

The *Mingle* place type (w=5) involves activities such as bartending, dancing, and mirror-dwelling, facilitating socialisation not only between friends but also strangers. They are *proportionally* open to encourage mingling between adjacent areas, *atmospherically* chaotic, and *aesthetically* sleek. They often feature a large atrium space with vantage points guiding sightlines towards other users, supporting people-watching through their *spatial orientation.* Notably, they may contain 'jails' for moderating disruptive user behaviour, as the chaotic nature of these virtual worlds are delightful to watch but also prone to nuisance. They are characterised by neon lights, bars, underground areas, VIP rooms, or drinking games.

4.2.1 Chaotic. A 'chaotic' quality evokes energy, messiness, disorder, but also fun and interest. P3 describes M1 as being *'questionable at best, but sometimes you find a gem in that.'* Compared to the other place types, mingle worlds are notable for their public instances rather than their private instances, as they facilitate meeting new and diverse types of people, and *'because chaos can be fun to watch sometime'* (P3). P2 describes public instances as more chaotic than private instances, attributing it to their demographic – *'in public worlds, that leaves the kids, that leaves the trolls, that leaves the hackers.'* The diverse demographic affords diverse social interactions, ranging from meaningful conversations to disruptive behaviours. For example, M1 enables moments of serious discussion despite the surrounding disorder. P3 recounts, *'You kind of have this feeling where you're having a serious conversation, and then someone runs up to you, swears, tells a joke about your mum, and then runs off.'* This juxtaposition creates a dynamic environment where users experience a chaotic mix of connection and disruption.

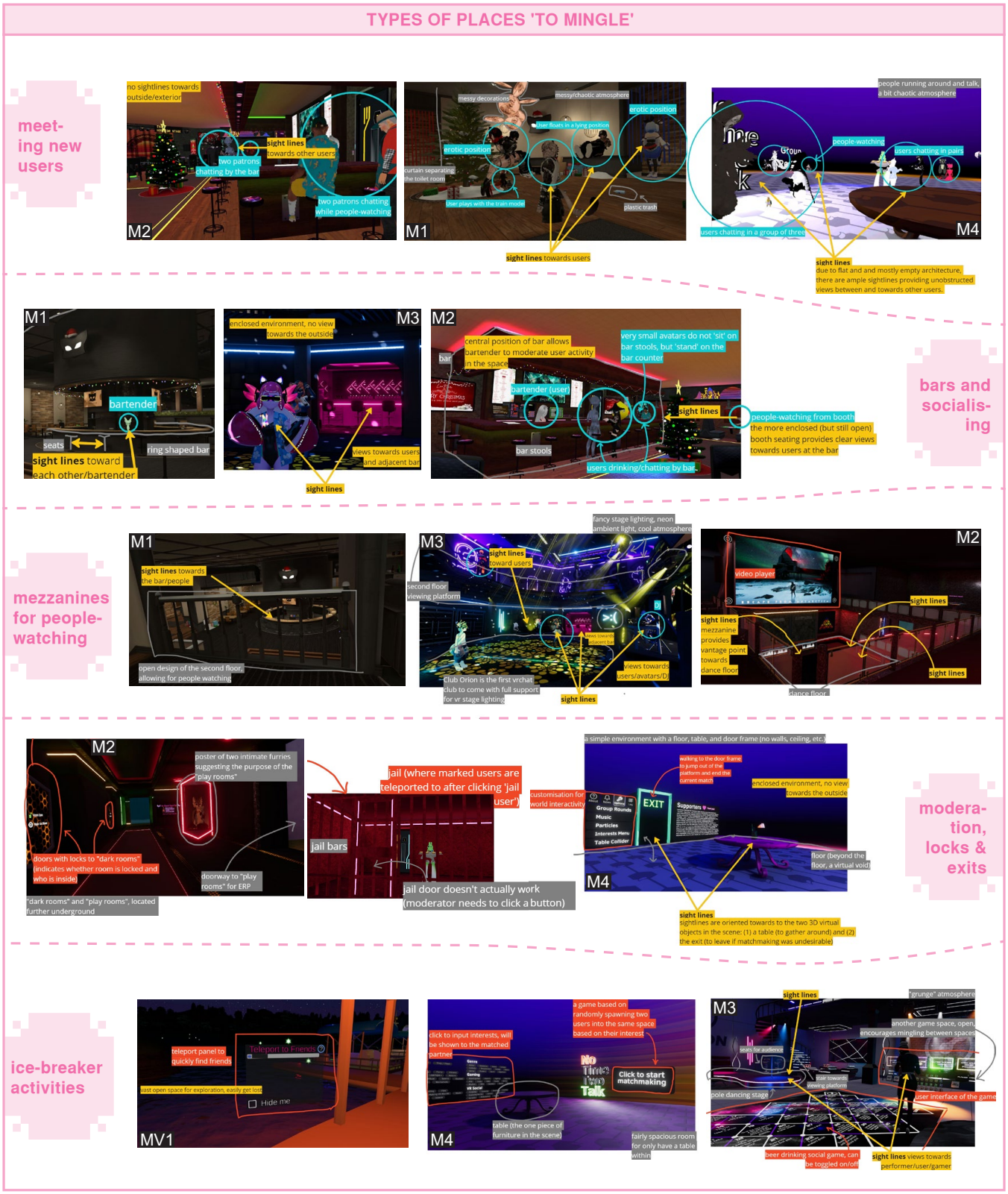

Figure 4: Mingle Place Type: annotated screenshots from social VR worlds M1-M4 and MV1.

Mingle worlds are thus characterised by spaces that facilitate meeting new people. One approach uses semi-open spaces with spacious proportions, with many interconnected zones that allow users to easily move back and forth between different spaces and therefore people. M1 has a spacious central atrium surrounded by second-floor vantage points, facilitating people-watching: *'Sometimes I like to just go in there and people watch, because I do find it interesting and fun'* (P9). Similarly, the dance floor in M3 and M2 are also atrium spaces with second-floor vantage points, providing sightlines towards avatars dancing to the DJ set. Another approach gamifies the socialisation between strangers – M4 automatically matches two users together in a small, simple room with only a floor, floating text, and no walls or ceilings. A single table exists in the centre, with not much to see or do except talk with the other user. After two minutes, each user is matched with a different partner, and the rounds continue until the final round, where the floor space expands and all users are spawned into a shared space.

People-watching, motivated by the delightful chaos of mingle worlds, is facilitated by mirrors and mirror-dwelling. M1 has *'three mirrors in that world. If you go to a busy [instance], there will be groups of people at all three of those mirrors. There'll be someone probably throwing drinks at someone, there'll be someone swearing, there'll be a kid saying language that you would not want to hear.'* (P3). Compared to cuddle worlds where mirrors are located alongside cosy nooks, mingle worlds have mirrors located in larger, more interconnected spaces, providing overarching views towards users both close and distant. In both M1 and M3, the mirrors are located alongside the main atrium space, allowing users to not only people-watch from vantage points (such as mezzanines) but also from the mirror reflections. P3 highlights the use of mirrors to mediate conversations: *'if you're just having a conversation, a lot of people like to put up a mirror and then all stand looking at the mirror, at each other in the mirror.'* Notably, as mingle worlds are used for meeting or observing people, their spatial layout offer few sightlines towards the outside environment. M2, M3, and M4 do not have any windows or openings that provide views to a wider outside.

Due to the chaotic demographic, mingle worlds are prone to harassment or negative experiences. P2 describes M1 as *'a world that's decent for hangouts, but at the same time, I'd say it's more prone to toxicity than a lot of the other more common ones'*. Thus, some mingle worlds offer moderation features to mitigate or avoid nuisance. For example, M2 provides a night club setting where visiting users must queue in front of a security booth, which is moderated by the owner of the world instance. The moderator asks for the age of the user before admitting access to the bar and dance area. Moreover, the moderator has special privileges to forcibly respawn a disruptive user into the 'jail', a red room with bars (M2). M4 employs a different approach, where a nearby 'exit' doorway allows the user to quickly escape unpleasant social interaction without accessing their pop-up menu screen.

4.2.2 Cool. A 'cool' quality evokes a classy, futuristic, and sleek look. Mingle worlds are characterised by neon lights, dim lighting, shiny surfaces, and black accents in their interior design. M1 is a spacious penthouse with an open layout, with minimal partitioning, tall ceilings, and black walls. M2 features a bar with black accents, while M3 and M4 has glossy dark surfaces lined with colourful, neon lights. M3 has a dedicated special effects system for vibrant and dynamic lighting for clubbing. P5 describes this *'cool and fleshed out'* atmosphere accordingly: *'it's very neon, it's very nice, like a neon city, and you can explore everything'*. Moreover, some decorations are customisable, and users find novelty with the seasonal options: *'You can change the way the world feels. So you can put on Christmas mode, Halloween mode, any other mode'* (P3).

Users are drawn to mingle worlds because they can easily find someone to socialise with. As P15 explains, *'Club Orion, that's a public club. There's like almost always someone inside, so that's where people go.'* Icebreaker activities for socialising include drinking at the bar (M1, M2, M3), clubbing (M2, M3, MV1), pole-dancing (M3), and playing pool games (M2, M3). In M2, a user – who takes bartender shifts – serves drinks to other users standing at the bar. As the drinks are virtual and do not contain alcohol, the virtual drinks simulate the disruption of cognitive states through changing colours or wobbly display perspectives. P7 explains, *'depending on how strong that alcohol or that drink itself was, it will change some colours. It will make your screen wobble around, as if you just spun around for like 10 minutes straight.'* Moreover, the drink name often also serves as a conversation-starter. P7 describes, *'most of the time, it's gonna be either some meme drinks like the rubber rat (...) or game references like uranium fever.'*

4.2.3 Sensual. A 'sensual' quality evokes intimacy, allure, and a sense of exclusivity. This quality is elicited by dark lighting, enclosed private spaces like VIP rooms and playrooms, and design elements that encourage close, personal interactions. Similar to cuddle worlds, mingle worlds occasionally feature large beds and small room proportions; however, their purposes and atmosphere differ. In M2, the furniture resembles human-scale cat trees, with a sign outside designating the room for furry erotic role-play. These play rooms are positioned away from the main activity areas, creating secluded zones that cater to more private and intimate interactions. In M2, the dark rooms have a display showing the username of their current occupant, and a lock symbol indicating whether other users can join. However, it is important to note that participants reported concerns about inappropriate sexual behaviour in public virtual spaces. P7 describes: *'Yeah, the traumatising part was literally me going into a public instance of Black Cat and just hearing moaning and stuff like that in the vents.'*

4.3 To Venture

The *Venture* place type (w=7) involves activities such as world-hopping, exploring, following a narrative, and – on a metalevel – sharing the experience of the world with others. They are *proportionally* large to encourage exploration, *spatially oriented* to direct sightlines towards the environment, *atmospherically* extraordinary, and often make *navigation* more challenging by embedding hidden rooms inside the virtual scene. They often empower the users with supernatural capabilities to better engage with the virtual environment, such as 'double-jumping' through difficult terrains or 'respawning' whenever the avatar 'dies' from falling off a ledge.

4.3.1 Marvellous. A 'marvellous' quality evokes a sense of awe, novelty, and delight, encouraging users to explore and immerse themselves in extraordinary environments. This quality is elicited

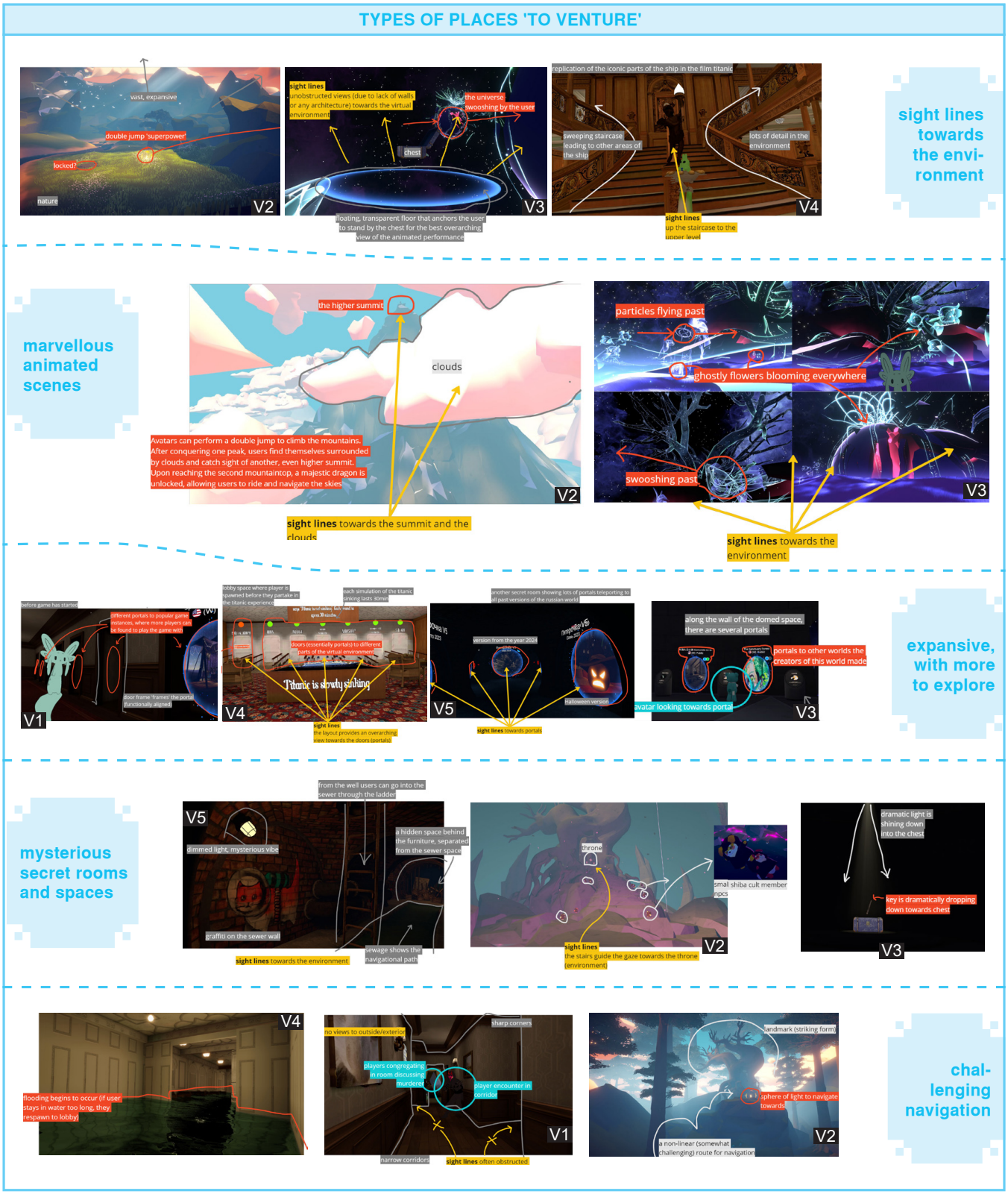

Figure 5: Venture Place Type: annotated screenshots from social VR worlds V1-V5.

through large proportions, expansive views, and interactive elements that offer surprising and visually stunning experiences. V2 features a peaceful valley, cradled by sweeping mountains and crowned by boundless, drifting clouds. V4 features a detailed, neoclassical recreation of the interior design of the *Titanic*, and V5 provides delightful detail over the supermarket products sold at a neighbourhood convenience store. V3 captivates users with its otherworldly landscapes of purple meadows and gigantic ghostlike plants that dynamically grow. P11 even switched into a smaller avatar to experience the expansive virtual environment through the unique perspective of a Lilliputian-scaled being: *'It's really nice to place a small character and sit in the grass, mm-hmm.'*

Compared to cuddle or mingle worlds, venture worlds offer a wider range of traversing the environment than walking or teleporting. For example, MV1 features a series of pavilions located in a vast lake. Users can navigate the world via swimming or sailing, encouraging users to further explore the space. P13 describes, *'We were speeding around, and there are sailboats further out. And there's an island that you can ride the boat over to (...) it's endless, but it's just beautiful.'* In V2, walking into a glowing orb allows the user to *'jump really high'* and better explore the expanse, quickly traversing over valleys and mountains. The large proportions create a sense of distance that continually encourages the user to explore further – *'So you see that mountain over there? Mmm, yeah. There's a giant seahorse thing that we could climb. Yeah, but I think we need to get a fourth [orb], I do want to show you the giant dragon.'* (P12, V2). However, this expansive scale often makes it challenging to locate other users. Unlike cuddle or mingle worlds, socialising in venture worlds often occurs outside the experience, where users find and share virtual worlds to explore with their friends and community – *'my friend loves exploring those kind of worlds and finding them, just to share them with the people'* (P2).

Venture worlds may be specialised for a narrative experience. For example, V4 provides an immersive 30-minute simulation of the Titanic event. P11 explains that *'you just experience Titanic yourself. It's a world where you are on the Titanic, trying to escape if you want to, and on the background it will tell you what happened that day, how it worked, how, at what point, the Titanic broke and stuff like that.'* If users do not escape the flooding in time and become submerged, they experience an 'avatar death' and respawn in the lobby space, where a series of portals represented as doors provide access to the next un-flooded area of the cruise. The angle of the cruise as it continues to tip over causes the floors to become slides, triggering the user to slip into the water. In contrast, V3 offers a *'beautiful performance'* (P11) where an artistic animation sequence unravels in tune with the music. First, ghostly flowers grow and bloom within a church, spreading across its surfaces until they crack and burst open the ceiling, revealing a surreal outer space environment where planets and spirits zoom by. A floating, transparent floor is the only thing that remains of the church, providing unobstructed views towards the floral, galactic performance.

Nevertheless, unlike cuddle worlds where users visit repeatedly, venture worlds are often *'just a one time visit'* (V4, P11). As venture worlds focus on marvel, repeated experiences likely reduce their novelty – that is, until the next update in the virtual world and there is more to be explored. P9 explains, *'I usually look at my list of worlds that I already have to see what's been updated, 'cause I have worlds I like and I like to see what's changed (...) I'll want to tell him, Hey! They added this! Or you know, I want to go explore this!'*.

4.3.2 Mysterious. A 'mysterious' quality evokes curiosity, intrigue, and a sense of discovery, inviting users to uncover hidden secrets and navigate through layered and challenging spatial layouts. For example, V1 features steep precipices, V5 includes labyrinthian underground waterways, and V4 has a time limit for which parts of the virtual environment may be explored. Mystery is further elicited by obstructed sightlines, which hide rooms and users, creating a sense of curiosity. Both V1 and V5 feature numerous 'locked' puzzle spaces that require a specific action or location to unlock.

In terms of challenging navigation, V2 is embedded with hidden events that can only be unlocked through specific sequences of actions. P2 explains that *'there's a couple of things you have to collect so that you can double-jump and then triple-jump. And there's this really big mountain that you can climb all the way up and you'll see like a dragon flying around.'* In V5, walking on a discrete manhole cover opens up an expansive and complex sewer network lined with graffiti, hiding nooks where users can discover storage units, underground living rooms, garages, and eventually stumble upon a corridor lined with portals towards seasonal versions of the same world. However, these challenging spatial layouts, which require exertion and mental discovery, also risk the possibility of getting lost and frustrating the user.

Notably, challenging navigation and obstructed sightlines can make venture worlds conducive for play. For example, V1 is a mansion with narrow corridors, obstructing sightlines through dim lighting and sharp corners, and facilitating the gameplay of ambushing users. While mingle worlds provide clear sightlines to other users to encourage social interaction, venture worlds obscure sightlines and employ challenge as a catalyst to search for other users in the environment. Indeed, playing games serves as a way to socialise between friends. P2 explains, *'I guess that's really the ultimate point (...) I'll play some games when they're fun and I like interacting with friends.'*

4.4 To Guide

The *Guided* place type (w=5) involves activities such as learning, meditation, raiding, or any other structured event associated with a specific community in social VR. These worlds are *spatially oriented* to direct sightlines towards the user or object guiding the activity. They tend to be *atmospherically* serious and facilitate *navigation* to inform community members where to go once they arrive in the world. Mirrors are uncommon, as they detract focus from the activity guide, and *spatial hierarchies* are used to distinguish the guide from other members or objects of interest in the environment.

4.4.1 Serious. A 'serious' quality evokes a sense of purpose, focus, and belonging, creating an atmosphere that supports structured, community-driven activities. For example, GV2 serves as the peer resource centre for the trans community in VRChat, with *'an entire group, a group leader and everything, and their goal is for people who are transitioning'* (P9). GV2 replicates a dormitory environment where usernames are written on placards above portals leading to the community members' personalised 'dorm room' worlds. Similarly, G1 is one of the virtual worlds used for guided meditation,

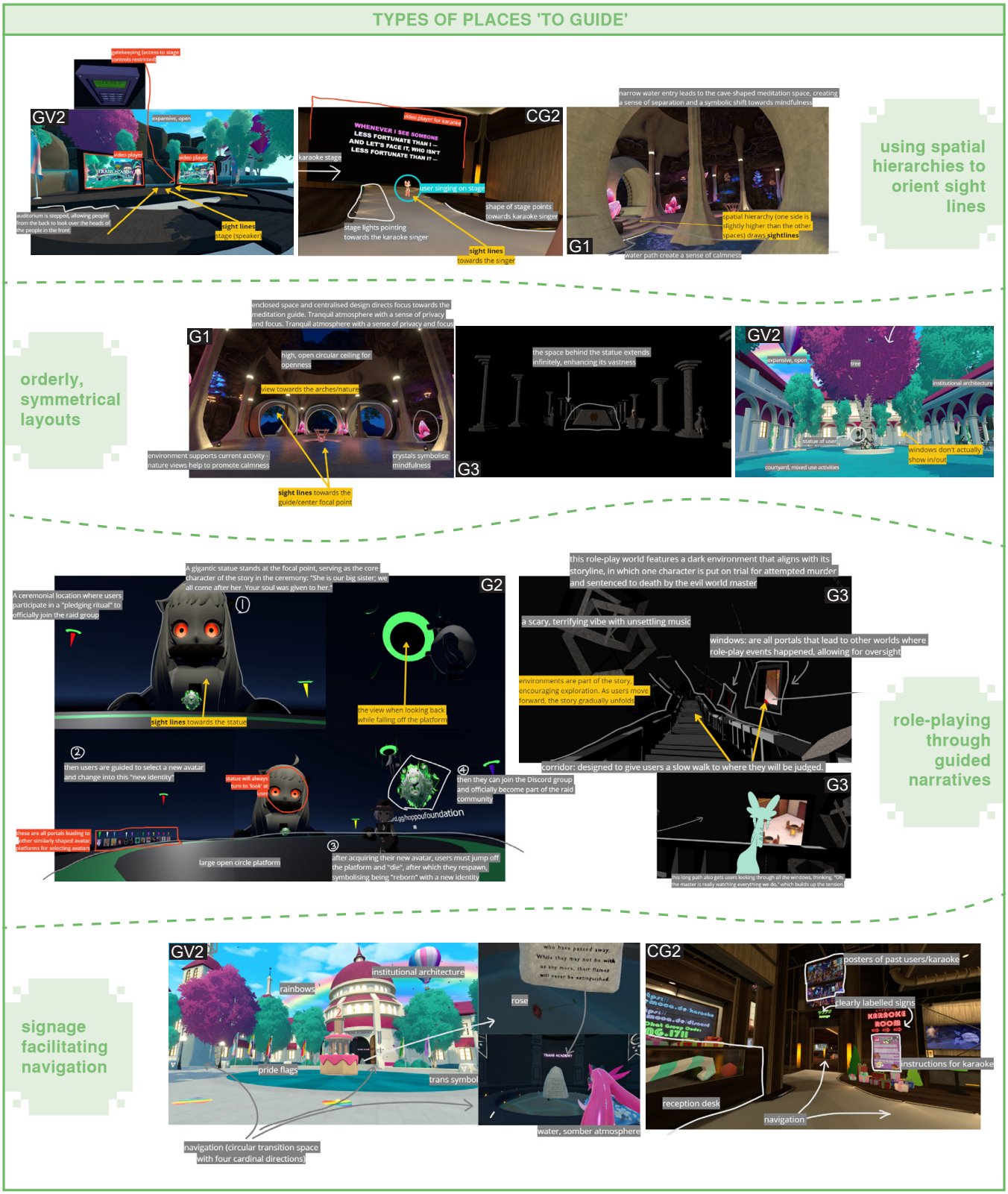

Figure 6: Guided Place Type: annotated screenshots from social VR worlds G1-G3, GV2, and CG2.

where *'at 3 o'clock today, I will get an invite and a pop up from the group saying (...) come join us.'* (P13). In contrast, some guided worlds are more informal, allowing any user to join, such as karaoke (CG2). P12 describes their experience when first chancing upon a karaoke world, *'I wasn't really that confident with singing at the time, but then, gradually, just watching people do it – especially watching people that aren't amazing singers sing – I was like, wow, I can sing too.'* Through shared group activity, the users within guided worlds feel a sense of belonging towards the community.

In terms of spatial characteristics, guided worlds often feature clean, crisp environments (G1-3) – free of any virtual graffiti or trash, as often seen in mingle or venture worlds, which may convey messiness. For example, the architecture of GV2 replicates a grand, neoclassical academy complex. A wide variety of classes occur in GV2, open to not only members of the trans community but for any respectful demographic of user. P11 lists some of these guided activities, which include *'teaching people sign language (...) some classes about learning how to make your voice higher or deeper.'* Symbols like pride flags or group insignias further reinforce the community's identity and shared goals. Notably, the central, domed building in GV2 has a memorial stone dedicated to members of the trans community who passed away: *'While they may not be with us today, their flames will never be extinguished'*. From a different approach, G1 also elicits seriousness. Purposed for meditation, tall arches and a grand but minimal architecture is half-embedded into stone, covered with crystals for mindfulness and framing relaxing views towards falling water.

4.4.2 Orderly. An 'orderly' quality emphasises clear navigation, structured progression, and logical spatial arrangements, ensuring users can easily follow the flow of activities. Guided worlds often employ linear paths, symmetrical layouts, and well-placed portals to guide user navigation.

For example, G3 employs a linear pathway that guides a user along a specific path to unfold the intended world narrative. G3 is used for role-play, where the visitors of the world are put on trial for attempted murder and sentenced to death by the evil despot, namely the world moderator. P3 explains the narrative of the role-play taking place: *'The people were walking down there [the corridor] with the sort of fear of 'what on earth is going on, why have we been summoned to this place?'* Instead of linear paths, G1 and G2 both have simple, circular floor plans that offer an overarching view towards the space. In contrast, GV2 provides a different approach to facilitate navigation. As soon as a user spawns into the virtual world, a series of portals offer quick access towards different zones in the environment. Thus, unlike venture worlds where navigation is challenging, guided worlds strive for orderly, clear navigation.

Moreover, spatial hierarchies direct sightlines towards the guide in a guided world. G1 has a circular, symmetrical floor plan. One side of the space is slightly elevated for the guide, which both orients sightlines towards the podium and provides a vantage point for a better overview of the space. CV2 and CG2 also employ podiums, for a karaoke stage and for an outdoor amphitheatre, respectively. In contrast, G2 employs a simple yet dramatic spatial hierarchy to guide sightlines – a giant statue of a fictional character called 'Hoppou'. This statue dynamically turns to look towards the user. Combined with the lack of any architecture other than floating floors, the statue draws considerable attention from visiting users. We learned from interviews that G2 is used as the home world for initiating new members into a raiding community. The ritual for joining the 'Hoppou Foundation' unfolds as follows (P11): entering a designated world, approaching the gigantic statue, clicking a button at its base, selecting a new avatar symbolising the user's new identity as a member of the community, listening to a speech by the raid leader, and finally leaping from the platform to experience avatar death and subsequent rebirth.

5 DISCUSSION

By relating how place types support distinct forms of social interaction, or '**social patterns**', we discern key considerations for the design of social VR environments. Similar to how proxemics theory links interpersonal distance to social behaviour [49], our place types link architectural affordances to social patterns. Understanding place types is important to designers and VR content-creators alike, as they help analyse and compare different virtual places to make informed design decisions. They are also useful for the developers of social VR platforms, helping understand the needs of the virtual worlds created in order to plan platform maintenance and future technological features. Below, we list the four types of social patterns supported by our synthesised place types:

5.1 Incubating Social Intimacy

Design implication: Consider spatial familiarity to support social legibility and emotional grounding.

In social VR, incorporating familiar spatial elements – such as living rooms, balconies, stages, bars, or hallways [34] – helps users intuitively understand how to engage with a space and with others. These cues reduce social ambiguity and support users in navigating new environments with confidence. Drawing on theories of place-making [20, 35] and affordance theory [54], familiar spatial metaphors provide a shared social script that enables emotional comfort and anchors expected behaviours. This familiarity can enable designers to create environments that feel inviting, legible, and conducive to meaningful interaction.

Cuddle worlds demonstrate how spatial intimacy can be designed by drawing on the poetics of enclosure and atmosphere. Following Bachelard's concept of 'intimate immensity' [2], small, layered nooks and soft lighting evoke a sense of comfort, reflection, and emotional resonance. Designers can purposefully create multi-nook environments that support quiet co-presence – allowing users to linger, observe, or create without the pressure of active interaction. Mirrors, ambient particle effects, and warm materials can act as affective layers, enabling users to engage both individually and collectively. These spatial conditions can support forms of bonding that are less about dialogue and more about *digital dwelling* – echoing Bachelard's idea that '*the house shelters daydreaming, the house protects the dreamer*'. Such design patterns are important for creating social VR spaces that feel less performative and more lived-in, supporting the experiential dimensions of place-making.

Social pattern supported: This refers to designing virtual spaces that protect and nurture close relationships, that is, to 'incubate' in terms of providing safe, controlled environment, nestled from external influences. In social VR, this implies creating cosy, semi-secluded spaces, with soft lighting and familiar spatial metaphors, to help users feel safe and emotionally open, supporting intimacy through a sense of privacy and emotional security.

5.2 Weaving Social Dynamics

Design implication: Consider spatial openness to facilitate social engagement between user groups and activities.

Mingle worlds exemplify how open layouts support sightlines towards different user groups. Here, the 'atrium' architectural form [38] creates a vantage point to people-watch from a safe distance, and users lounging at a mezzanine can observe others below, promoting ambient social awareness and optional participation. Echoing principles in video game level design [75], vantage points offer strategic access to 'prospect space'. Although traditionally understood as a large open area susceptible to attack, prospect space adopts new meaning in social VR as 'open to serendipitous social interaction'. Moreover, the open plan layouts of mingle worlds facilitate circulation between different zones due to the lack of definitive boundaries, and users may flit between social circles. Note that although venture worlds, like mingle worlds, often feature open layouts, their expansive proportions can pose challenges to encounter other users, making social interaction less likely.

However, in social VR, spatial openness is not defined solely by the *geometry* of the virtual environment but is also shaped by the scale of the user's *avatar*. Unlike physical reality, users have the ability to customise the scale of their avatar to influence their experience of the place. For example, using a large avatar scales down the perception of the virtual environment, making the setting feel relatively small. Conversely, a small avatar exaggerates spatial vastness. In venture worlds, some users deliberately shrink to experience a vast environment as even more vast and marvellous. In mingle worlds, smaller avatars hop onto tables to join conversations with larger avatars, creating playful hierarchies. Nevertheless, although scaling an avatar may influence the perception of a virtual world, other place characteristics influence the atmosphere. A small avatar may feel cosy in an expansive environment, assuming the environment already has other qualities of cosiness such as soft lighting or a sense of enclosure, the perception of openness remains relative.

Social pattern supported: This refers to designing virtual spaces that facilitate social interactions between different group dynamics, encouraging engaging not only with friends but also strangers. In social VR, this implies leveraging sightlines, permeable boundaries, and vantage-prospect spaces. However, perceived openness remains relative, as adjusting avatar scale can make a space feel more enclosed or vast depending on its proportion to the environment.

5.3 Supporting Metasocial Engagement

Design implication: Consider empowering users to freely customise or explore environments, encouraging them to form personal narratives and share experiences beyond the immediate game world.

Metasocial engagement can be described as *'socialising about social VR'*, referring to social interaction that extends beyond real-time presence and into reflection, storytelling, and community discourse. Much like metagaming, i.e. *'gaming about games'* [6], meaning in metasocial engagement emerges not just from in-world mechanics but from sharing user experiences outside of said world, for example, through official game forums, Youtube videos, Discord channels, Reddit threads, etc. In particular, the social function of venture worlds exemplify this, where users world-hop independently to discover new places to recommend to their friends. The striking, marvellous vistas of venture worlds root themselves in human memory, creating cognitive landmarks [45] to revisit when recounting their experiences. Allowing users to freely explore the virtual environment supports the creation of personal narratives, and cathartic moments such as uncovering hidden rooms become meaningful stories shared through metasocial engagement.

In contrast to venture worlds, which rely on the virtual environment to make compelling experiences, mingle worlds rely on the chaotic behaviour of their occupant users. People-watching or actively participating in the chaos becomes both the most enjoyable and memorable aspects of engaging with the space, and these interactions are often then shared through external forums. For example, a Reddit post discusses controversial opinions regarding the *Black Cat* world[8], which follows a snowballing of candid or critical community reactions. Beyond free exploration, customisable environments too deepen metasocial engagement, allowing users to leave behind spatial traces that persist even after they leave the virtual world. In cuddle worlds, users employ virtual tools to draw three-dimensional sketches and virtual graffiti[9] in the scene, allowing others to chance upon these traces in the future.

Social pattern supported: This refers to designing virtual spaces that are not only meant to be inhabited, but also interpreted, shared, and recontextualised by users over time. In social VR, this implies creating memorable virtual environments, or facilitating memorable social encounters, in order to support sharing experiences outside of the time and space of where they original took place.

5.4 Moderating Social Tensions

Design implication: Consider spatial hierarchies or zoning to implicitly support moderation activities.

Moderation oversees and coordinates user activity and may be used supportively to guide group activities or preventively to mitigate harassing behaviours. In social VR, spatial hierarchies (like podiums, stages, or elevated platforms) and spatial zoning – such as walls, gates, and material changes – serve to *implicitly* moderate user behaviour. Spatial hierarchies guide users' attention toward

[8] www.reddit.com/r/VRchat/comments/sds7g5/do_you_like_the_black_cat/
[9] www.reddit.com/r/VRchat/comments/jihmqa/more_vrchat_graffiti_nephtanica/

moderators while giving moderators visual control over the environment. Guided worlds employ podiums and stages to guide sightlines towards the moderator (i.e guiding structured activities such as karaoke or meditation) where elevation reinforces authority and focus. In contrast, mingle worlds use spatial zoning to guide users through varying degrees of social intimacy – from the lively dance floor, towards the quieter bar table, and to the secluded dark rooms for sensual activity. Notably, moderation in the platform is yet organised bottom-up, where individual users choose to monitor their instantiated worlds to ensure respectful behaviour.

Nevertheless, implicit strategies can only nudge, but not enforce, user behaviour, and more *explicit* strategies are often required to combat harassment. Indeed, online anonymity tends to embolden harassers more than in real-world contexts [4], making enforcement mechanisms essential rather than optional. While guided worlds benefit from organised group activities and clear structures, mingle worlds demand more robust moderation protocols due to their unpredictable and often chaotic user base. Moderators in mingle worlds gatekeep access for certain areas of the virtual environment, or 'jail' users by confining users to a single area. While social VR platforms have introduced various explicit tools – such as muting and blocking functions to curb verbal harassment [48] or personal space 'bubbles' that render nearby avatars invisible when encroaching a user's comfort zone [42] – implicit strategies should be considered when supporting a user's sense of autonomy.

Social pattern supported: This is refers to designing virtual spaces that guide group activities, promote respectful behaviour, and reduce conflict or harassment. *Implicit* moderation implies using spatial hierarchies to guide sightlines between the moderator and the moderated, supporting group coordination. In contrast, *explicit* moderation implies enforcing interactive features to manage access and enforce boundaries in more chaotic or high-traffic environments.

6 LIMITATIONS AND FUTURE WORK

Our study utilised a first-person spatial protocol to provide contextual data regarding architectural affordances of Social VR spaces. Our approach allowed us to reflect on the nuances of the data, categorise place-type of virtual worlds, and ground a social VR typology. However, our findings are also shaped by our positionality. While this bias is partially mitigated by incorporating perspectives from 15 participant interviews and the in-the-wild observations of social VR users, the findings remain influenced by our interpretations.

Additionally, our study focused on VRChat due to its prominence and diversity of users, but this platform may not fully represent the broader spectrum of social VR. Platforms such as Rec Room or Meta Horizon Worlds might offer different spatial and social dynamics that were not explored. In addition, social VR platforms or worlds that lie outside of our sample might exemplify fundamentally different place qualities, as VRChat may have a different demographic of users or technological limitations for rendering the virtual environment. Some platforms may have different performance thresholds for high-resolution textures or geometries compared to VRChat. These differences likely impact both the spatial qualities and the activities supported, potentially limiting the generalisability of our findings to other social VR ecosystems.

Another limitation is further empirical validation through quantitative methods. Although this study provides an in-depth *qualitative* analysis of the social VR worlds, it would benefit from incorporating behavioural analytics (e.g user movement patterns, interaction frequencies, dwell times, or navigation data) to strengthen and triangulate its claims. Furthermore, the small sample size of 15 participants, while offering qualitative depth from their 'intense' social VR usage, may offer different insights compared to other user groups. A broader participant pool, including novice users and a wider demographic spectrum, could enhance validity of future work.

Looking forward, we propose several directions for future work. First, incorporating quantitative data would provide a more robust empirical foundation, such as interaction density or engagement duration. Second, longitudinal studies could explore how users' spatial preferences and social behaviours evolve over time within and across social VR platforms. Third, expanding the participant base and including general surveys among novice users would capture a broader spectrum of user experience.

Indeed, designing for social VR presents unique challenges compared to physical environments, as the context of social VR communities and spaces is still an emerging field. As technology advances and virtual worlds achieve higher fidelity, the potential for eliciting diverse or more intense sensory experiences will likely expand. For example, this could incorporate current conversations on using AI-powered adaptive environments to dynamically adjust lighting, spatial configurations, or interactive elements to better support social interaction.

7 CONCLUSION

Through interviews with 15 intense social VR users and a first-person spatial analyses of virtual environments, we identified patterns in architectural affordances that mapped user activities with perceived atmosphere. Our findings led to the synthesis of four place types to ground a new social VR typology: Cuddle worlds, where intimate proportions and soft materials facilitate cosy conversations with friends; Mingle worlds, where mirrors and vantage points provide sightlines between users and facilitate new encounters; Venture worlds, which use vast proportions to elicit marvel and hide mysterious secret rooms waiting to be discovered; and Guided worlds, which use spatial hierarchies to guide sightlines towards a focal point and employs symbolic decorations to foster a sense of belonging. The place types provide insights into how users find meaning and engage with space and activities in social VR, informing how virtual space becomes 'place' over time.

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