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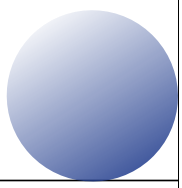

Immersive engagement within homes
to prioritise well-being and productivity

Shravan Rao

To my parents
For raising me to believe
anything is possible

INTERSTICE

A thesis submitted in partial fulfillment of the requirements for the degree Master of Design in Interior Studies [Exhibitions & Narrative Environments] in the Department of Interior Architecture of the Rhode Island School of Design

By
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2023

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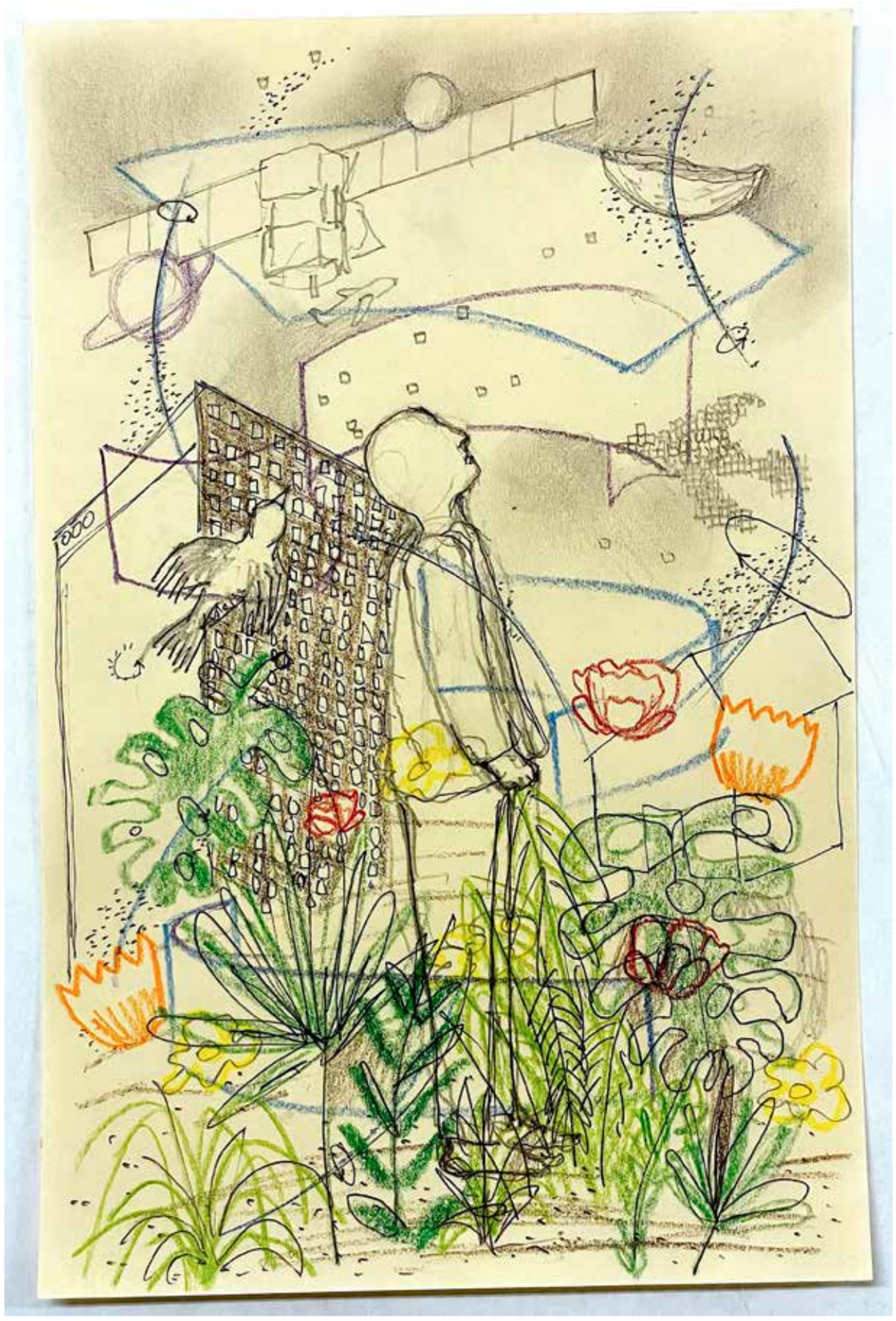

"The role of artworks is no longer to form imaginary and utopian realities, but to actually be ways of living and models of action within the existing real, whatever scale chosen by the artist."[1]

— Nicolas Bourriaud

[1]Bourriaud, Nicolas. Relational Aesthetics. [Dijon] :Les Presses du réel, 2002.

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—

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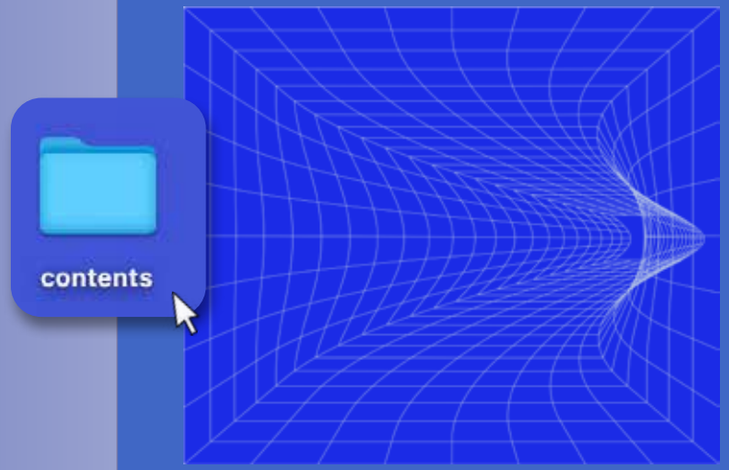


Abstract

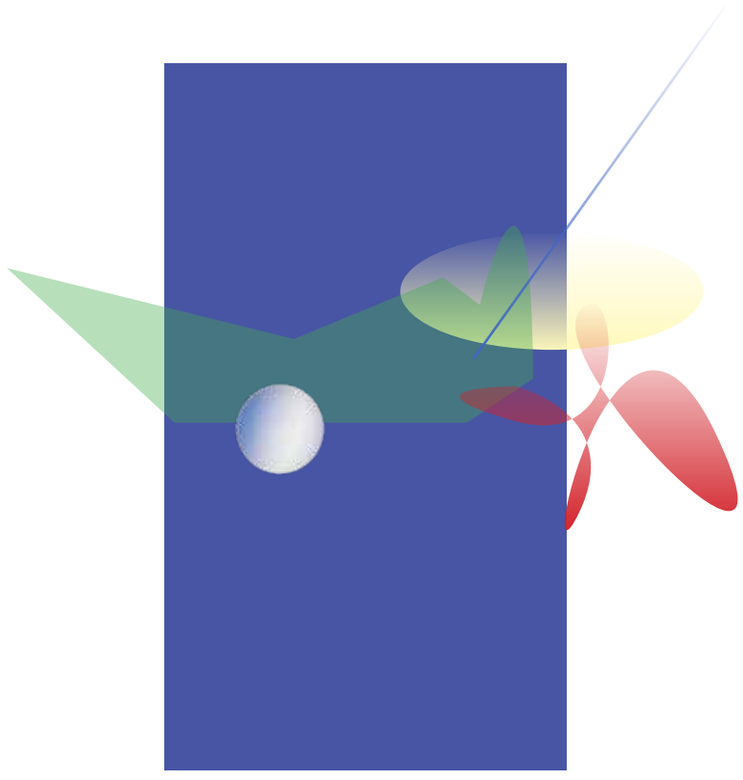
When I was about three years old, I distinctly remember being too small to see what was on top of the table. A couple of years later, when I could see those objects, I thought the world around me had grown smaller. In a way, it did, as I experienced, lived, captured, remembered, and shared the space repeatedly. This sense of the world shrinking was exaggerated during the Covid-19 pandemic, allowing new behaviors and modes of interaction to emerge. Continually shaping our modern lives, virtual technologies redefine how we access and share information and stories or even explore new places.

Thanks to the exponential increase in our computing powers, we live in hyper-connectivity, constantly in sync with our multiple screens, tabs, devices and profiles. Smartphones serve as two-way communication bringing the world in and letting the home out. As people increasingly rely on digital tools for work, communication, and leisure, the boundaries between physical and digital realms have become blurred. The overlap of our stories, information and spaces has subsequently led to challenges in managing the clutter and disorganization that can arise in physical and digital realms, affecting productivity, well-being, and overall user experience. In response, this thesis aims to create a hybrid space that carefully calibrates information and architecture to initiate interactivity within home settings.

The thesis adopts a human-centred design approach, including user interviews and iterative prototyping, to understand how augmented reality (AR) augments reality. Research focuses on young adults, primarily students and working professionals who have access to smart devices where increasing demand for personalized experiences present an ideal environment for AR to grow and thrive. Overall, the research and prototypes are representative of AR as a tool for novelty in familiarity, offering new ways of enhancing interactions and immersive experiences within the home. I believe this synthesis of our physical and digital elements will lead to a de-cluttered and productive mode of engagement.

This thesis attempts to make the world smaller by seeing and being more.

Key-phrases: Virtual Environments, Augmented Reality, Smart Homes, Experience Design



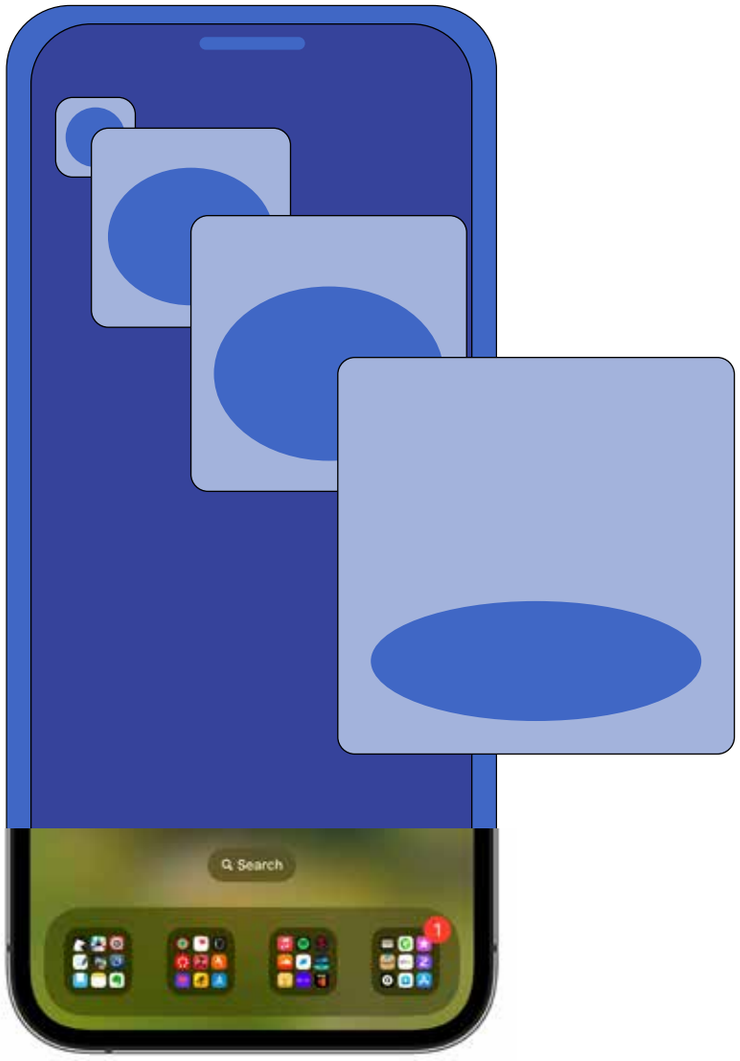
Glossary

interstice
a space between things or events

mixed reality
a blend of physical and digital worlds, unlocking natural and intuitive 3D human, computer, and environmental interaction

spatial computing
digitization of activities of machines, people, objects, and environments to enable actions and interactions

widget
an application, or a component of an interface, that enables a user to perform a function or access a service



Capabilities in computing have become so accessible that they have pervaded nearly every aspect and device concerning modern living.

Introduction

Higher chances are you are reading this on a screen. To restate the obvious, humans have started spending much more time in their virtual worlds immersed in devices and interfaces. The average time spent online per person was 397 minutes[1] (6 hours and 37 minutes) daily as of 2022. Technological evolution has restructured communication and sharing of experiences.

The new models serve up experiences integrating the most basic human needs resulting in close homophily to these virtual worlds. As we can conjure up memories from the past and visions for the future, the ways we perceive our built environment are becoming increasingly nuanced and pervasive.

As human beings, we are wired to categorize and understand the spaces we inhabit. This instinctual behavior is crucial for survival and central to how we interact with the world around us. A combination of knowledge, situational awareness, and design lies at the core of this innate trait.

My creative process began with a keen observation of the changing role of the home in our lives. Traditional homes had exhibited minimal changes over time, but the advent of digital technology disrupted this stagnancy. The pandemic acted as a catalyst, forcing us to view our homes through a new lens. Suddenly, our living spaces became our offices, schools, gyms, and entertainment hubs. This heightened utilization shed light on the need for adaptable and multi-functional spaces and seamless integration of devices to cater to these evolving needs.

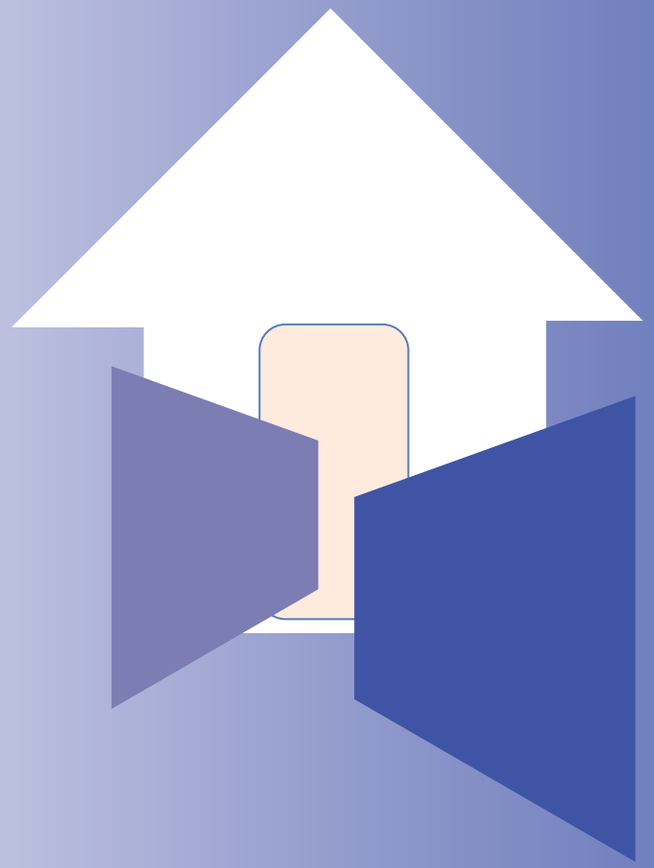
In this design thesis, I embark on a journey of exploration through research and making delving into the dynamic relationship between humans and their devices. Throughout the book, I will explore various topics, including the impact of emerging technologies on our daily lives and the potential of immersive experiences to transform how we learn and communicate, suited to the users' preferences and needs.

[1] Lin, Ying. "How Much Time Does the Average Person Spend on the Internet?" Oberlo, www.oberlo.com/statistics/how-much-time-does-the-average-person-spend-on-the-internet.

PART I

Making Sense of the World(s) Around Us

The transformative powers of emerging technologies, such as smartphones, smart homes, sensors, augmented and virtual reality, and the Internet of Things (IoT), have ushered in a new era of connectivity and convenience within our homes. The roles and rules of ‘home’ are reimagined not merely as a physical space but as a repository of portals to limitless domains of knowledge, creativity, and entertainment. Through extensive research and writing, I explore how humans have gradually embraced a culture of excess experience. Examining precedents and existing works across various disciplines led to a deeper understanding of consumption and its consequences over a vast typology of physical-digital experiences.



1.1 A Note on Home

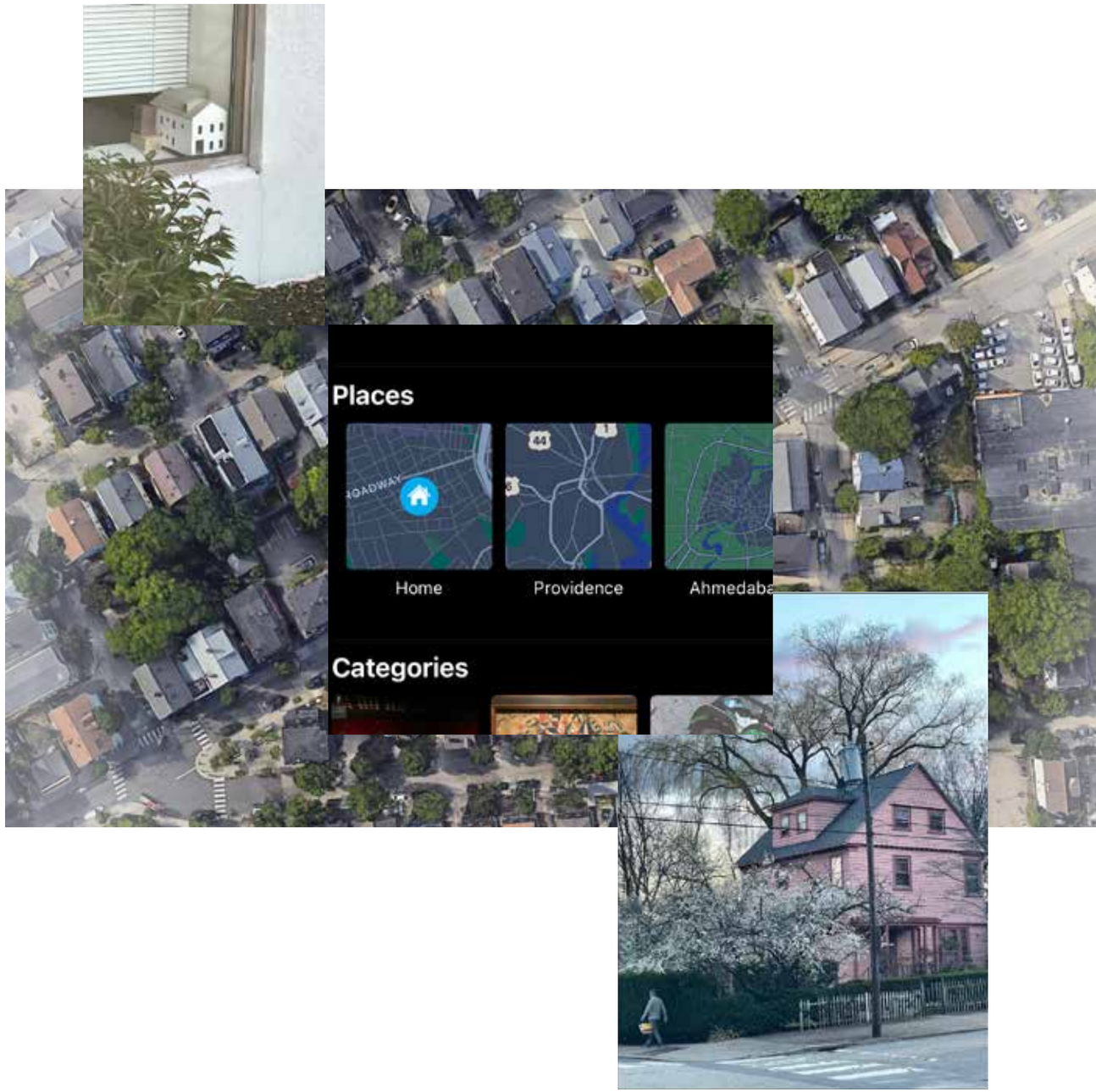
The home has been a domain that has exhibited little outward change until the rise of digital technology. The speed of innovation has further solidified the home's transformation, where it became an operating system for living, coordinating an ever-changing array of needs and integrating devices that meet those needs. This increase in home utilization has led to a heightened awareness of the spatial dynamics within our living spaces. As a result, the contemporary home has become an interface, mediating between its inhabitants and the outside world.

Despite these exciting developments, it is vital to recognize the limitations of architecture and the built environment. In particular, the physical space of the built environment is often constrained by cost, materials, and building codes, which can limit the range of design possibilities and outcomes. Additionally, the built environment is often designed and controlled by a narrow range of stakeholders, such as architects, developers, and government regulators, which can limit the diversity of narratives and identities that should ideally be present in the planning, design and occupancy stages.

In this context, software and virtual environments offer a powerful alternative, enabling us to create and explore multiple identities, narratives, and affordances that are impossible in the physical world. By allowing us to experiment with new forms of spatial representation and interaction, these tools can challenge our assumptions about the built environment and offer new possibilities for creativity and collaboration.

Virtual reality platforms such as Second Life and VRChat allow users to create and explore fully immersive virtual environments that are not constrained by physical limitations or material constraints. This has led to new forms of architecture and design, as well as new communities and social interactions that transcend physical space.

Our homes embody a synergy of form and function, where every element can be meticulously curated to enhance the human experience. From devices that respond to our every command to carefully crafted spaces that evoke a sense of serenity, our homes can provide affordances that invite us to explore and express our true selves.



Krista Kim’s Mars House NFT

A home designed in Minecraft

Therman Statom’s Glass House at RISD Museum

Decentraland

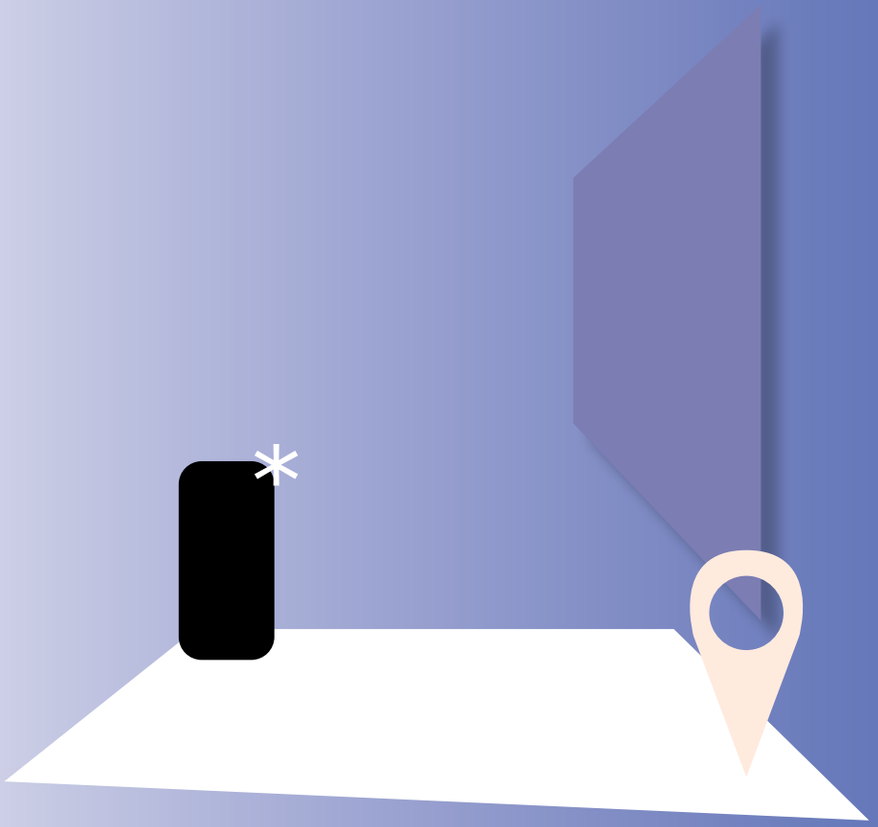
The virtual estate refers to digital properties and land within virtual worlds or metaverses. It represents a growing trend where individuals can own and trade virtual land, buildings, and other digital assets, blurring the line between the physical and virtual realms. This concept has gained significant traction in recent years, with platforms like Minecraft, Decentraland and NFT artworks showcasing the potential of virtual real estate.

The transition from 2D screens to 3D immersive interactions has fundamentally shifted how we approach design and planning, including creating spaces and cities within games like Minecraft. This shift opens up new possibilities for incorporating production and game design elements into the process. Using grids and squares in Minecraft allows players to create orderly and organized structures easily. The simplicity of placing blocks in simple rows, along with the ability to add carefully placed windows and vertical elements, contributes to the creation of buildings that resemble real-life houses. This alignment with the grid-based system reflects the influence of modern and contemporary architecture, which often emphasizes geometric forms and clean lines.

Decentraland is a prominent example of a virtual world built on the Ethereum blockchain. Users can purchase and own parcels of land within Decentraland, which they can then develop and monetize. The platform utilizes non-fungible tokens (NFTs) to represent ownership of virtual land, enabling users to have complete control and rights over their digital assets.

Krista Kim’s Mars House NFT, as mentioned earlier, is an artwork that explores the intersection of architecture, technology, and the virtual realm. Through the Mars House NFT, Kim challenges the traditional notion of physical properties and questions the boundaries of what constitutes real estate. The artwork highlights the increasing interest in virtual land as a form of ownership and investment while also questioning the significance of physicality in the concept of home.

Limitations of current metaverses highlight the need for value-driven experiences in the context of smart homes, emphasizing the importance of bridging the gap between entertainment-focused metaverses and the practicality of everyday living.



1.2 Where do we meet?

In hyper-connectivity and globalization, the question of “Where do we meet?” has taken on a new dimension. With the convergence of multiple realities, platforms, and services, the answer is no longer limited to physical locations. We can now meet in virtual spaces, social media platforms, online multiplayer games, and video conferencing tools. The digital products that have led us to this convergence have opened up endless possibilities for collaboration, interaction, and immersion. The challenge now lies in navigating these virtual meeting spaces and finding the most effective ways to connect with others.

Our understanding of spaces and architecture has dramatically shifted in recent years, largely due to the exponential growth of new technologies such as GPS, LiDAR cameras, generative AI tools and processing power. At the heart of this transformation is the role of image, spatial representation, and value, all of which have been radically redefined by the rise of digital media and computing. With the advent of high-speed internet, powerful mobile devices, and sophisticated data analytics tools, we can now navigate and explore the world in once-impossible ways. From remote work to gaming, the endless scroll induced a digital sprawl shaping how people behave and interact.

Marshall McLuhan's concept of the global village[1] describes the interconnectedness and compression of time and space in the digital age, where electronic media and communication technologies unite individuals worldwide, transcending geographical boundaries. The term, coined in 1960s highlights the profound impact of media on our perception, consumption, and cultural dynamics, thereby shaping our understanding of the world as a singular, interconnected community.

Previously, space was associated with physical dimensions and geographic boundaries. However, platforms like Instagram and Airbnb enable people to curate and share their experiences of space, making it a vital part of self-expression and identity.

A key example of this transformation is the emergence of platforms such as Airbnb, which allow users to rent and book unique accommodations from around the world. By providing detailed images, descriptions, and user reviews, these platforms have radically transformed the way we think about travel and the built environment. They have enabled us to see spaces from different perspectives, evaluate their relative value and desirability, and engage with diverse narratives and identities.

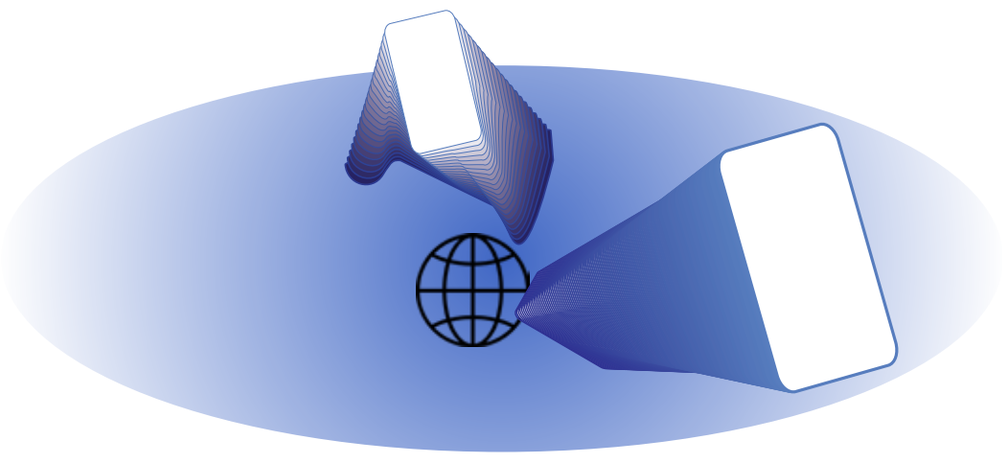
Instagram's visually-driven platform has revolutionized the way we perceive and share space. With carefully crafted images and curated aesthetics, individuals can present their homes and personal spaces as extensions of their identity. This has led to an increased focus on interior design, unique architectural features, and the desire to create visually appealing environments that align with Instagram's aesthetic trends.

[1]McLuhan, Marshall, and Bruce R. Powers. 1989. The global village: transformations in world life and media in the 21st century. New York: Oxford University Press.

While we possess tools to aid in planning and prioritizing what we value, the very concept of value itself has become increasingly obscured. The gamification and quantification of various aspects of life, although offering potential benefits, also come with their downsides. People's increasing investment in virtual worlds and avatars has resulted in a dominant mirroring and shadowing of physical existence, fundamentally reshaping the nature of human interactions. This collective participation in a hybrid gestalt of virtual and physical realms is gradually redefining our sources of information.

Emergent technologies, inextricably linked to this shifting landscape, bring with them both rudimentary opportunities and imminent dangers pertaining to privacy, security, exclusivity, and ethics. Each platform provides an avenue for performative behavior and alters our sense of identity through diverse levels of stimulation and conditional experiences.

Our smartphones have become an extension of ourselves, providing us with an instant connection to the world and each other. Our idea of home has expanded beyond the physical walls of a building to encompass a digital space that connects us with loved ones and the wider community. However, as we continue to explore these new frontiers, it is important to remember what keeps us grounded: the human experience and social connection.



We find ourselves confronted with a multitude of challenges arising from the pervasive influence of advertisements, visuals, and marketing campaigns that have become ingrained in our daily lives. This bombardment of stimuli has gradually become second nature to us, leading to an overload of choices and an unequal distribution of resources. These times are characterized by the booming attention economy, which raises serious concerns regarding both physical and mental well-being, such as addiction to devices, apps, or games and deteriorating mental health.

Attention span: 9 seconds

6.8 billion smartphone users across the world

Time spent indoors: 90% daily avg

Time spent online: 7 hrs per day in US

Avg no of times we check our phones in a day: 144

Avg number of ads/logos we come across in a day ~ 5000 to 10,000

1.3 Why Extend Reality?

Over the last 60 years, as computers have become more powerful, human interactions with computers have evolved from punch cards and keyboard inputs to using natural speech and gestures, with ongoing research into thought-controlled computing.

This represents a broader shift from explicit interaction (the end-user instructs the computer what to do) to implicit understanding (the computer observes end-user behaviour and implicitly infers, predicts, and responds to user intent).

Imagine taking a journey through time and space, from the first moments of human existence to the far-flung future. Along the way, you would witness a remarkable evolution in technology, design, and the spaces we call home. From the earliest cave paintings to the invention of the printing press, from the first telegraph messages to the ubiquitous smartphone, humanity has always been driven by a desire for connectivity and the need for social experiences. And yet, amidst all these changes, one thing remains constant: our need for a sense of place, a grounding that keeps us connected to the world around us. That's why design is so crucial, why the spaces we create must be both functional and beautiful, both responsive to our needs and reflective of our values.

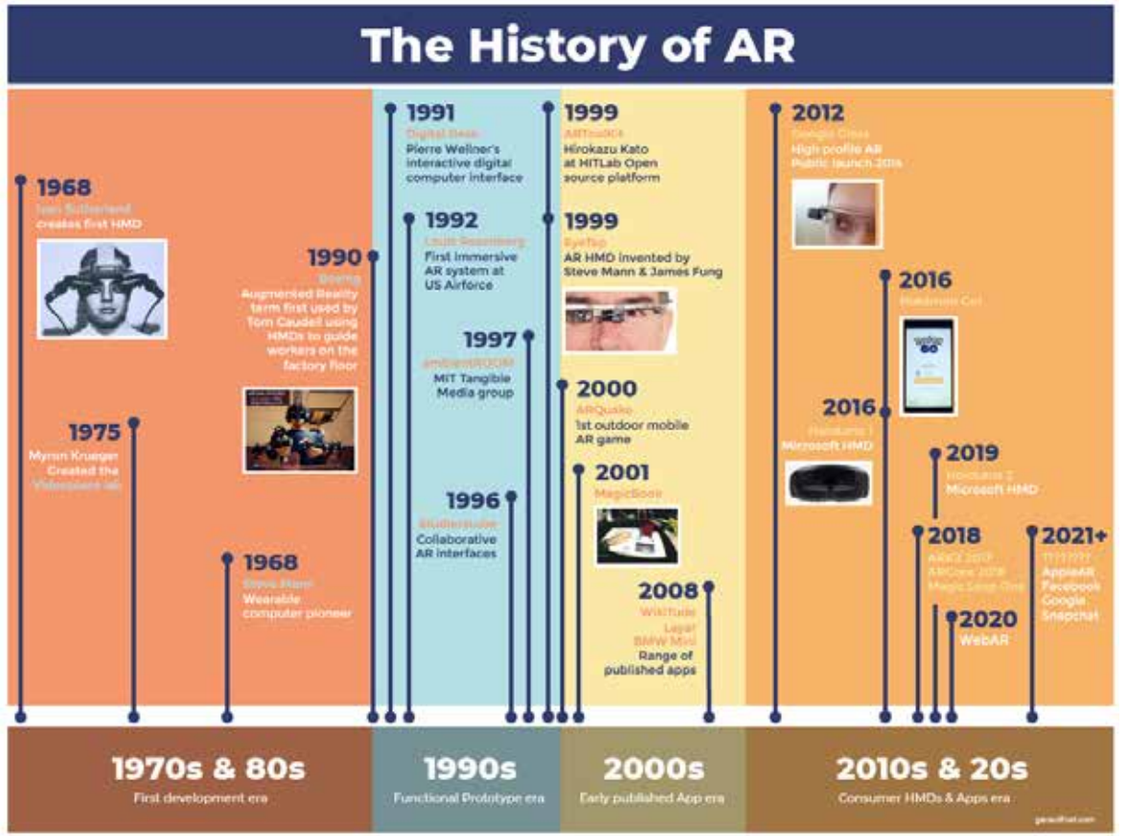
In many ways, technology has only deepened our appreciation for the spaces we inhabit. And yet, for all its benefits, technology can never fully replace the experience of being in a physical space.

Virtual avenues offer innumerable ways of without capping the number of people engaging. People come together for a purpose, and largely by chance. These platforms provide for exciting, unpredictable and unhindered interactions to bask in knowledge and entertainment. Computationally mediated communication disrupted the age-old methods known to man, transcending space, time and quantity of interactions too.

The use of technology has allowed for the development of experiential design, which offers a more immersive and effective way to engage communities. With the constant advancements in technology and the ease of AI, big tech companies are making bets on the future of ambient computing and innovative storytelling. Spatialization brings together multiple disciplines and modalities of technology and social interaction, allowing for the transition from screens to functional scenes anytime. Despite limitations on the web and mobile, the rise in so-lo-mo (social, local, mobile) computing and the diminishing size of gadgets and sensors have enabled us to rely heavily on them for organizing and operating between physical and virtual environments. The next version of the internet, the metaverse, will allow for the integration of narrative environments and objects persistently, intelligently and collectively.

Dance, Henri Mattisse

Illustration showing future potential of immersive interactions



Timeline showing history of Augmented Reality by Gerard Friel

The concept of augmented reality has been around for several decades, with the first use of the term in a 1990 paper by Tom Caudell and David Mizell. It was not until the development of smartphones and wearable devices that AR technology began to gain widespread use. In recent years, the use of AR has expanded beyond entertainment and gaming to include fields such as education, healthcare, and retail.

However, challenges remain in mass adoption of AR for unified communications. Technical hurdles such as device capabilities, network bandwidth, and data privacy need to be addressed to ensure a smooth and secure user experience. Additionally, ethical considerations around data collection, user consent, and information sharing must be prioritized to maintain user trust and privacy. Hardware and devices need to keep pace with the evolving trends in generative AI and software development.

By overlaying contextual information, such as annotations, visual cues, or shared documents, onto the physical environment, AR enables users to have synchronized and enhanced interactions, fostering better understanding and through visual, virtual and spatial configurations.

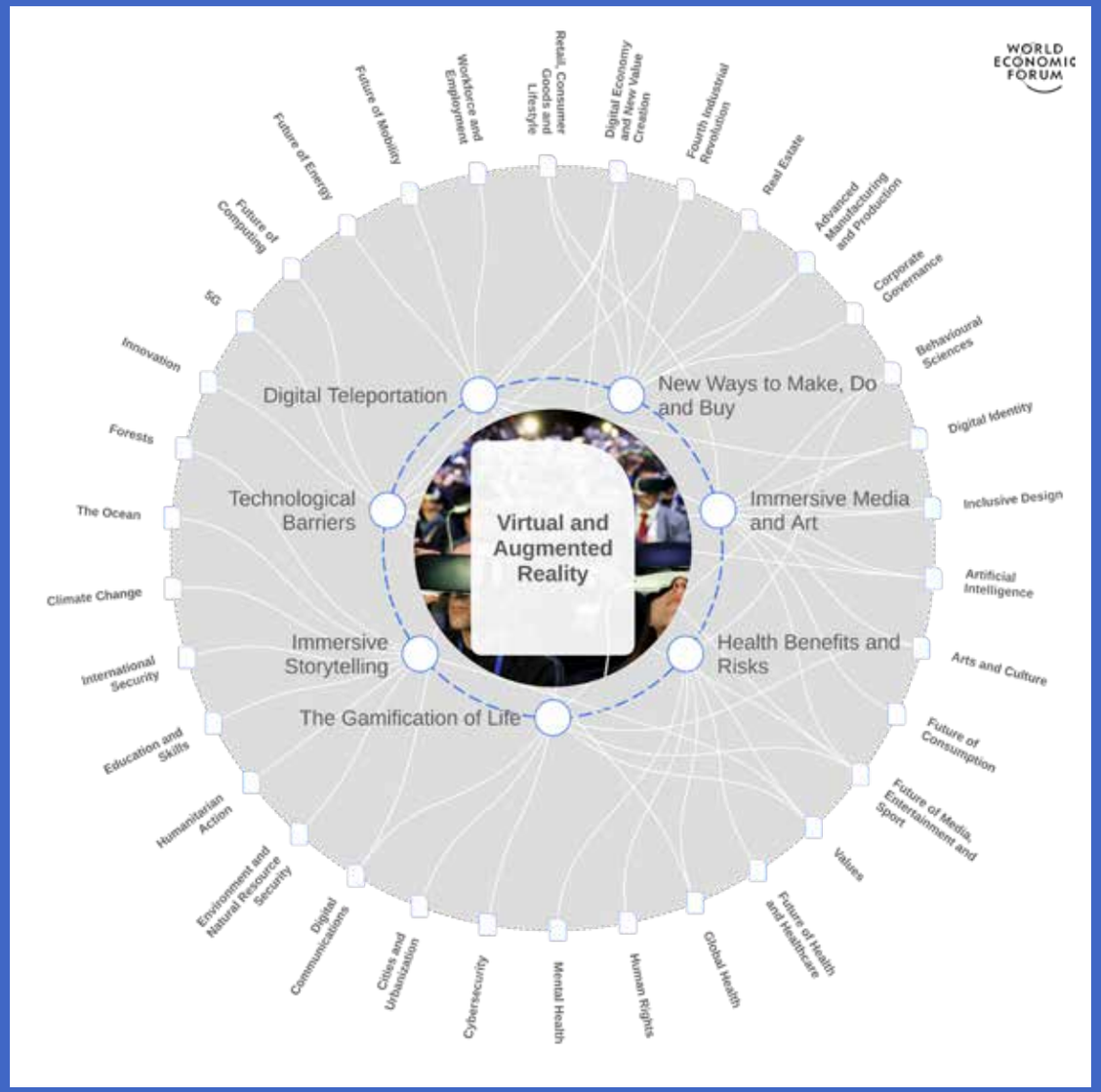


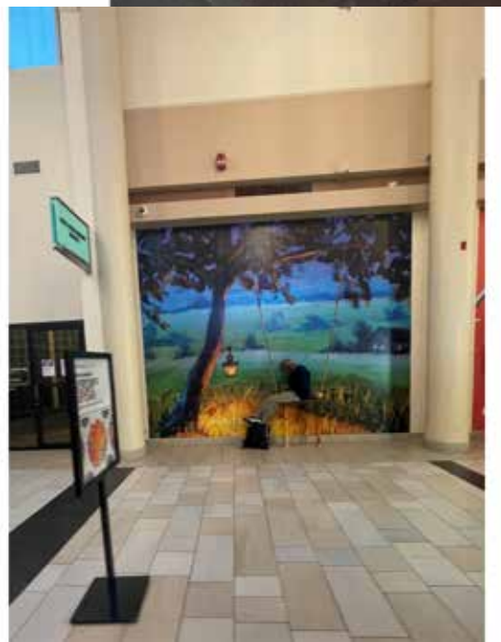
Image Source: World Economic Forum

Image Source: Picture of a physical storage in house by author

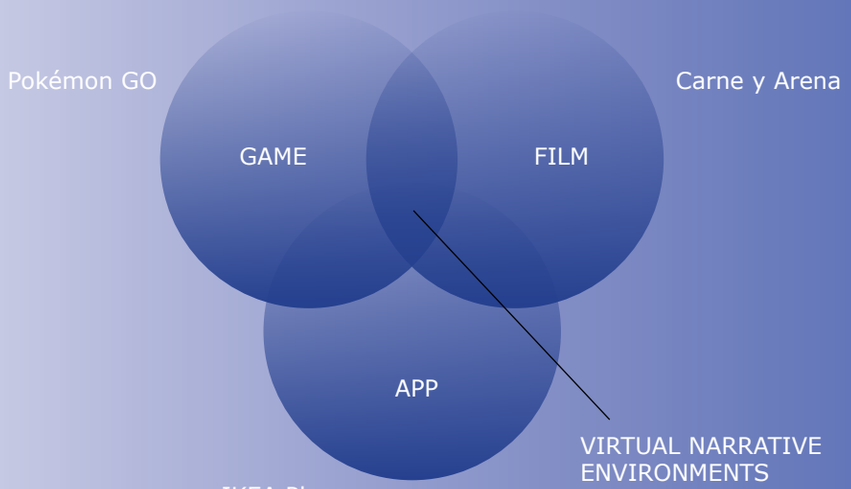
How do the physical and virtual worlds feed off of each other positively?

Image Source: YouTube screenshot from a demo by Meta 2 Augmented reality glasses

What can be learnt from physical sensory cues that can be transformed in their digital counterparts?



Previous Projects
Crossing the Pell
Virtual Spatial Morphologies



Readings and Literature

1.4 Precedents

Precedents were chosen and analysed based on experiential, social and visual components to gain a deeper understanding of how XR technologies can find applications either for storytelling, entertainment or utility. Influenced by various mediums, the precedents span across varied outputs such as film, games and apps.

Crossing the Pell

Year: 2022

Tools: Unity, Twinmotion, Rhino 3D

Skills: AR/VR prototyping, Worldbuilding, Experience Design, Interaction Design

The projects - Conductivity, The Net, Inhabited Bridge and All the World's a Stage - were first developed in 2021 during the Crossing the Pell RISD Interior Architecture studio. Graduate students in Interior Architecture and Landscape Architecture formed cross-disciplinary teams and developed visions for adding a suspended lower level to the bridge that would allow for pedestrians and cyclists as well as arts venues, parks, cafes and even a floating fish market.

Image : Jo Sittenfeld MFA PH 08

The use of state-of-the-art technology brings these futuristic projects to life. Visitors can pedal through four student design concepts on stationary bikes that respond to the riders' movements, while a VR headset shows a structure featuring people-powered access. Such immersive 3D experiences are offered to allow everyone to partake in future-oriented discourse on questions such as: How can we creatively adapt our infrastructure for a more sustainable and inclusive future? How can we rethink mobility while supporting healthy activities such as cycling and walking?

Sitting atop on tables, this 40 ft long infographic comprises of 4 graphic panels on the history of the Pell Bridge along with the design proposals. A portion of the panel serves as an Augmented Reality (AR) marker. Visitors can load up the 4 projects on different iPad screens enabling them to see animated models come to life. The entire experience pops up on the iPad spanning over the graphic prints.

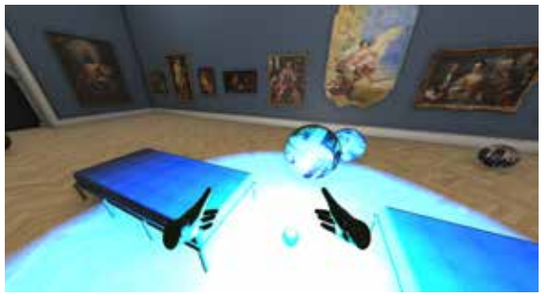
Virtual Spatial Morphologies

Year: 2023

Tools: Unity, Twinmotion, Rhino 3D

Skills: AR/VR prototyping, Worldbuilding, Experience Design, Interaction and Game Design

Using Unity game engine, Meta Quest VR headsets, AR, and smartphones, students embarked on projects that pushed the boundaries of spatial design. They meticulously crafted virtual landscapes, architectural marvels, and interactive experiences that transported users to distant lands beyond the confines of the physical realm. With these advanced technologies, students were able to reshape environments, manipulate perceptions, and create transformative encounters that unfolded in virtual spaces.



(Top) 3D modeled home for an AR artwork
Screenshots from a VR experience

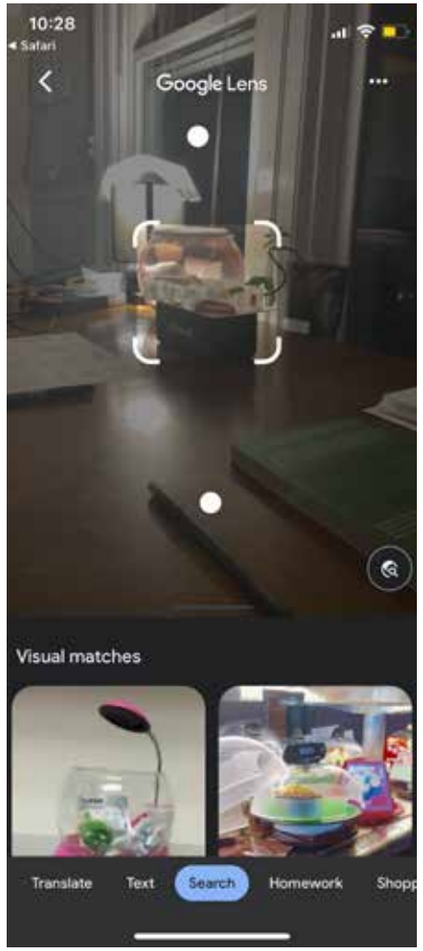
Virtual Spatial Morphologies, Feb’23
exhibition in the Grand Gallery, RISD Museum

Carne y Arena
Alejandro Inarittu • 2017

A VR film, originally premiered at Cannes Film Festival immerses the viewer simulating experiences faced by undocumented migrants. The charged emotional narrative explores the human condition and captivates the scene beyond the screen.

Actual Reality OS
Hito Steyerl • 2019

Actual RealityOS is an open source digital tool for data visualization that brings together augmented reality and immersive audio. The app considers the symbiotic relationship between technology, capitalism and power.



Google Lens
Google • 2017

By simply pointing their camera at an object or image, Google Lens can provide relevant information and actions. Users can translate text, scan QR codes, find similar products, and get more information about items they come across.

IKEA Place
IKEA • 2013

With the IKEA Place app, users can virtually place true-to-scale 3D models of IKEA furniture in their homes, allowing them to visualize how the pieces will look and fit before making a purchase. This innovative use of AR technology provides an immersive and interactive shopping experience, eliminating the guesswork and enabling customers to make more informed decisions.

Use of VR in Healthcare

Scientific studies and tests have consistently revealed the potential of VR to alleviate symptoms and provide therapeutic benefits for individuals with diverse ailments. From burn injuries and stroke to PTSD and schizophrenia, VR has demonstrated its ability to effectively reduce pain, promote relaxation, and improve mental well-being.

Portal-ble (Portal+Portable)
Brown HCI Group • 2019

Portal-ble is portable augmented reality that turns the phone into a portal into a virtual world. The virtual and real are merged into a single view, so you can interact with both virtual and real objects with your hand.

Spatial.io
Spatial Systems Inc • 2016

Spatial.io is a collaborative augmented reality platform that enables remote teams to work together in a shared virtual space.

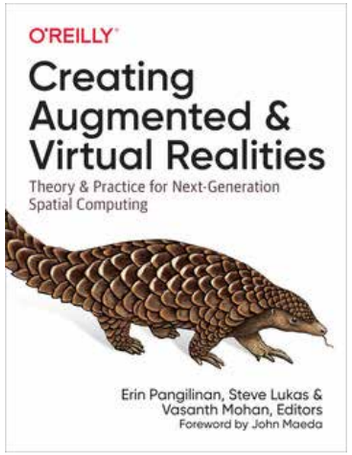
Pokémon GO
Niantic Labs • 2016

With over 500 million downloads in the first two months, Pokémon GO became one of the most successful game apps. The game uses the phone's GPS and camera to create an augmented reality (AR) world inhabited by Pokémon that one must catch to advance through the game. It allows players to explore the real world while capturing virtual Pokémon creatures, engaging in battles, and discovering hidden locations in their quest to become Pokémon trainers.

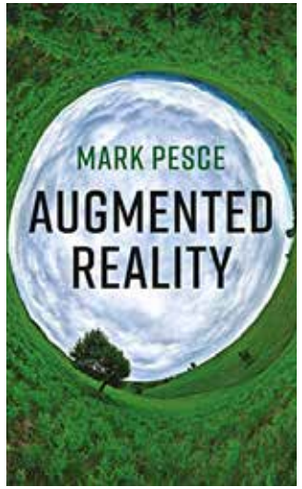
Tripp VR
Tripp Inc • 2017

Tripp VR is an immersive virtual reality experience that takes users on a mind-altering journey, combining stunning visuals, interactive gameplay, and captivating storytelling to transport them to surreal realms where reality is redefined through meditative experiences.

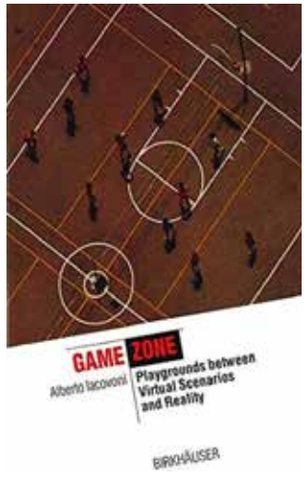
Readings & Literature



Creating Augmented and Virtual Realities
by Erin Pangilinan, Steve Lukas, Vasanth Mohan



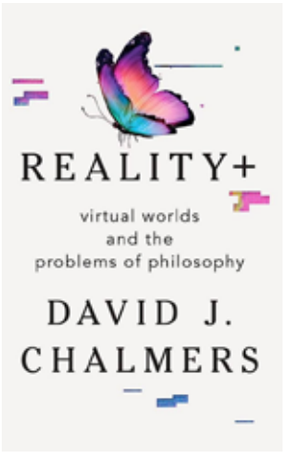
Augmented Reality: Unboxing Tech's Next Big Thing
by Mark Pesce



Game Zone: Playgrounds Between Virtual Scenarios and Reality
by Alberto Iacovoni

Home Futures: Living in Yesterday's Tomorrow
by The Design Museum

Extended Reality (XR) & Gamification In The Context Of The Internet Of Things (IoT) And Artificial Intelligence (AI)
by Georgios Pappas



Reality+: Virtual Worlds and the Problems of Philosophy
by David Chalmers

PART II

Who and How

In my quest to develop a comprehensive design framework, I employed various means to gather insights and shape my approach. Google surveys served as a valuable tool to gather feedback and understand user preferences at a broader scale, allowing me to capture a diverse range of perspectives. To explore and generate design possibilities, I experimented with generative AI tools like MidJourney, different scenarios and ideate with prompts and visualizations. Recognizing the importance of customizing and tailoring experiences to the audience, user testing and workshops were conducted. These interactive sessions provided me with direct feedback, allowing me to understand users' unique needs and refine my design approach accordingly.

2.1 Understanding the User

Initial findings suggest that users often feel burnout and information overload while using devices and screens. Working across devices creates problems of portability and redundancy. Designing for this involved creating user personas, journey mapping, and conducting iterative design cycles that prioritize usability, simplicity, and meaningful engagement.

I primarily aim to create product solutions / experiences f1or college students, young adults and working professionals aged 22–35.

Intervention
Indoor experience through mobile phone, tablet or mixed reality glasses

I sometimes find it challenging to keep track of all the events happening in the city and to navigate to new locations.

Overall, my goal is to use technology to enhance my productivity, stay organized, and simplify my life. I'm always on the lookout for new tools and apps that can help me achieve these goals and improve my daily routine.

As a busy professional, I spend most of my time working on my laptop or smartphone, whether it's responding to emails, attending virtual meetings, or working on projects. I also rely on various apps and devices to stay organized and productive, such as Google Calendar, Trello, and Slack.

In terms of my daily life interactions at home, I rely heavily on my smartphone and laptop to stay connected with friends and family, check social media, and stay up-to-date with the news. I also have several connected devices in my apartment, including a smart TV, a smart speaker, and a smart thermostat, which I control using my phone.

When I'm at home, I often use my connected devices, like my smart TV and smart speaker, for entertainment and relaxation. I generally watch a movie or listen to music to unwind after a long day. However, I sometimes struggle with clutter and information overload, as I have a lot of digital files and documents to manage.

I also struggle with productivity and staying focused, especially when working from home. My goal is to find ways to improve my overall well-being and productivity by leveraging technology. In terms of my expectations, I'm looking for tools that are user-friendly and easy to integrate into my daily routine.

Feedback from audience on current problems

What is their current struggle today? What problems do they face?

Burnout, information overload, no barrier between work and life

What's one idea you have to solve their problem?

AR app to organize physical and digital devices and tasks

How would that idea improve the user's experience?

Camera, text and voice empowered search, being able to see 3D visual representations of world around

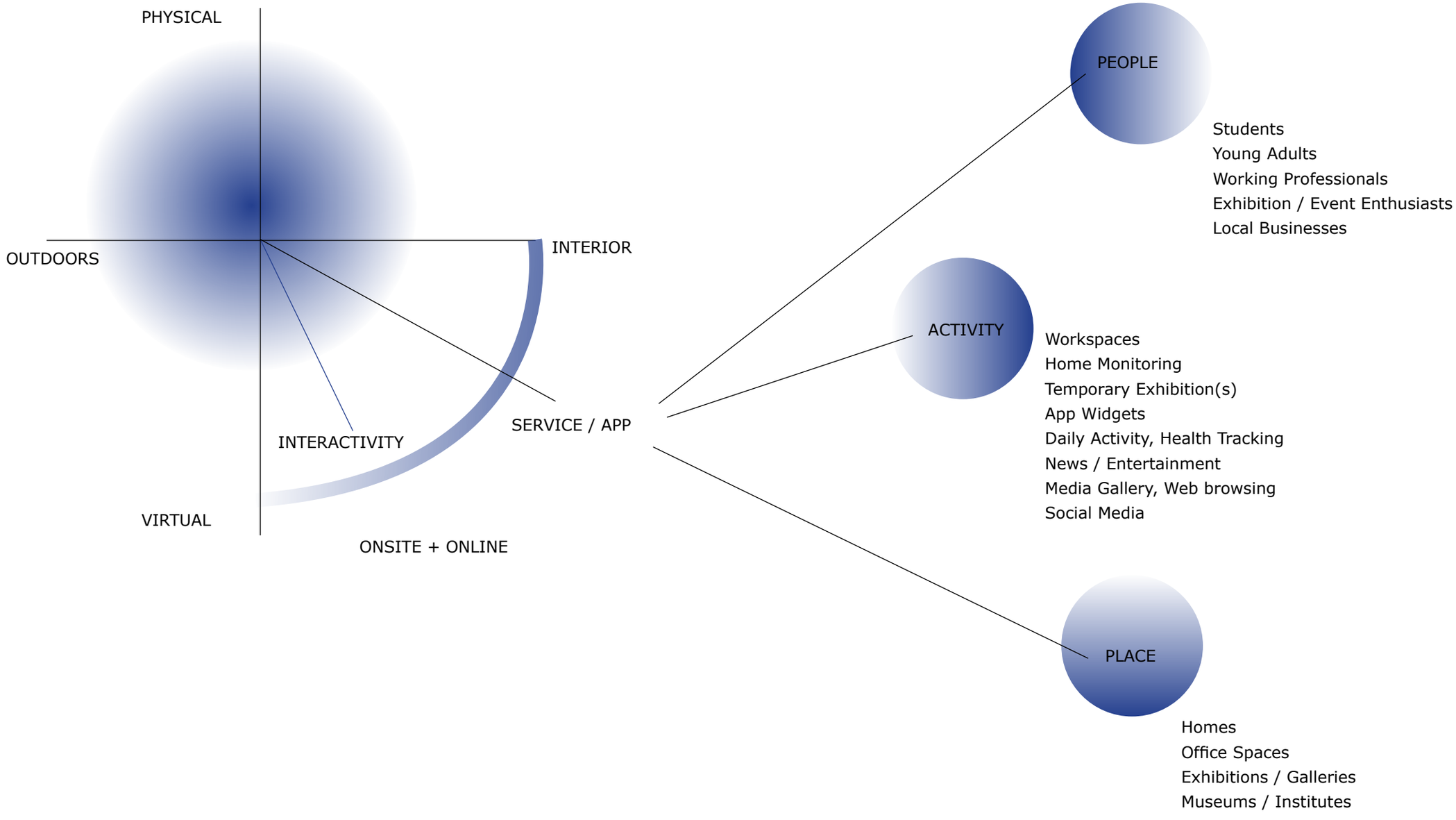
The original business problem

Information loss, productivity loss, personal + mental wellbeing, events and social connection

The user-centered problem after 5 Whys

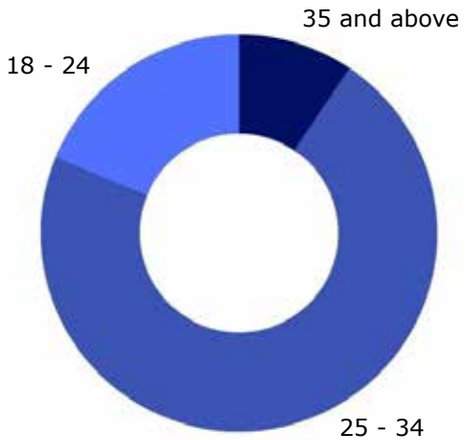
User experience, technical problems and hardware not in one place - cost to compute is high

Framing the problem using IBM's Enterprise Design Thinking Tool

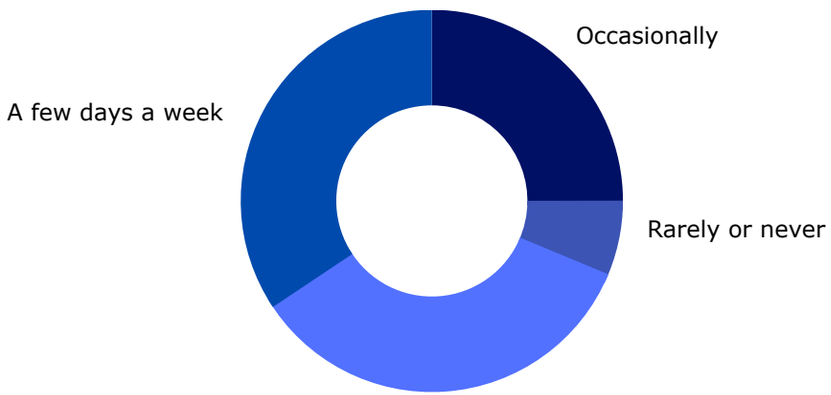

PHYSICAL
OUTDOORS
INTERIOR
INTERACTIVITY
SERVICE / APP
VIRTUAL
ONSITE + ONLINE
PEOPLE
Students
Young Adults
Working Professionals
Exhibition / Event Enthusiasts
Local Businesses
ACTIVITY
Workspaces
Home Monitoring
Temporary Exhibition(s)
App Widgets
Daily Activity, Health Tracking
News / Entertainment
Media Gallery, Web browsing
Social Media
PLACE
Homes
Office Spaces
Exhibitions / Galleries
Museums / Institutes

User Survey

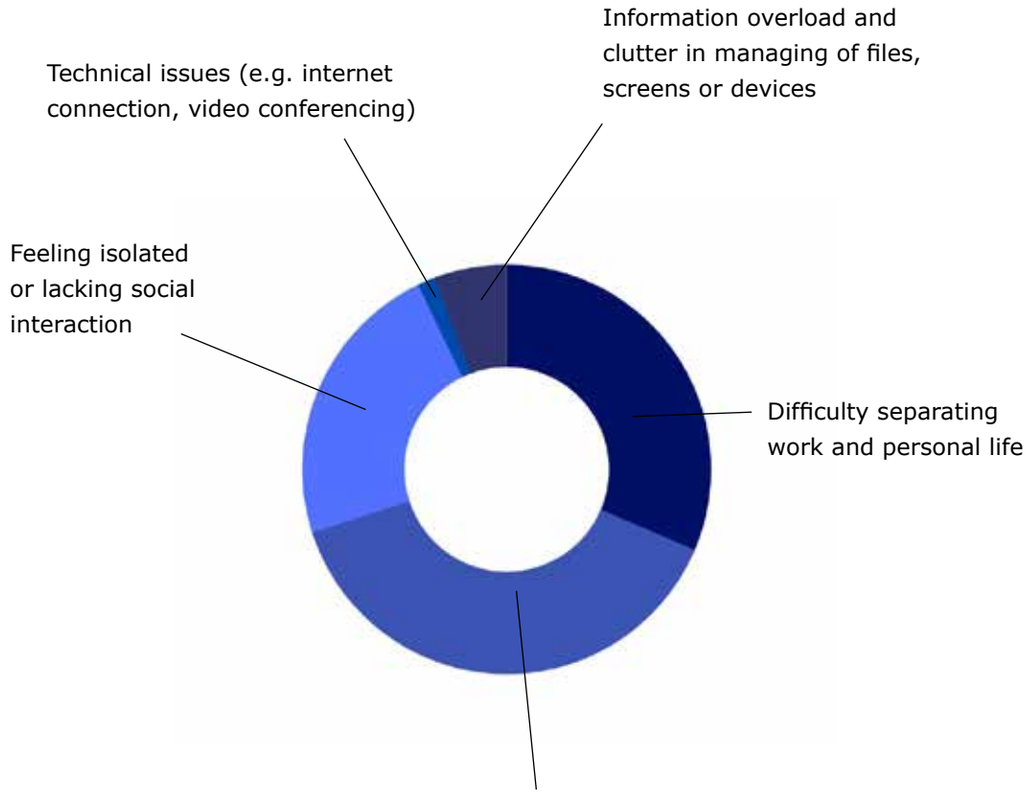
Responses were collected to analyze and enhance the quality of indoor interactions adapted to multiple preferences and needs.



Age

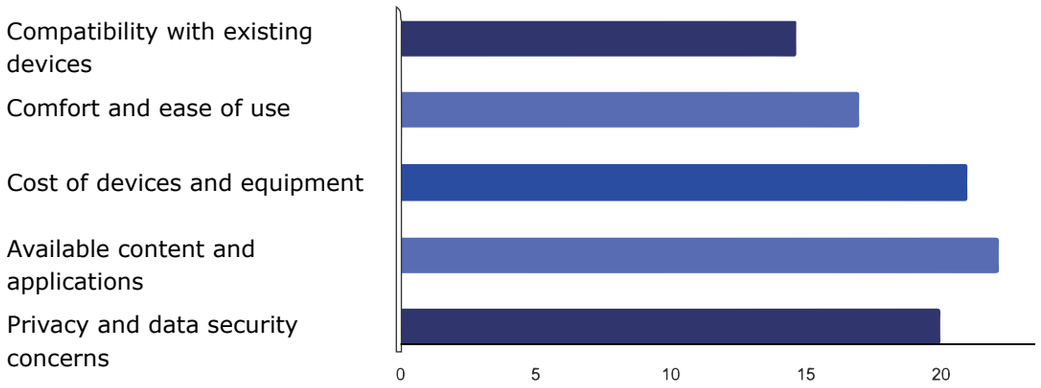


How frequently do you work / study from home?



What are the main challenges you face when working from home?

AR/VR applications ranked based on their potential impact on daily life



Which factors influence your decision to adopt AR/VR technologies?

Young adult population needs interactive, engaging and intuitive immersive experiences because such hybrid experiences can provide them with a sense of empowerment and control leading to digital autonomy and efficient utilization of time and space.

After conducting user interviews, it was found that there is a significant demand for intuitive and immersive mixed reality experiences among the participants. Some of the key findings are:

Need for Immersive Experiences

A desire for immersive experiences that transport the user to different worlds and enable them to explore and interact with their surroundings in new ways was expressed. Seeing personal photos or scans of spaces, elements of nature, educational content, 3D visualizations in biology, home improvements and health tracking were some of the suggested use cases.

Intuitive User Interface

Participants emphasized that the user interface should be easy to use and navigate. They want to be able to interact with the virtual environment in a natural and intuitive way, without the need for complex instructions or training.

Customization

Participants expressed a need for customization options that allow them to personalize their interactions within virtual environments as per their preferences.

How might we create an organisation framework to priorotise well-being and productivity by enhancing the quality of human computer interactions?

Activity

My research stems from a very fundamental question :
What qualifies as a good interaction and what are the cues involved?

To answer this question, I consider spaces and activity as potential barometers to assess interactivity within a simple framework.

I photographed and collected images of workspaces/homes from peers and participants interested in the research to gain insights into their daily environments.

By observing these spaces, I could understand how individuals utilize their surroundings for productivity, well-being, and entertainment. I focused on capturing the arrangement of furniture, organization of workstations, and the presence of devices through 3D scanning apps like Polycam, Matterport, iRhino3D and digital photography.

Explorations in MidJourney

Prompt: 3D vector illustration render of home objects and interfaces in interior space

Prompt: augmented reality app allowing people to organize and interact with physical surroundings and digital content

Prompt: home filled with solid bold colorful elements rendered in 3D minimal illustration in blue, yellow, green and a warm orange. the elements are simple geometric shapes like sphere, cylinder, table, chair, lamp, speaker, cubes as screens

Prompt: graphical user interfaces through smart phones for a responsive AR smart hub

Prompt : desk space showing objects, devices, to do lists, photos etc

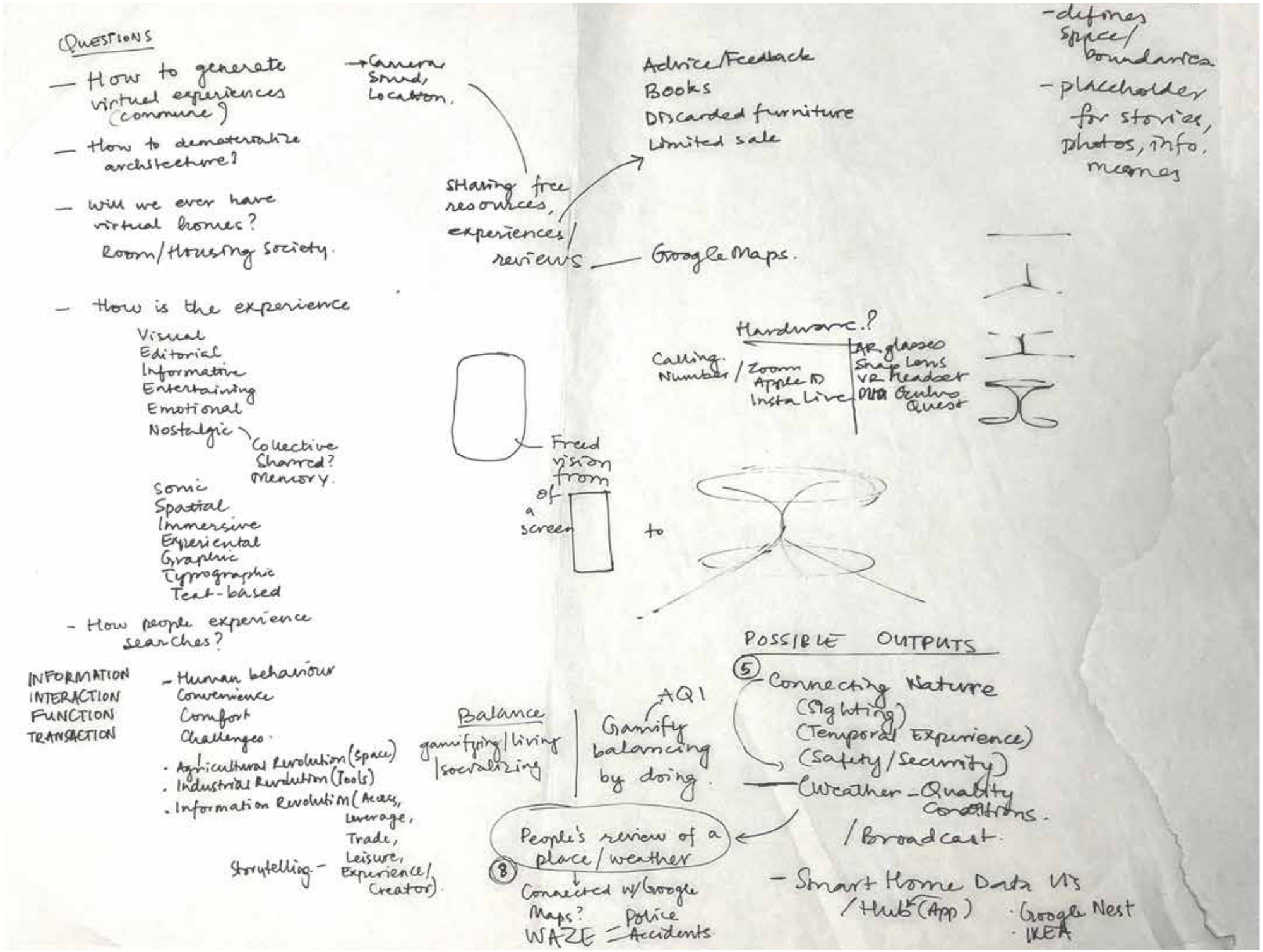
Prompt: modern interior apartment with projections of useful interfaces and widgets for a young woman. Image should be indoors at home rendered photorealistically

Prompt: 3D photo-realistic rendering to show working of augmented reality user interface. The screens are displayed as curved interactive widgets with animated visuals of weather, clock, calendar, photo gallery and controls for the home office space like speaker and light. ar 3:2

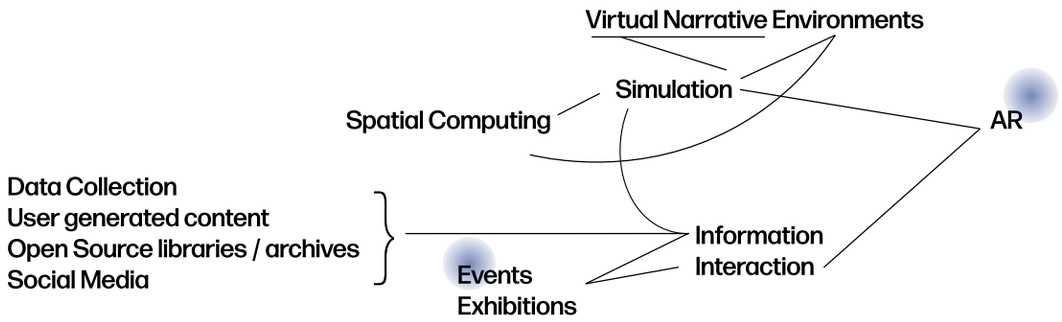
Prompt: smart home design with interfaces to augment workspace and devices using projection mapping and augmented reality , --ar 3:2

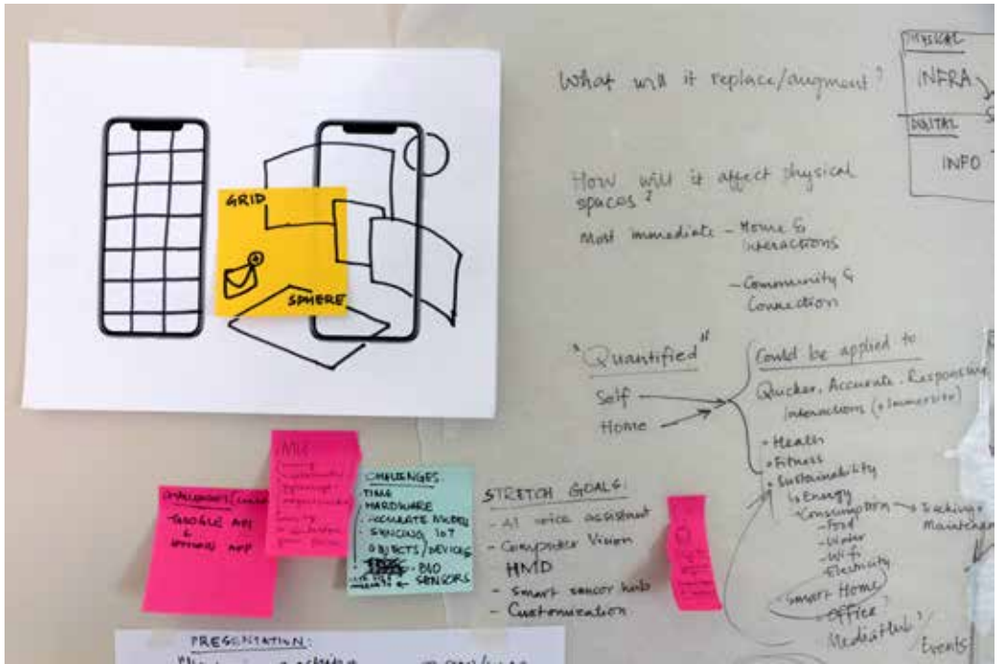
2.2 Design Framework

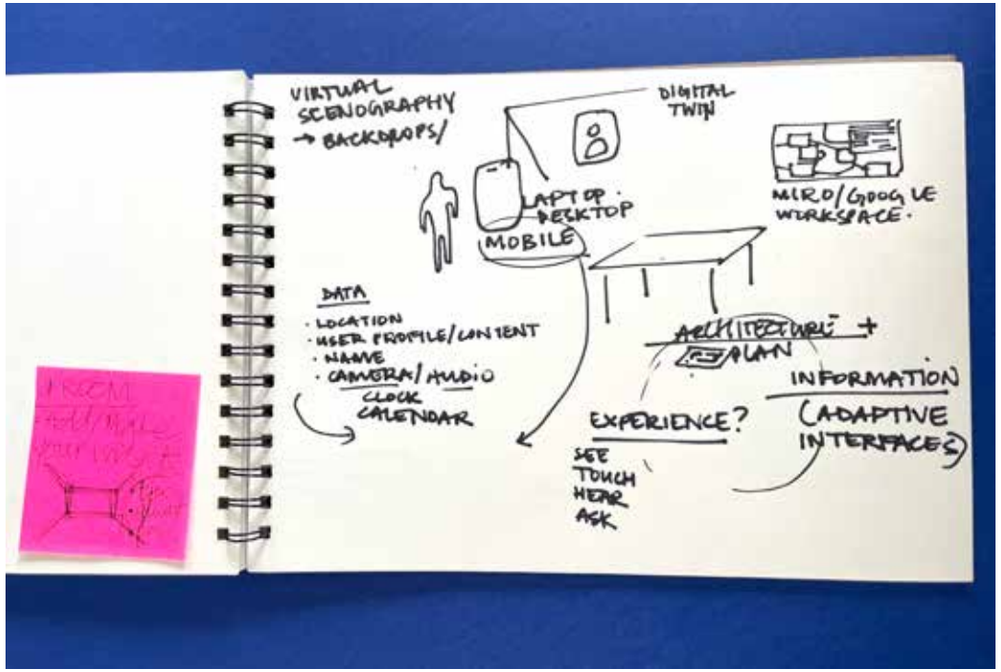
To ensure that the experience does not end up as a mere archive of amusement or sensory pleasure, I focus on creating a call to action. By designing experiences that inspire users to take meaningful steps or engage in their immediate environments, I transform the experience into a catalyst for action. Whether it’s promoting sustainable behaviors, fostering social connections, or encouraging personal growth, the experience becomes a powerful motivator for users to engage, learn, and evolve. My design framework revolves around providing value, engaging users, and fostering co-creation.



from fragmented to augmented

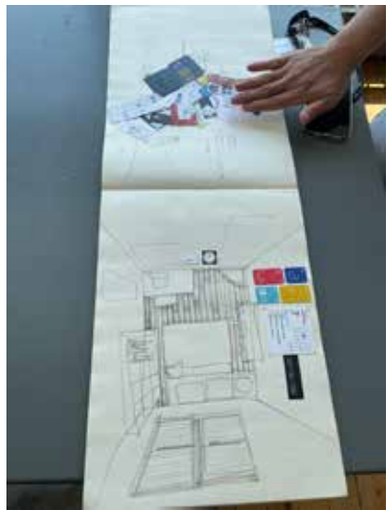






Mindmaps and sketches to arrive at solutions

Participatory Workshop



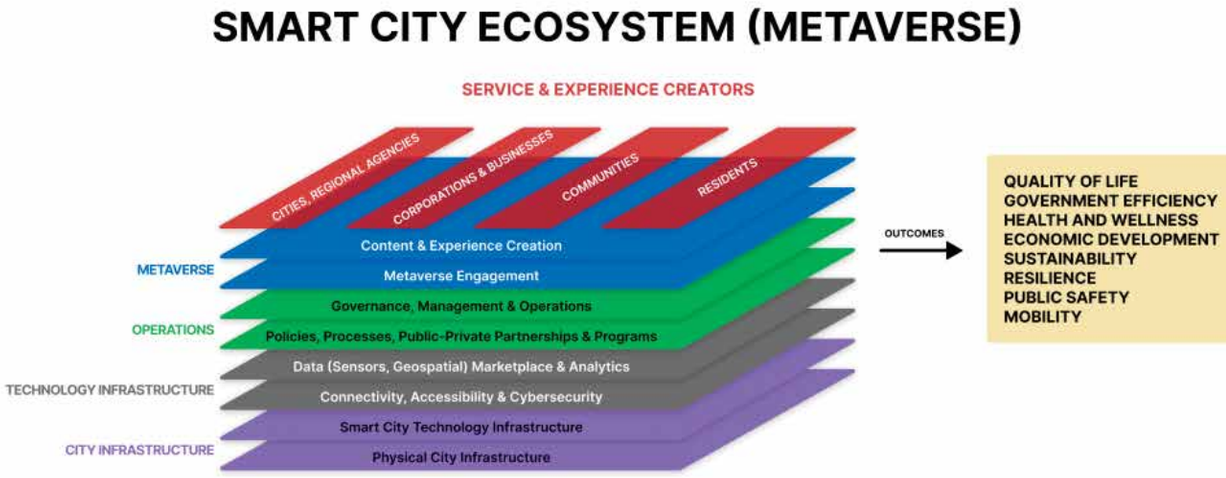
An interactive hands on workshop was facilitated to understand the placement, type and duration of widgets with which potential users would want to interact with the Augmented Reality app. Through this workshop, a collaborative approach helped immensely to learn from conversation, gather feedback and make real-time adjustments.

The overall aim was to empower participants to take control of their information flow, optimize their productivity, and create a balance between their thoughts and their physical environment.

The workshop not only avoided cognitive overload by allowing participants to strategically arrange widgets, but it also provided new modalities of interaction that enhanced functionality and efficiency.

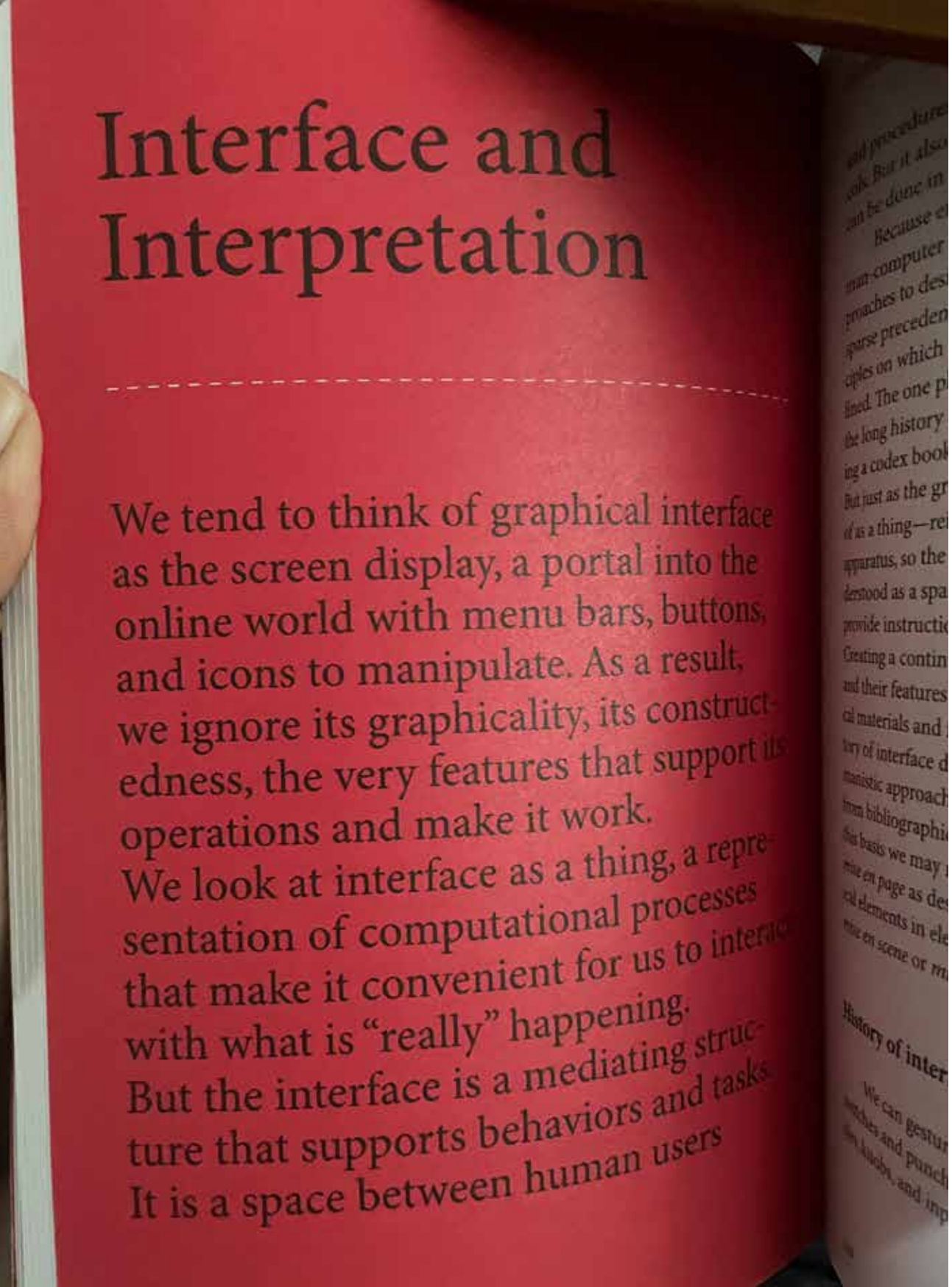
"A new horizon where game and knowledge can flow - transform the inert 2D webpage or the neutral anonymous container of a chat room into a truly interactive place, one that is open to the multiple levels of communication and the construction of situations in constant change[1]."

Game Zone : Playgrounds between Virtual Scenarios and Reality
by Alberto Iacavoni



The layers in a smart city Metaverse.
Image courtesy Strategy of Things

[1]Iacovoni, Alberto. 2004. Game Zone : Playgrounds between Virtual Scenarios and Reality. Basel: Birkhäuser.



There are different categories of models like the children's models, the architect's models, like the souvenir shop's models that you can buy etc. Digging deeper into the idea of the model: I realized over the years that the model is an underestimated cultural technique. Because the architect's model has some shortcomings, one of them being that it's small, it never shows the detail but it gives to a person, who decides to realize a building, the feeling that he's got. The model is important because is kind of being communicated between architect A and architect B. That's the interesting thing about model, because there is an idea to be transmitted. But that's an open field: there is a city model of Rome in Iowa, there is the model of the modern planetary when you go to a natural history museum and, even if of course nobody has seen that ever, we recognize what it is and we can immediately take information from it.

CGI (computer-generated imagery) is also a model because itìs created after geometry and it's not a real thing, it's a model to give you an impression. So you realize that the all things you know can be represented by models such as the economic models (like demand and supply), retirement funds are models too, models are used also in war, there are models in medicine, for instance, used to understand the body or models for simulating space travels. You find models everywhere so I realized that models are actually a cultural technique and the reason why they have something in common is because reality is so complex, you must have a filter. Memory is a good filter because it keeps the most important things, models are filters because they reduce the information to the focal point. Otherwise the world would be too complex.

Today we only have specialists so the models are a kind of way to communicate on a meta level between the different parts of society. Our way of understanding the world is for large part based on models. And that's why I think there is much more in modeling than what people think.

-Thomas Demand

< Image from the book Graphesis
Visual Forms of Knowledge Production
by Johanna Drucker

^ Excerpt from a 2021 interview of
German sculptor and photographer
Thomas Demand by Angela Maderna

Experience Map

From a design perspective, ensuring a seamless and intuitive user experience is crucial in realizing the full potential of AR for unified communications. Designing for AR requires careful consideration of factors such as spatial layout, visual hierarchy, and intuitive interactions.

1. Discovery
The user discovers the AR app and learns about its integration with their smart home devices. The app provides a simple and user-friendly interface that allows the user to explore different actions they can take with their devices.

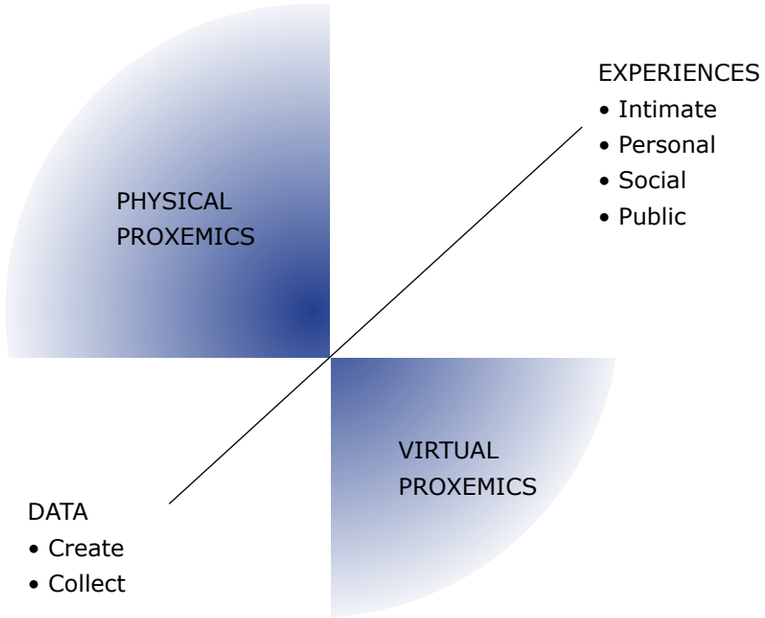
2. On-boarding
The user sets up the AR app by connecting it with their smart home hub and selecting their preferred devices and actions. The app provides clear instructions and visual cues to guide the user through the on-boarding process.

3. Interaction
The user interacts with the virtual interface to control the device or object. The AR app provides affordances that cater to the user's lifestyle, such as voice commands or hand gestures, depending on the user's preferences and device capabilities.

4. Activation
The user activates the AR app by launching it on their smartphone and pointing it at a smart device or object. The app detects the device and displays a virtual interface that allows the user to interact with it.

5. Feedback
The user receives feedback from the AR app and the smart home hub, confirming that the action has been executed. The app provides visual and auditory feedback that enhances the user's sense of control and satisfaction.

6. Reflection
The user reflects on their experience with the AR app and considers how it has improved their smart home experience. They may share their experience with others and recommend the app to friends and family.



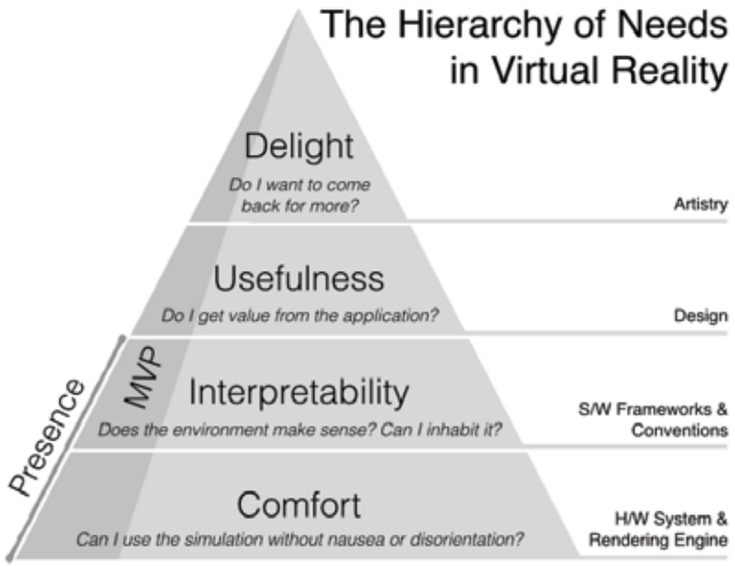
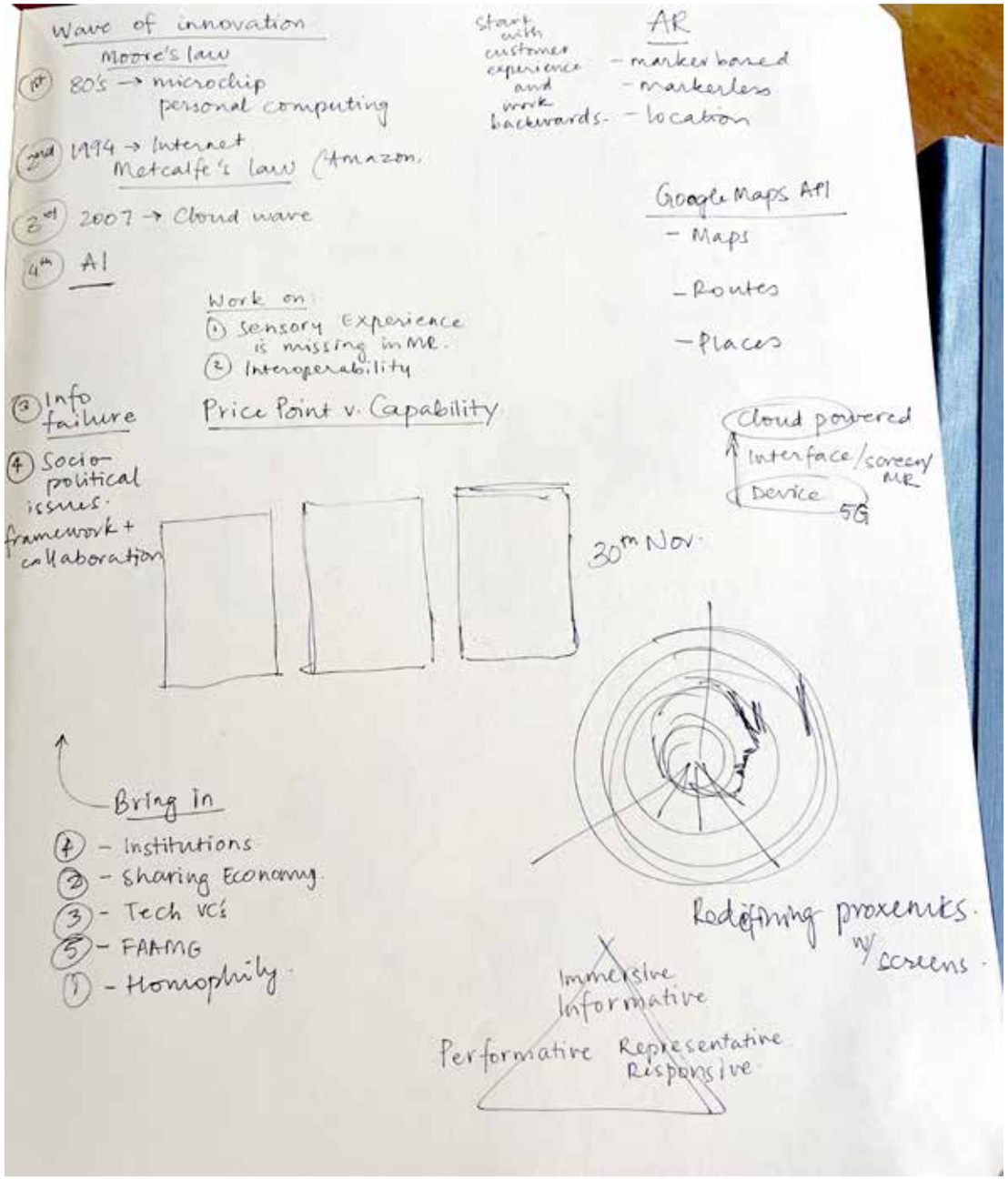
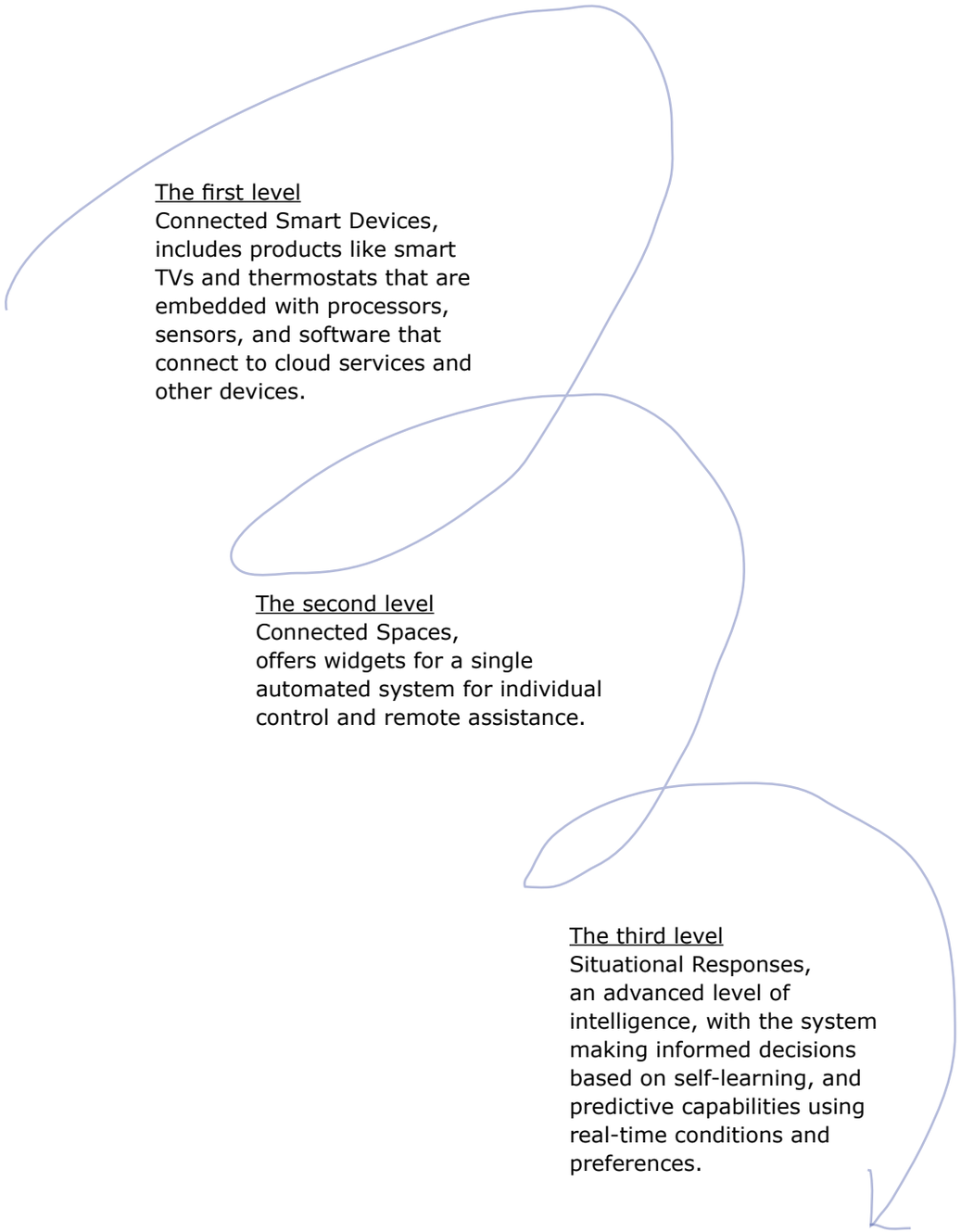


Image source: Beau Cronin, 2015.





Goals

What if smart homes could anticipate my needs and automatically adjust the lighting, temperature, and entertainment options based on my preferences and activities?

What if smart homes could integrate with my virtual assistant or smart speaker, allowing me to control everything with my voice from any room in the house?

What if smart homes could use augmented reality to help me arrange and declutter my space, giving me visual suggestions for furniture placement and organization?

What if smart homes could create a personalized, immersive experience for watching movies or playing games, with surround sound, high-quality visuals, and haptic feedback?

What if smart homes could monitor my energy usage and suggest ways to reduce my carbon footprint and save money on utilities?

What if smart homes could automatically adjust the lighting and ambiance to match my mood, using color and brightness to create a calming or energizing atmosphere?

What if smart homes could alert me to potential hazards or dangers, such as smoke, leaks, or intruders, and automatically contact emergency services if needed?

What if smart homes could integrate with my fitness tracker or smartwatch, offering suggestions for workouts, nutrition, and sleep based on my goals and activity levels?

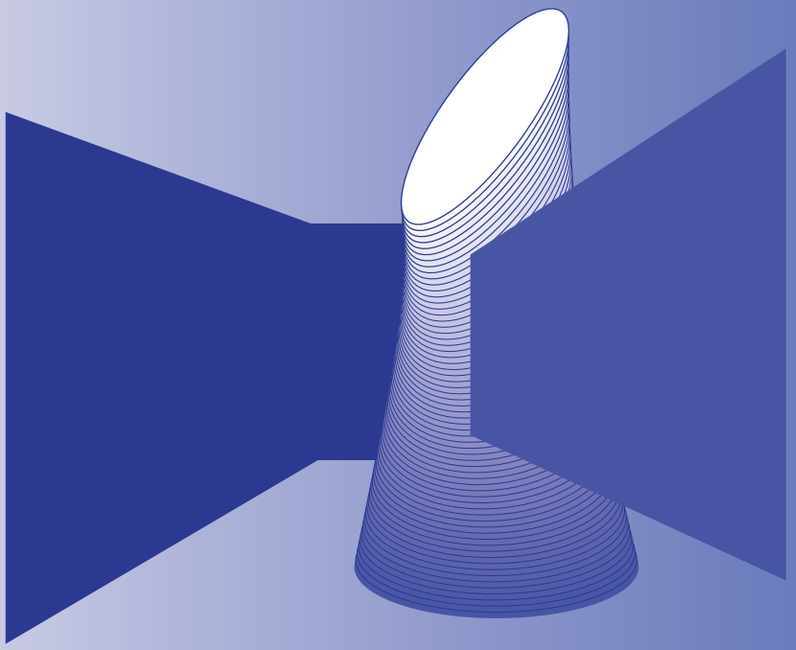
What if smart homes could connect with other smart homes in my neighborhood, creating a network for sharing resources, services, and community events?

What if smart homes could offer personalized recommendations for entertainment and events based on my interests and social network?

PART III

Prototypes and Proposed Intervention

In Section 3 of this design thesis book, I bring my research to life through the creation of prototypes and propose interventions that reimagine the augmented reality and smart home landscape. By carefully considering the needs, desires, and aspirations of users, I introduce design interventions that foster connection, engagement, and well-being.



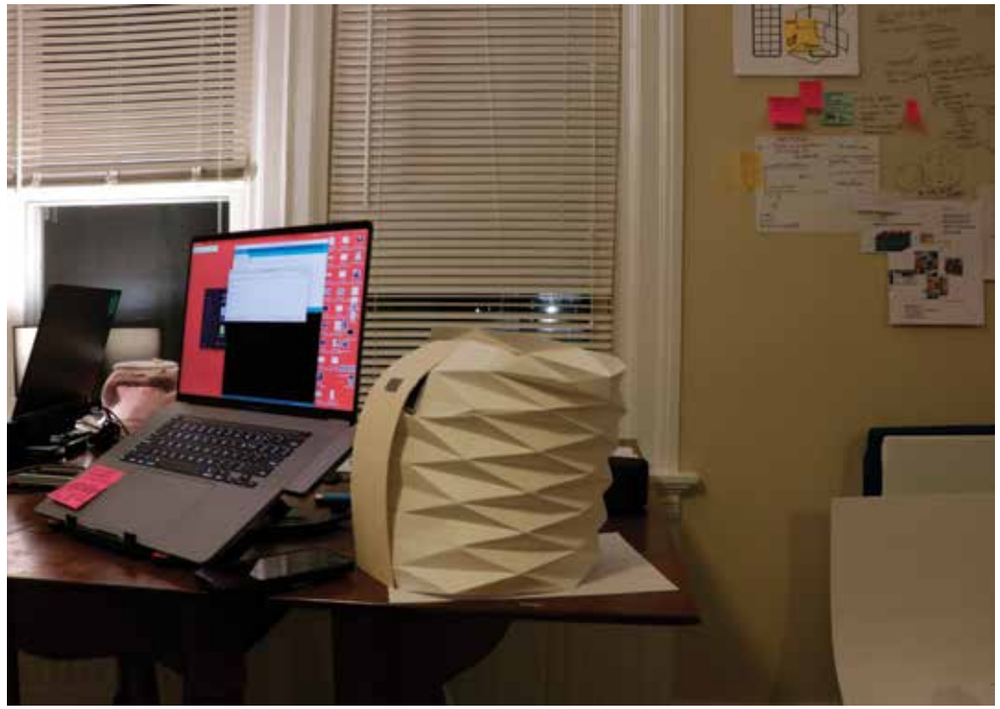
3.1 Prototypes

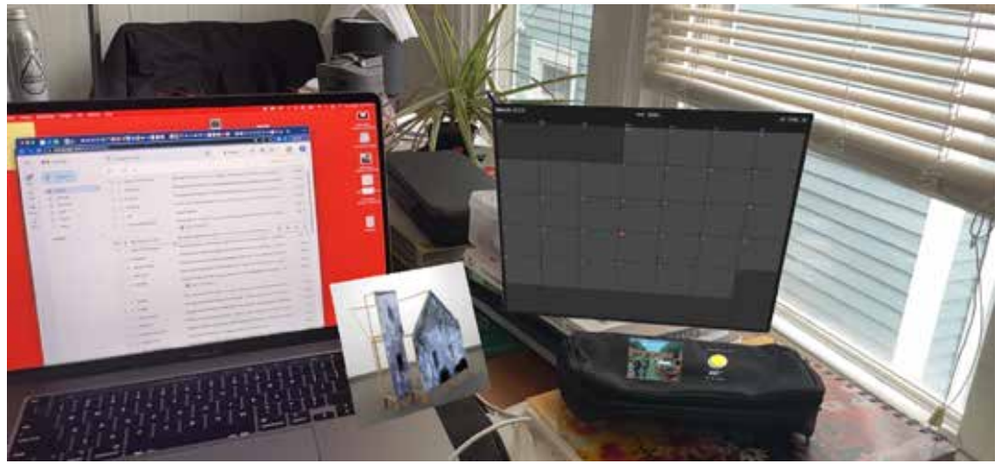
"Prototypes," serves as a launchpad for ideas taking shape. I delve into the iterative process of rapid prototyping, experimenting with diverse materials, technologies, and interfaces. Through these prototypes, I have tried envisioning novel interactions that redefine our relationship with the home environment. Low fidelity prototyping techniques and explorations helped facilitate visual comprehension with informed design choices.

< An important aspect of my prototyping was understanding how to make information portable and responsive in real-time within AR experiences. This involved considering varying levels of information density and dynamically adjusting the presentation of information based on user context and preferences. I explored techniques such as progressive disclosure, cascading menus and bubbles where additional layers of information are revealed as users interact with AR content.

The exploration of projection mapping for spatial augmented reality within homes allowed me to push the boundaries of traditional interaction design and imagine new possibilities for transforming everyday living spaces into dynamic and engaging environments.

< I also examined the challenges and opportunities specific to home environments, such as the availability of suitable surfaces, ambient lighting conditions, and the need for seamless integration with existing interior aesthetics.





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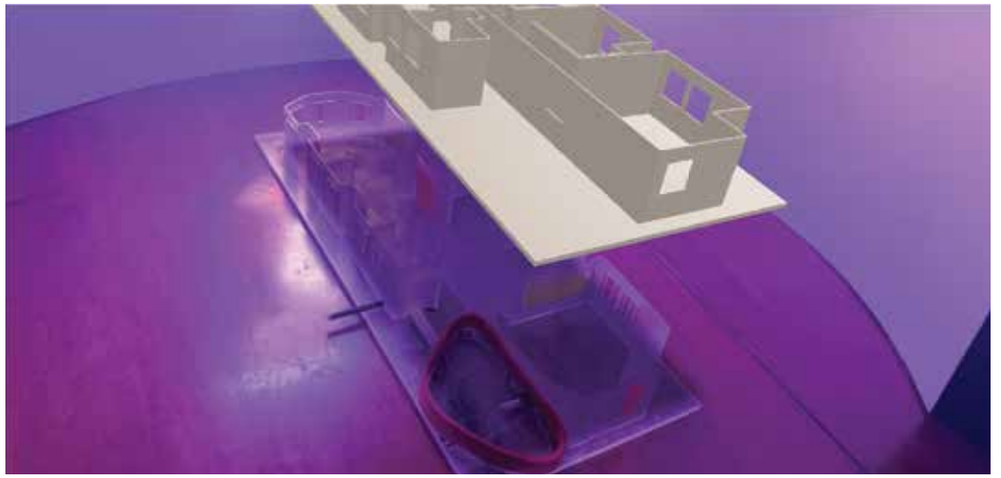
Integrated Arduino, AQI (Air Quality Index) sensors,
for controls within specific areas of a home or room



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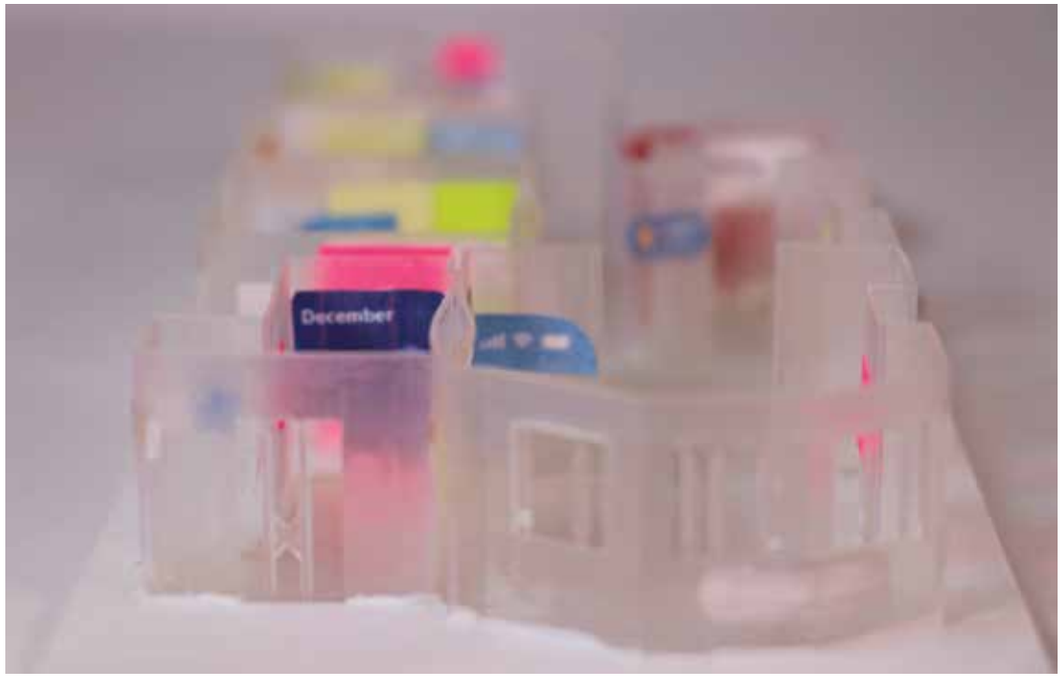
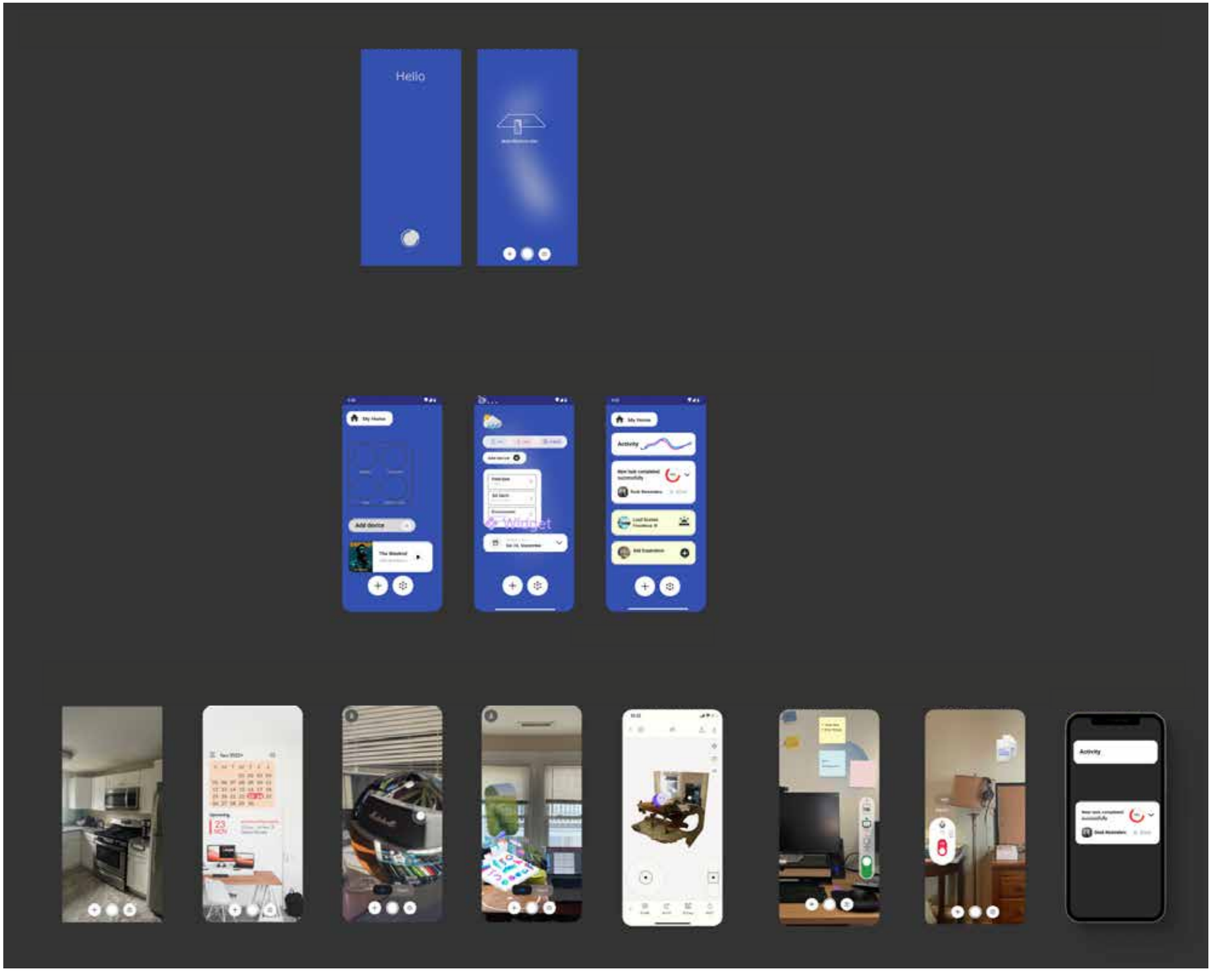
A 3D model floats above a 3D print of the same house along with a
Calendar and Weather updates

In order to bring the concept of spatializing thoughts and information within a home setting to life, I decided to create a 3D printed model as a prototype. This prototype served as a tangible representation of the system and allowed for a detailed study of inhabitants' behavior patterns, widget preferences, and phone and media usage.

^

The model served as a scaled-down replica of a home environment, complete with various interactive widgets and representations of phones and media devices. The inhabitants of the model were positioned in locations that reflected their usual presence along with their prefered applications and utilities within the home which allowed for a realistic visualisation of how they would interact with the AR system.





< Using Figma’s wireframing capabilities, I created low-fidelity representations of the AR interfaces, focusing on the arrangement and hierarchy of key elements. This allowed me to evaluate the cognitive load imposed on users, ensuring that the information presented was clear and easily digestible within the AR context.

^

2D interfaces and affordances that can help the user organize the space around them with automations and affordances such as reminders and alerts

< Interfaces anchored to specific sites or objects (in this case - a pencil box). Prototypes realised using Unity, Figma and Adobe Aero

Scan the space
Use the app to scan the space. This will create a digital map of the area and allow you to see the space in augmented reality.

Identify cluttered areas
Once the digital map is created, the app can be used to highlight objects that need to be removed, moved, or organized and create a digital plan for the space, such as where to store items and how to arrange furniture.

Smart home device control
AR can provide a more intuitive and interactive interface for controlling smart home devices, such as using hand gestures or voice commands to turn on/off lights or adjust temperature. AR can also incorporate sensors embedded in smart home devices, such as motion or light sensors, to provide additional safety and security features.

Living Room

25°C
Cool Mood

Set Temperature

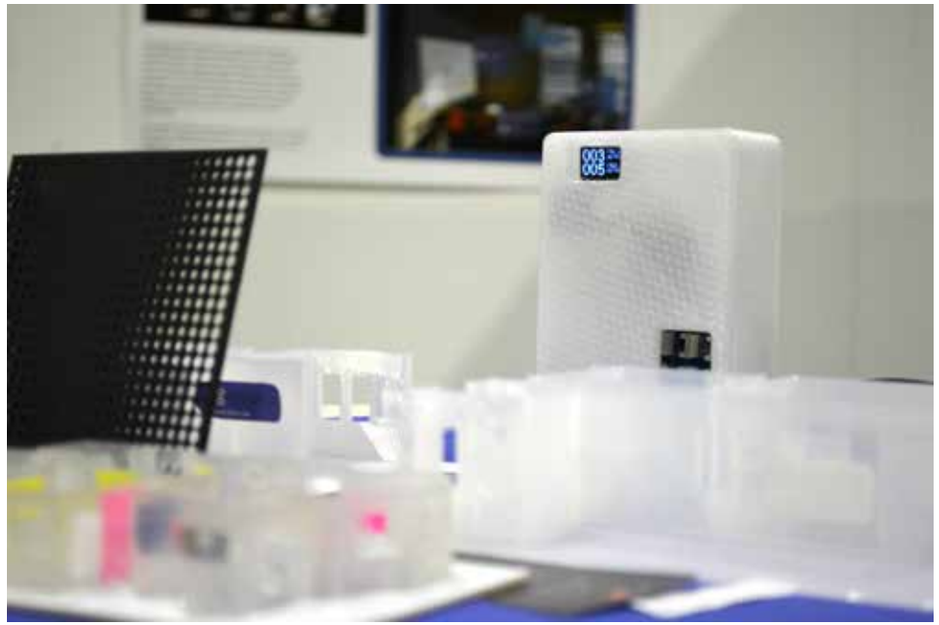
Statistic

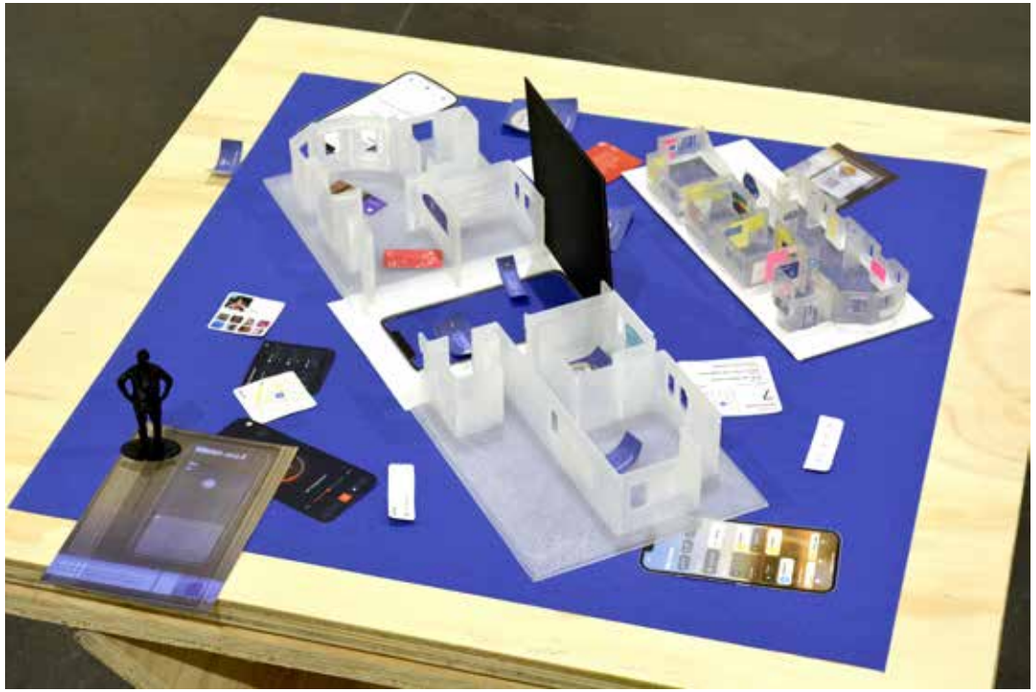
Living Room

004
006

OCTOBER
Wednesday
7

Write next chapter of book





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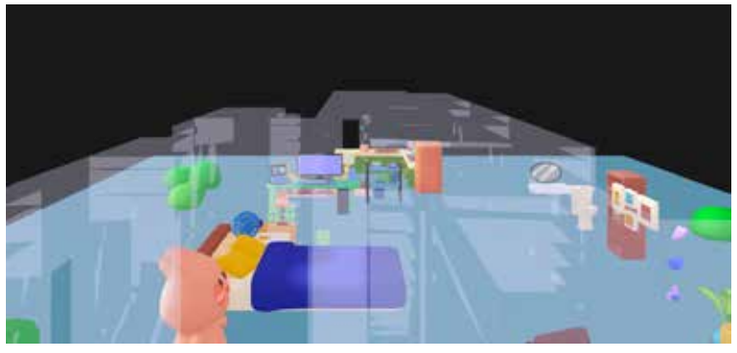
Display pictures from the graduate expo hosted by RISD
at the Rhode Island Convention Center, Providence



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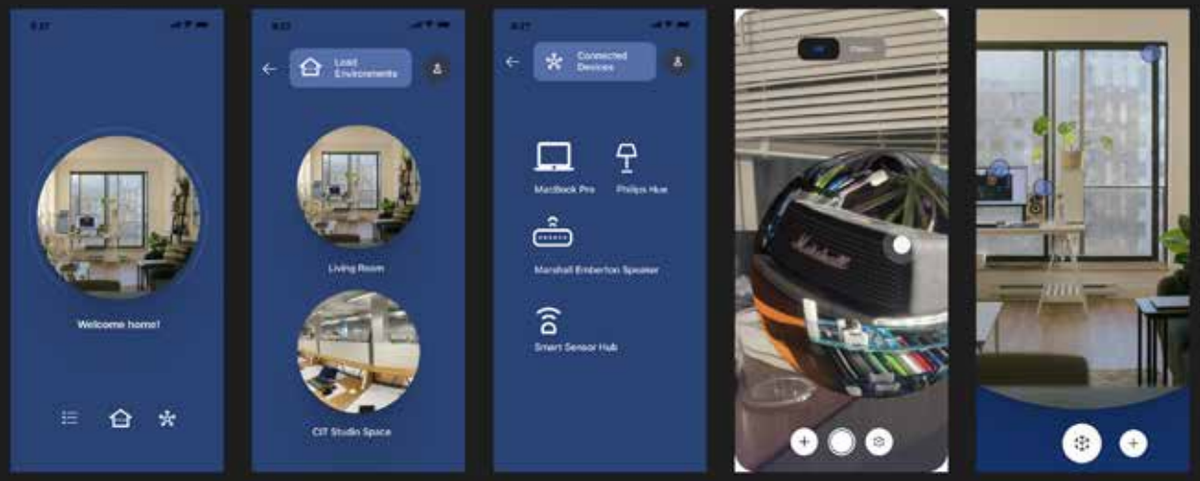
Screenshots from AR publishing platforms Bezel 3D and Spline that serve as easy to use, no code prototyping tools

< Screenshots from a 3D rendered video of Sol Koffler Gallery. To set up the premise of loading environments and scenes, I looked at portability in information and spaces through 3D reconstructions and models of home, gallery and office

3.2 Proposed Intervention

I developed a proof of concept for an augmented reality (AR) based application designed specifically for homes, enabling users to seamlessly add, connect, and control various devices within their living spaces. Bridging the gap between a smartphone and a smart home, this AR-based system empowers users with timely information, personalized assistance, and automation capabilities. By simply pointing their AR-enabled device at a specific area or object, a virtual interface overlays the real-world environment, providing an interactive display of available devices and functionalities.



Having identified key pain points and desired outcomes, I devised a design intervention that promotes optimal living and working with AR, spatial computing, and generative AI.

Extending capabilities

Marker-based
Detects markers placed around the workspace to provide location-based information and services. For example, a marker on a desk could trigger a relevant AR display of notes or reminders.

Markerless
Detects the location and orientation of the device in real-time. The app uses the device's camera to recognize the user's surroundings and display information about nearby objects or locations.

Location-based event updates
AR can provide a visual representation of nearby events, such as concerts or festivals, overlaid on the user's real-world view. This can help stay updated on and navigate to nearby events.

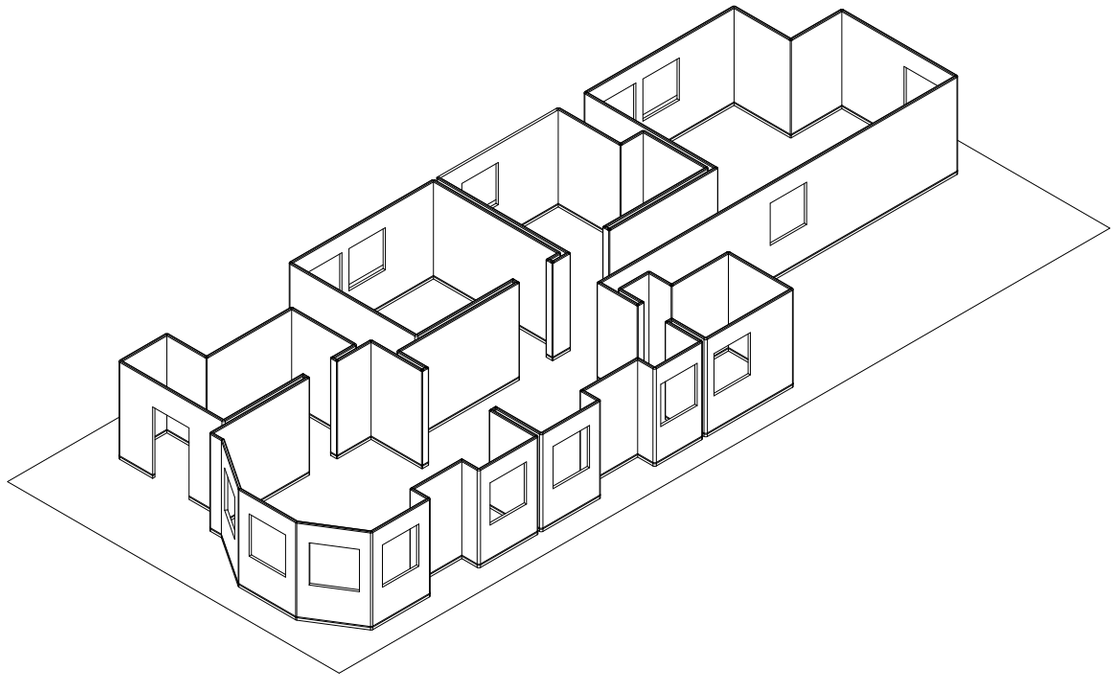
Location-based services
The app can use location-based services (LBS) such as GPS or Bluetooth beacons to provide location-based information and services.

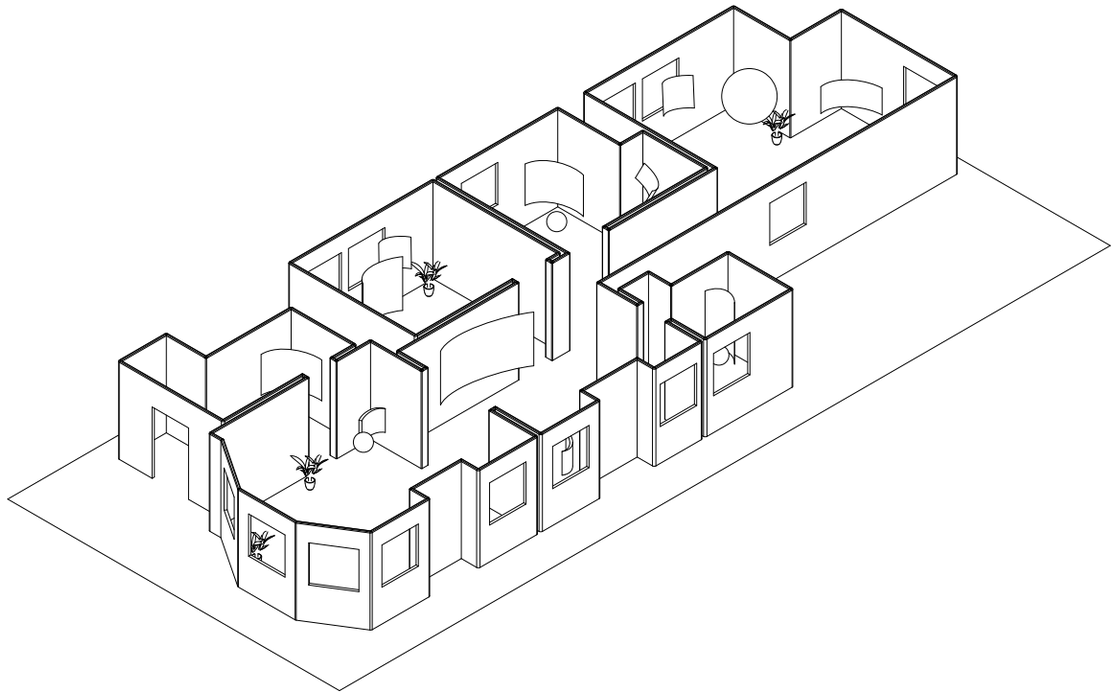
Workspace setup
The app can use AR to visualize and set up a workspace, allowing the user to experiment with different layouts and configurations before physically rearranging their workspace.

Connected messaging and feedback
AR can enable real-time messaging and feedback, such as displaying incoming messages from friends or colleagues while the user is working on their smart home automation.

Collaborative design
Multiple users could work together on a shared virtual workspace. For example, users could use marker-based tracking to place virtual objects and annotations in a shared space, allowing them to collaborate on a project in real-time.

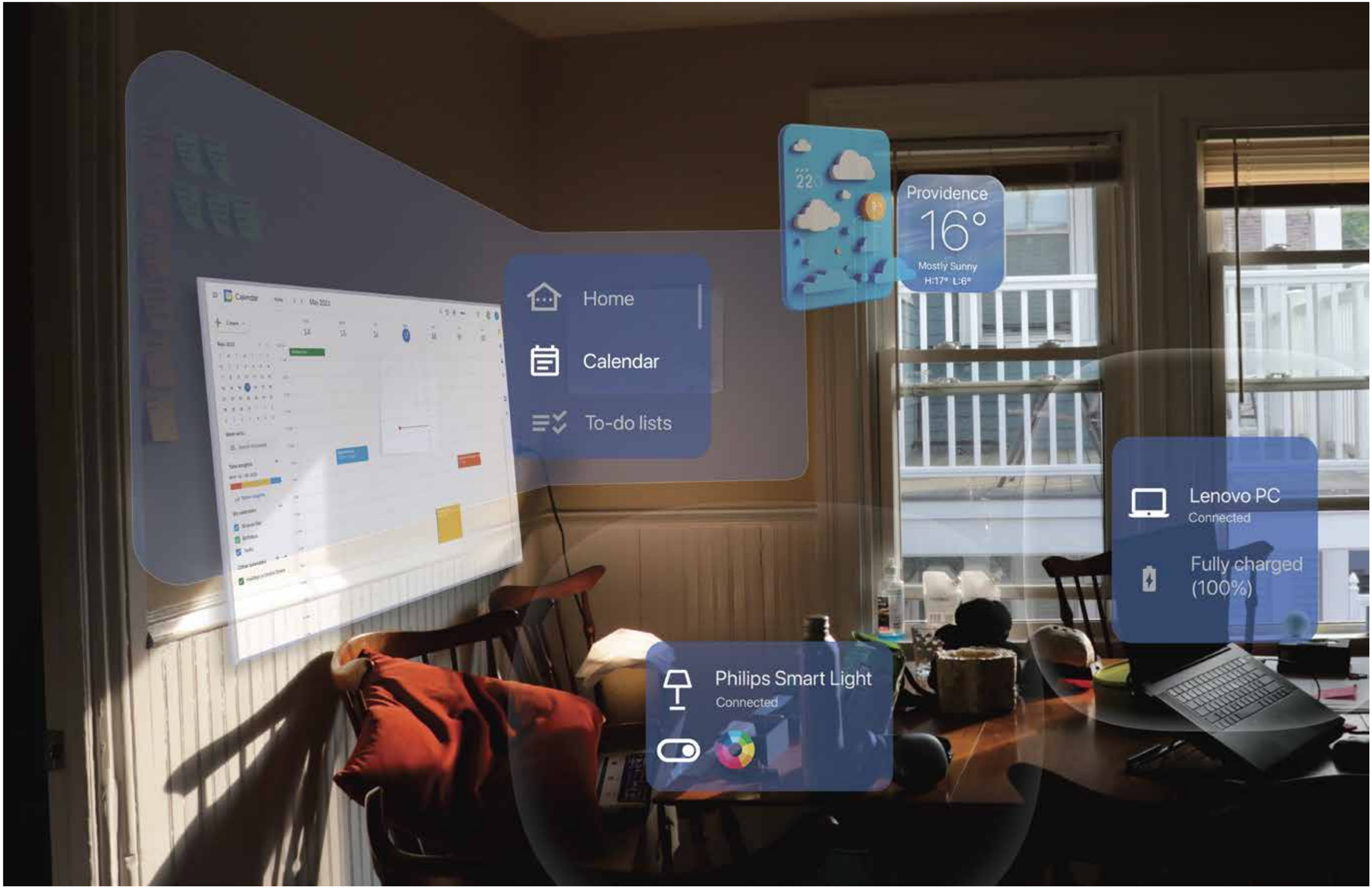
Cloud and edge capabilities
Access to files stored in the cloud or edge devices, allowing the user to easily share or present files anytime, anywhere. This can be especially useful for professionals who need to work remotely and on-the-go.





time to reimagine space,

starting from home.


Home
Calendar
To-do lists
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16°
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Lenovo PC
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Fully charged
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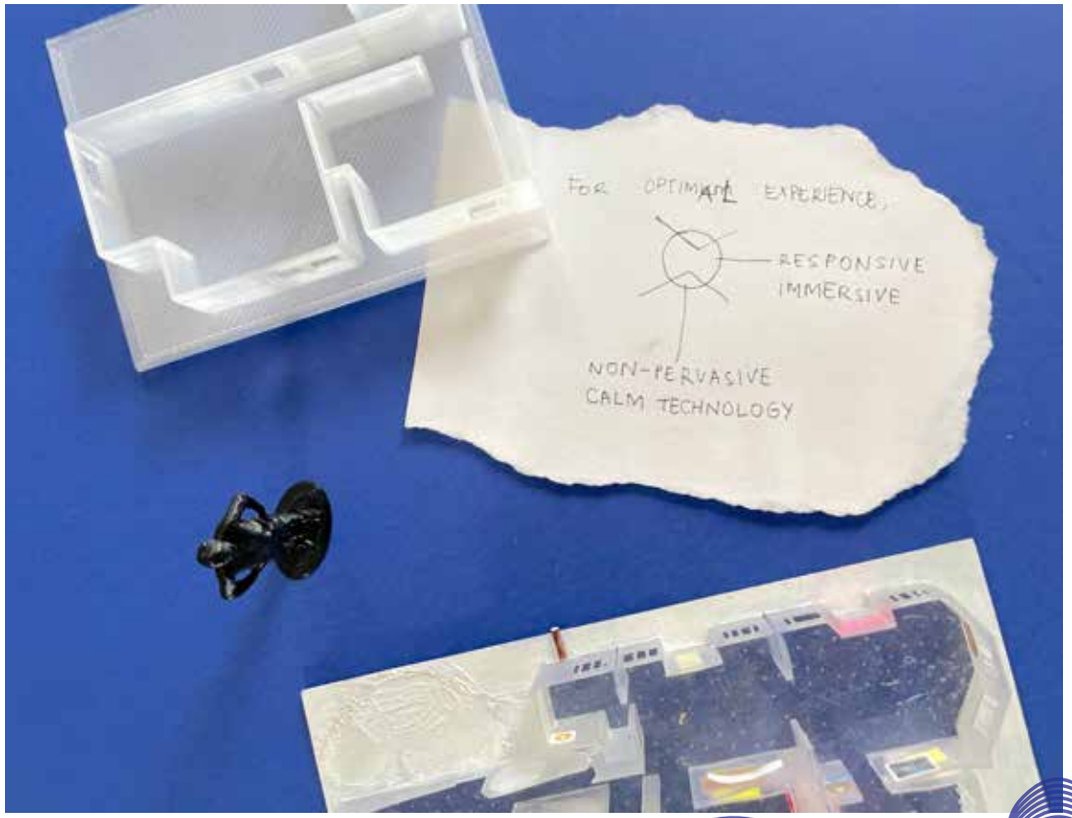
Philips Smart Light
Connected



3.3 Concluding Thoughts

In conclusion, the integration of interior and interaction design principles, along with technology, offers innovative solutions for creating hybrid spaces that facilitate interactivity. Further research and design efforts in this area can contribute to developing more effective strategies for a radical reorganising of our physical and digital spaces.

Display at Sol Koffler Gallery, RISD

Interior design traditionally focuses on shaping physical spaces' aesthetic and functional aspects, considering layout, materials, lighting, and ergonomics. However, with the emergence of augmented reality (AR) and virtual reality (VR) technologies, interior design can now extend beyond the confines of physicality. AR overlays digital information onto the physical surroundings, augmenting users' perception and interaction, while VR creates fully immersive digital spaces. By integrating these technologies, designers can expand the possibilities of interior design by introducing dynamic, customizable, and interactive elements into the built environment.

On the other hand, interaction design revolves around creating intuitive and engaging interfaces for digital systems. It focuses on understanding user behaviour, anticipating needs, and designing seamless interactions. A new frontier emerges by merging interaction design principles with interior design, where interactive environments respond to user input, adapt to their preferences, and offer personalized experiences. This convergence paves the way for creating hybrid environments where sensors, data, and interconnected devices enable real-time adaptation and enhanced user engagement.

Coalescing the creative and technical possibilities of AR, I am driven to develop ingenious design solutions and deliver captivating personalized experiences for users.

As I tread forth, an unwavering commitment propels me to pursue the creation of mindful interactions for smart homes, collaborate with peers and market leaders, and learn further about technologies to redefine the very essence of interior design.

Image Credits

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